Bargaining structure, corporatism and macroeconomic performance

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1. Introduction

It has gradually become recognized that wage setting may be as important as government policy for macroeconomic performance. Today it is commonplace to explain the diverse experiences of countries with reference to differences in wage-setting institutions. But the literature in the field often lacks precision due to attempts to cover too much ground. There seems to be much to be gained from pursuing a systematic analysis of one aspect at a time. We focus on how macroeconomic performance is affected by the extent of centralization of wage bargaining, which we believe to be a crucial factor.

Wage-setting arrangements differ fundamentally among OECD countries in this respect. At one extreme are countries like the US, Switzerland, Japan and Canada with decentralized wage setting mainly at the level of individual firms. At the other extreme are the Nordic countries and Austria with centralized bargaining between national trade union movements and employer federations. In between, there are countries such as Germany, Belgium and the Netherlands, where bargaining occurs at the industry level.

The success of countries such as Sweden, Norway and Austria in maintaining high levels of employment is usually attributed to centralized bargaining which takes into account macroeconomic considerations. Similarly, the absence of such considerations under decentralized bargaining in Britain, France and Canada is a widely held explanation for their high rates of unemployment. Yet, at the same time, real wage flexibility, presumably resulting from decentralization, is regarded as

We are grateful to Judith Weilbull for help with compilation of data and regressions, and to Hakan Lyckeborg for help with the non-parametric statistical tests. Useful comments on an earlier version were received from the Panel, our discussants and Charles Wyplosz. Annica Hjertmann, Annika Gustafsson and Anna Thompson typed numerous versions with great care and patience.

Economic Policy April 1988 Printed in Great Britain

Centralization of wage bargaining

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Summary

The structure of labour markets is increasingly perceived as a determinant of the macroeconomic performance of a country. This article focuses on one aspect of labour markets, the degree of centralization of wage setting. The main conclusion is that extremes work best. Either highly centralized systems with national bargaining (such as in Austria and the Nordic countries), or highly decentralized systems with wage setting at the level of individual firms (such as in Japan, Switzerland and the US) seem to perform well. The worst outcomes with respect to employment may well be found in systems with an intermediate degree of centralization (such as in Belgium and the Netherlands). This conclusion is reasonably well supported by the available empirical evidence. It is also logical. Indeed, large and all-encompassing trade unions naturally recognize their market power and take into account both the inflationary and unemployment effects of wage increases. Conversely, unions operating at the individual firm or plant level have very limited market power. In intermediate cases, unions can exert some market power but are led to ignore the macroeconomic implications of their actions. These conclusions challenge the conventional wisdom which asserts that the more 'corporatist' is an economy, the better is its economic performance.

a major cause of low unemployment in Japan and Switzerland. Decentralization is also a frequent explanation for the success of the US economy in generating more employment growth over the past decade than the European economies.

Two fundamentally different views seem to be involved. According to the first view, centralization is seen as a guarantee that wage setters will recognize broader interests. This view has been articulated by political scientists in the literature on 'corporatism', and recently adopted by many economists. The opposing view holds instead that wage increases would be restrained if market forces were allowed to play a larger role. This is the rationale behind the Thatcher government's attempt to break union power. Similar ideas have inspired the employer side in the Nordic countries to try to break up central wage negotiations.

It is easy to be sympathetic to both views. Both the idea that competitive forces will restrain wages, and the idea that there are potential gains from internalization of the external effects of wage increases within large encompassing organizations, have solid foundations. Indeed, we find that both heavy centralization and far-reaching decentralization are conducive to real wage restraint, whereas intermediate degrees of centralization are harmful. This suggests a hump-shaped relation between centralization and real wages (unemployment) as depicted in Figure 1. This relation stands in contrast to an often postulated monotonic relation whereby centralization always reduces real wages and unemployment. The hump-shaped pattern is related to Mancur Olson's (1982) idea that organized interests may be most harmful when they are strong enough to cause major disruptions but not sufficiently encompassing to bear any significant fraction of the costs for society of their actions in their own interests.

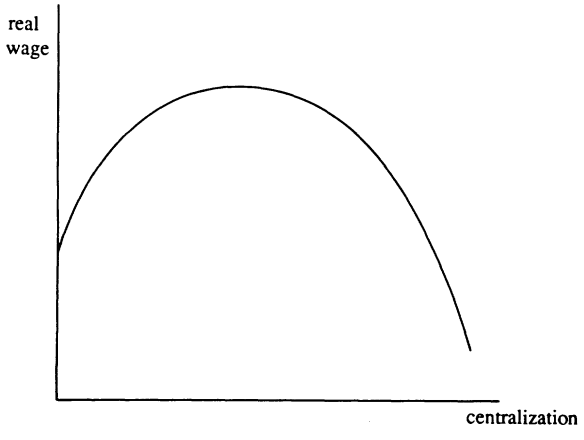

Figure 1. The hump-shape hypothesis

This article provides both empirical evidence and an interpretation of the effects of centralization. Section 2 describes the basic differences in wage-setting institutions among OECD countries, and Section 3 presents some stylized facts on macroeconomic performance. Section 4 examines critically the literature on corporatism. Section 5 develops an analytical framework and provides numerical simulations on the effects of centralization. Section 6 contains our conclusions.

2. Wage-setting institutions in the OECD countries

2.1. Brief overview of national arrangements

Central wage agreements between powerful national employer associations and union confederations characterize the Nordic countries (Denmark, Finland, Norway and Sweden). These centralized systems have proved to be quite stable in the past, although there has been a strong tendency towards increased decentralization recently. The main threat to the established framework seems to be wage competition between three groups of employees that usually bargain separately at the national level: private-sector blue-collar workers, private-sector white-collar workers and public-sector employees in general (Flanagan *et al.*, 1983, and Elvander, 1987).

In Austria wage agreements are formally made at the industry level, but all wage contracts have to be approved by the central confederation of labour (VGB), which organizes both blue-collar and white-collar workers in both the private and the public sector. No negotiations are allowed without the approval of the central Subcommittee on Wages and Prices which consists of union and employer representatives. As a result, 'the centralization of authority in the VGB probably exceeds that of any other democratic trade union movement' (Flanagan *et al.*, 1983).

In Canada, the US, Japan, Switzerland, UK, France and Italy, wage bargaining is instead mainly at the enterprise level, although there are certain elements of industry bargaining in the latter three countries. In Canada and the US, there is no tradition of involvement by central organizations in bargaining, and indeed there exist no central employer organizations. In the other countries central organizations play some role, but primarily in negotiations on general working and employment conditions. In Switzerland, France and Italy unions are split along political and religious lines. As to Japan, there are several national confederations of labour but their coordinating roles are minor, and the actual negotiations take place exclusively at the enterprise level. The UK differs because of the complex intermingling of craft and

industrial unions; for example, in some large engineering firms, 15 or 20 different unions may be represented in one working place (Bratt, 1986).

In Germany, the Netherlands and Belgium the main negotiations occur at industry level. In Germany there exists one central employer association and one central union confederation but they are not usually involved in actual bargaining (Flanagan *et al.*, 1983). Wage agreements are usually struck within industries on a regional basis but the wage agreements in the metal industry are typically pattern making. In the Netherlands and Belgium, labour organizations are split along ideological and religious lines. The Belgian system of industry negotiations, within so-called Parity Commissions consisting of labour and employer representatives, has been quite stable over time. The Dutch system changed in the 1960s from high centralization in connection with government income policies to bargaining at the industry level (Faxen, 1982 and Bratt, 1986). In contrast to Germany, several contracts are struck within each industry since the jurisdictions of the various parallel unions overlap, but there is a high degree of coordination on the union side (Flanagan *et al.*, 1983).

The least transparent systems occur in New Zealand and Australia, which have ingredients of both centralization and decentralization. On the one hand there is a large element of wage setting in individual enterprises and for individual crafts, often on a regional basis. On the other hand compulsory arbitration tribunals attempt to follow common norms. The trend in both countries is in the direction of increased centralization connected with government attempts at tripartite agreements (Rimmer, 1985, and Easton, 1986).

2.2. Rankings of countries

In order to relate these broad characteristics to macroeconomic performance, we need to quantify them, which requires a more precise definition of centralization. We shall define it as *the extent of inter-union and inter-employer cooperation in wage bargaining with the other side.* The focus is thus on the extent to which coalitions are formed among unions and employers respectively. This definition differs from others that are concerned more with the formal than the behavioural content of wage setting. One such definition is the level at which bargaining occurs. Another definition concerns the extent to which unions and employers join in aggregate bodies with varying powers vis-à-vis member unions and employers. These alternatives are good 'proxies' for centralization as we have defined it, but, as described above, there are also exceptions.

Table 1. Rank orderings of countries according to their degree of centralization

	Ours		Schmitter		Cameron		Blyth		Bruno–Sachs
1	Austria	1	Austria	1	Sweden	1	Austria	1	Austria
2	Norway	2	Norway	2	Norway	2	Norway	2	Germany
3	Sweden		Sweden	3	Austria	3	Sweden	3	Netherlands
4	Denmark	4	Denmark	4	Belgium	4	Denmark	4	Norway
5	Finland		Finland	5	Finland	5	Finland		Sweden
6	Germany	6	Netherlands	6	Denmark	6	New Zealand	6	Switzerland
7	Netherlands	7	Belgium	7	Netherlands	7	Australia	7	Denmark
8	Belgium	8	Germany	8	Germany	8	Germany	8	Finland
9	New Zealand	9	Switzerland	9	UK	9	Belgium	9	Belgium
10	Australia	10	US	10	Australia	10	Netherlands	10	Japan
11	France	11	Canada	11	Switzerland	11	Japan	11	New Zealand
12	UK	12	France	12	Italy	12	France	12	UK
13	Italy	13	UK	13	Canada	13	UK	13	France
14	Japan	14	Italy	14	US	14	Italy	14	Italy
15	Switzerland			15	France	15	US	15	Australia
16	US			16	Japan	16	Canada	16	Canada
17	Canada							17	US

Column 1 in Table 1 is an attempt to rank countries according to our definition. The ranking is based on an index developed in Appendix A, which takes into account the extent of coordination both within and between various central organizations. Because we have more confidence in the relative positions assigned to countries than in the measurement of the magnitude of differences, the emphasis is on the *ranking*, not on any precise scale. Three other authors have ranked countries according to similar criteria. Schmitter's (1981) ranking (column 2) considers only the union side. So does Cameron's (1984) in column 3, but in addition it also takes into account the extent of unionization. This is an attempt to measure cooperation among workers in general rather than among unions only. The main problem with this approach is to judge the extent to which variations in unionization rates reflect differences in the – formal and informal – coverage of union contracts. Blyth (1979), finally, ordered countries according to two criteria: the extent to which unions and employers are joined into central bodies with executive negotiating powers, and the level at which bargaining takes place. The well-known ranking used by Bruno and Sachs (1985) is shown in column 5. The differences between our ranking and those in columns 2–5 are minor. Any such classification is inevitably subjective. It will be useful, therefore, to check the sensitivity of empirical results to variations in the rankings used.

3. Some stylized facts

Our basic result, developed in Section 4, is the existence of a hump-shaped relation between centralization and real wages. With an inverse relationship between labour demand and real wages – for which there is empirical evidence (see e.g. Metcalf, 1987) – the employment performance in both centralized and decentralized economies should be better than in economies with intermediate centralization. Evidence that this is indeed the case would be a useful starting point to examine some stylized facts. This indirect method of comparison overcomes the difficulty of comparing real wages – and their development – across countries.[1]

3.1. Measures of macroeconomic performance

Table 2 groups countries into three categories of centralization, and gives a series of macroeconomic indicators relating to employment performance. These indicators concern both the period 1974–85 and the change in performance between this period and 1963–73, the period preceding the supply shocks of the 1970s.

Columns 1 and 2 refer to actual unemployment rates as standardized by the OECD. Columns 3 and 4 instead refer to employment as a percentage of working-age population. This measure avoids differences in national procedures for recording and defining unemployment but still reflects differences in national demographic characteristics. Columns 5 and 6 refer to the Okun 'misery index', used in Soskice (1983), which adds up the rates of unemployment and inflation. The idea is that it may be misleading to measure the workings of the wage-setting system by employment performance alone as inter-country differences may also reflect differences in government policies. To the extent that inflationary expectations are similar across countries, faster-inflating countries may be able to achieve lower unemployment. The Okun index can be seen as a crude attempt to control for such policy differences. Columns 7 and 8, finally, refer to a performance index of our own, which adds up the rate of unemployment and the current account deficit as a percentage of GDP. The motivation is similar to the one for using the Okun index: to the extent that there exists a trade-off

[1] The main problem is how to control for differences with respect to technical progress. It has been argued by, e.g., Layard and Nickell (1986) that in any reasonable model of wage determination, technical progress should only affect real wages but not employment: otherwise any application to longer historical periods would give ridiculous results – cf. also Sections 5.5.5 and 5.5.8.

Table 2. Indicators of macroeconomic performance (levels: 1974–85 average; changes: 1974–85 average less 1963–73 average)

	Unemployment rate		Employment[a]		Okun index[b]		Alternative performance index[c]	
	Level (1)	Change (2)	Level (3)	Change (4)	Level (5)	Change (6)	Level (7)	Change (8)
Centralized economies								
Austria	2.5	0.8	66.3	−1.6	8.2	2.9	3.6	2.3
Norway	2.2	0.6	72.6	8.7	11.2	4.3	5.0	1.8
Sweden	2.4	0.4	78.2	5.8	12.2	5.3	4.1	2.3
Denmark	7.9	6.9	73.1	−0.3	17.6	10.4	11.3	8.4
Finland	5.0	3.8	72.2	0.7	16.0	7.6	7.0	3.3
Average	4.0	2.3	72.5	2.7	13.0	6.1	6.2	3.6
Intermediate economies								
Germany	4.8	4.0	63.2	−5.9	9.2	4.8	4.3	4.2
Netherlands	8.0	6.8	53.4	−5.6	13.9	7.0	6.4	5.4
Belgium	9.3	7.1	58.5	−2.5	17.0	10.7	11.0	10.0
New Zealand	2.2	2.0	63.9	−0.1	15.6	10.1	7.5	6.9
Australia	6.3	4.4	65.6	−1.9	16.7	10.8	9.3	5.7
Average	6.1	4.8	60.9	−3.2	14.5	8.7	7.7	6.5
Decentralized economies								
France	6.4	4.3	63.2	−2.8	16.9	10.8	7.5	5.4
UK	8.1	5.4	68.4	−2.6	20.5	12.3	8.2	5.2
Italy	7.9	2.8	55.3	−2.1	23.5	15.5	8.6	5.1
Japan	2.2	1.0	70.1	−1.4	9.1	1.7	1.6	1.2
Switzerland	0.5	0.3	73.3	−5.0	4.6	0.1	−3.1	−2.7
US	7.3	2.8	66.1	2.5	15.0	6.9	7.6	3.4
Canada	8.5	3.7	64.6	3.4	17.1	8.6	9.9	4.4
Average	5.8	2.9	65.8	−1.1	15.2	7.7	5.8	3.1
Average excluding Switzerland	6.7	3.3	64.6	−0.5	17.0	9.0	7.2	4.1

Sources: *Historical Statistics*, OECD and *Main Economic Indicators*, OECD, various issues.
Notes: (a) Percentage of population between 15 and 64 years; (b) Rate of unemployment plus rate of inflation; (c) Rate of unemployment plus current account deficit in per cent of GDP.

between unemployment and external balance, actual unemployment may not only reflect the efficiency of the wage-setting system *per se* but also the governments' choice of a point on the economy's 'production possibility frontier' with respect to unemployment and external balance. One government may – as in Sweden towards the end of the 1970s or in the US in the early 1980s – choose to inject demand into the economy through expansionary fiscal policies, with the result that the current account deteriorates. Governments with other priorities – say in the

Netherlands or Germany – may instead prefer situations with current account surpluses despite high unemployment.[2]

3.2. The evidence

Table 2 provides support for the hump-shape hypothesis. Looking at changes in the different measures between 1963–73 and 1974–85, the intermediate group shows the worst outcome in all cases. The same holds true for the levels of the various indicators for 1974–85, with the exception of the Okun index. Comparing centralized and decentralized economies, the former have performed better both in terms of levels and changes according to the first three indicators, the reverse being true for our own performance indicator. Of course, the measures are likely to suffer from a number of defects. For example, unemployment figures do not include workers under retraining or holding relief jobs. The most obvious distortion concerns foreign labour, in the particular case of Switzerland. The share of foreign labour in Switzerland fell by 3.1 percentage points between 1973 and 1984 and the bulk of this reduction occurred already in the mid-1970s (Danthine and Lambelet, 1987). Arguably, this may distort the Swiss figures for 1974–85.[3]

As a check, the last line in Table 2 excludes Switzerland. This clearly affects some of the results, with the intermediate economies now appearing to perform better than their decentralized counterparts in terms of the unemployment level and the change in the Okun index as well. However, on most criteria in Table 2 the hump-shaped relation remains even when Switzerland is excluded.

While the evidence from Table 2 is informative, a proper statistical test of the hump-shape result is obviously desirable. A serious difficulty is that we do not have a measure of centralization, we only propose the ranking shown in Table 1. Consequently the procedure adopted is to examine the correlations between centralization rankings and the rankings of countries according to the various measures of macroeconomic performance in Table 2.

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[2] In a standard open-economy model, fiscal expansion lowers the product real wage (the money wage deflated by the domestic output price), even if the consumption real wage (the money wage deflated by the consumer price index) stays the same. This is possible if the real exchange rate (the domestic output price divided by the foreign output price measured in the same currency) appreciates. Formally, if W = the money wage, $\bar{P}$ = the domestic output price, $\bar{P}^*$ = the foreign output price measured in the own currency and P = the consumer price index, we have that $W/\bar{P} = (W/P) \cdot (P/\bar{P})$ and $P = P(\bar{P}, \bar{P}^*)$. Thus, $W/\bar{P}$ will fall at unchanged W/P, if $P/\bar{P}$ falls, which occurs if $\bar{P}/P^*$ increases.

[3] However, it is not clear on theoretical grounds how an adjustment for the net emigration of foreign labour should be done. For instance, for how long should foreign workers who have returned home be regarded as part of the domestic labour force?

Table 3. Macroeconomic performance and centralization rankings

	Unemployment rate		Employment		Okun index		Performance index	
	Level (1)	Change (2)	Level (3)	Change (4)	Level (5)	Change (6)	Level (7)	Change (8)
Our Central-ization index	0.19 (0.14)	0.05 (0.39)	0.13 (0.24)	0.07 (0.34)	0.22 (0.11)	0.24 (0.09)*	0.18 (0.15)	−0.05 (0.39)
Cameron's index	0.19 (0.15)	0.01 (0.48)	0.19 (0.15)	0.17 (0.18)	0.08 (0.33)	0.11 (0.28)	0.04 (0.41)	0.02 (0.46)
Our revised index A	0.15 (0.20)*	0.39 (0.02)*	0.36 (0.03)*	0.35 (0.03)*	0.21 (0.12)	0.36 (0.03)*	0.22 (0.11)	0.56 (0.001)*
Cameron's revised index A	0.28 (0.07)*	0.39 (0.02)*	0.22 (0.13)	0.48 (0.006)*	0.22 (0.12)	0.25 (0.09)*	0.21 (0.14)	0.32 (0.05)*
Our revised index B	0.24 (0.09)*	0.48 (0.004)*	0.41 (0.01)*	0.41 (0.01)*	0.28 (0.06)*	0.44 (0.007)*	0.29 (0.05)*	0.63 (0.000)*
Cameron's revised index B	0.32 (0.04)*	0.44 (0.07)*	0.26 (0.08)*	0.45 (0.008)*	0.27 (0.08)*	0.28 (0.07)*	0.20 (0.14)	0.31 (0.05)*

Sources: Rankings are shown in Table 4. Performance indicators from Table 2.
Notes: Numbers in parentheses indicate levels of significance. An asterisk indicates significance at the 10% level.

In principle rank correlations are used to test for monotonic relations between two rankings. We, therefore, proceed in two steps. First we test the alternative hypothesis of a monotonic relation between centralization and macroeconomic performance. Row 1 in Table 3 presents correlation coefficients between our centralization index and each of the rankings implied by the eight performance indicators in Table 2. Using Cameron's centralization ranking in row 2 allows us to check for sensitivity to the choice of any particular centralization ranking. Only one significant correlation was found, so the evidence is clearly against the alternative hypothesis of a monotonic relation.

To directly test the hump-shape hypothesis, we develop new institutional rankings such that both very centralized and very decentralized economies rank above the intermediate ones. More exactly, to test the idea that countries perform better, the closer they are to either institutional extreme, we list the most centralized economy and the most decentralized one first, followed by the second most centralized and the second most decentralized etc. Columns (A) in Table 4 give new such rankings and rows 3 and 4 in Table 3 their rank correlations with the various macroeconomic indicators. There appears strong statistical significance with respect to all measures of *change* in performance. This reinforces the impression from Table 2. With respect to the *level* of macroeconomic performance in 1974–85, only two correlations out of

Table 4. Revised rankings to test for a hump-shaped relation

	Our original ranking	Revised rankings (A)	(B)		Cameron original ranking	Revised rankings (A)	(B)
1	Austria	1.5	1	1	Sweden	1.5	1
2	Norway	3.5	2	2	Norway	3.5	2
3	Sweden	5.5	3	3	Austria	5.5	3
4	Denmark	7.5	7	4	Belgium	7.5	7
5	Finland	9.5	8	5	Finland	9.5	8
6	Germany	11.5	9	6	Denmark	11.5	9
7	Netherlands	13.5	13	7	Netherlands	13.5	13
8	Belgium	15.5	14	8	Germany	15.5	14
9	New Zealand	17	15	9	UK	15.5	16
10	Australia	15.5	17	10	Australia	13.5	15
11	France	13.5	16	11	Switzerland	11.5	12
12	UK	11.5	12	12	Italy	9.5	11
13	Italy	9.5	11	13	Canada	7.5	10
14	Japan	7.5	10	14	US	5.5	6
15	Switzerland	5.5	6	15	France	3.5	5
16	US	3.5	5	16	Japan	1.5	4
17	Canada	1.5	4				

eight are significant. An alternative rearrangement of the original rankings allows for the possibility that although intermediate economies perform the worst, centralized countries may outperform the decentralized ones. To test for this, we rank the three most centralized economies first, followed by the three most decentralized ones, the three second most centralized ones, etc. (column B in Table 4 and rows 5 and 6 in Table 3). In most cases the corresponding correlations turn out higher than before: they are statistically significant for all measures of *change* in performance, and also in six cases out of eight for the *levels*.

A sensitivity analysis may be conducted using again the case of Switzerland. An erroneous measure of unemployment in Switzerland is likely to affect more seriously our own index than Cameron's since we classify Switzerland as the third most decentralized country, and the largest effect should concern the unemployment rate. To go to the extreme, if it is assumed that the 'true' increase in Swiss unemployment is the largest – not the smallest as shown in Table 2 – among our sample countries, we obtain a correlation of 0.24 (still significant at the 6.2% level) with our revised index (A). On the other hand it was enough to rank Switzerland as number three instead of as number one in terms of the level of unemployment for 1974–85 to get significance at the 10% level for a *monotonic* relation with our centralization index. For the other performance indices the results are less sensitive.

4. Corporatism

The hump-shaped relation between centralization and real wages, and therefore the U-shaped relation between centralization and macroeconomic performance suggested by the stylized facts of the previous section is at odds with conventional wisdom. The currently accepted view is formulated in terms of the concept of 'corporatism' which has been developed in political science. It is widely held in this tradition that there exists a monotonic relation, according to which a larger extent of corporatism always works in favour of lower real wages and unemployment. The problem is that the concept of corporatism is not precisely articulated, so that the existence and interpretation of a monotonic relation are, to say the least, problematic.

4.1. The concept of corporatism

The concept of corporatism is given different definitions by various authors, as should be clear from the following quotations:

> 'institutionalized negotiation, bargaining, collaboration, and accord about wages and "income policies" (and perhaps additional economic issues) between representatives of the major economic groupings in the society (most typically labour confederations and employers' associations) and often including, in addition, representatives of the government' (earlier version of Cameron, 1984, quoted by Bruno and Sachs, 1985):
> 'cases in which a centrally coordinated union movement has developed within a political system responsive to labour demand' (Crouch, 1985):
> 'the integration of trade unions in economic policy making in exchange for their incorporation of capitalist growth criteria in union wage policy and their administration of wage restraint to their members' (Panitch, 1980):
> 'wage setting by central organizations, commanding the obedience of individual workers and employers to achieve a high level of employment' (Newell and Symons, 1987).

The concept of corporatism thus seems vaguely to capture the extent to which some broader interests influence the determination of individual wages. But in consequence most definitions embrace various aspects which could have quite different effects, and which should be analysed within different analytical frameworks. In addition

to centralization, the corporatist concept appears also to incorporate the following aspects.

(i) *The degree of government involvement in wage negotiations.* Larger government involvement is no doubt facilitated by a high degree of centralization, since the number of actors is then reduced. Norway and Finland, where formal social contracts have sometimes been concluded, are good examples. But it is not a necessary requirement, as shown by, for instance, the experience of Britain and the Netherlands. Nor does centralized bargaining within the private sector mean that the government has to become directly involved in the negotiations: indeed, the driving force behind the centralization of wage setting in Sweden in the 1950s was precisely a desire to avoid government intervention through 'private incomes policies' (Flanagan *et al.*, 1983).

(ii) The existence of 'consensus' between labour and firms with *shared perspectives on the goals of economic activity* (Soskice, 1983). This may be reflected in the low frequency of industrial disputes, or the existence of works councils and other elements of co-determination in firms. A frequently quoted example is Japan with almost paternalistic relations between firms and employees. The emergence of consensus may be related to labour's ability to achieve its goals via the political system, as has been claimed for Sweden and Austria (Crouch, 1985). In any case, consensus is a feature quite distinct from centralization.

(iii) *The aims of the wage setting system rather than its characteristics.* This is expressed most clearly by Newell and Symons (1987) who state that 'the purpose of corporatism, whether overt or covert, must be to obtain lower wages than would otherwise hold'. This definition is quite problematic, since it is circular.

Not surprisingly, classifications of countries according to the degree of corporatism differ from those based on centralization. The most frequently used classification is the Bruno and Sachs (1985) ranking, which is shown as column 5 in Table 1. It is based on an index involving central union influence on wage setting, employer coordination, shop-floor union power, and the presence of works councils within firms. The first three factors are closely related to centralization but the fourth variable is designed to measure consensus between labour and employers. The main difference with the other classifications is that Germany and the Netherlands are ranked above all the Nordic countries, and Switzerland above Denmark and Finland. Japan is also ranked higher than in the centralization rankings, and Australia lower.

4.2. Empirical studies of corporatism

The general approach has been to estimate wage and/or price equations in such a way that the effects of corporatism can be detected. Bruno and Sachs (1985), and McCallum (1983, 1986) have estimated cross-country Phillips-type price equations, introducing a measure of corporatism as one of the explanatory variable. In general corporatism turns out to be strongly significant. The effects are very pronounced: the difference between the most and least 'corporatist' economies is found to account *ceteris paribus* for as much as a 5–7% difference in rates of inflation. The results can be taken to imply lower equilibrium rates of unemployment (NAIRUs) for more corporatist economies.

Bean, Layard and Nickell (1986), and Newell and Symons (1987) have instead estimated wage equations (which are based on union wage setting and bargaining models) on time series data for individual countries. Bean *et al.* examine whether the differences among response parameters from country to country may be explained by differences in the extent of corporatism. More precisely, they rank countries according to the responsiveness of wages to various shocks and look for correlations with the Bruno–Sachs corporatism ranking. The most interesting result is a strong inverse relation between the Bruno–Sachs index and the reaction of the product real wage (the wage cost to employers deflated by the output price) to changes in the so-called wedge. The wedge is the ratio of the product real wage and the net consumption real wage to workers (the after-tax wage deflated by the consumer price index).[4] An increase in the wedge may occur as a result of higher direct or labour taxes, or an increase in the consumer price index relative to the producer price index. The Bean *et al.* study thus suggests that a given rise of the wedge causes a smaller increase of the product real wage (the real cost of labour) and, therefore, a smaller reduction in employment in more corporatist economies. In these countries, therefore, the real take-home pay of workers is flexible downwards. This is quite important since the wedge increased dramatically in most OECD countries in the 1970s, because of the oil shocks and as a result of tax increases. The results can, therefore, be seen to provide one explanation of why the employment performance of the more corporatist countries has been superior to that of the less corporatist ones.

[4] If in addition to the symbols used in footnote 2 we let w_p = the product real wage, w_c = the net consumption real wage, θ = the wedge, t_L = the payroll tax rate, and t = the income tax rate, we have $w_p = (1+t_L)W/\bar{P}$ and $w_c = (1-t)W/P$. Hence, $w_p/w_c = \theta$, where $\theta = [(1+t_L)/(1-t)] \cdot (P/\bar{P})$. It follows that a given increase in the wedge will cause a smaller rise of w_p, the more w_c falls.

Newell and Symons (1987) study five countries (Sweden, Germany, UK, Japan and the US). They make cross-country comparisons and also distinguish between 'corporatist' and 'non-corporatist' episodes within some of the countries. In all cases they look for differences in wage responsiveness to unemployment. A basic conclusion is that corporatism leads to a more powerful moderating influence of unemployment on wages. Hence, according to their interpretation, smaller increases of unemployment have been required under corporatism in order to achieve a given downward adjustment of real wages.

4.3. Appraisal

All these studies may appear to give overwhelming support for a monotonic relation between corporatism and real wage moderation. For example, Metcalf (1987) concluded that 'there is strong evidence, both across countries and over time that corporatism, consensus and superior macroeconomic performance go hand in hand'. We are, however, sceptical about the interpretation of these results.

First, the vagueness of the concept of corporatism makes it unclear what the studies capture. For instance, McCallum (1986) ranks in the same corporatist group countries so diverse as on the one hand Austria, Norway and Sweden (on the basis of high centralization) and on the other hand Japan and Switzerland (because of a large amount of consensus). It therefore becomes unclear what is driving the results. In Newell and Symons (1987) considerations with respect to centralization, government intervention and consensus are mixed in a puzzling way. When comparing countries the first aspect is stressed, but when distinguishing between 'corporatist' and 'non-corporatist' episodes within a country the emphasis is instead on the latter two. We are especially puzzled by the focus on consensus. While the explanatory power of the regressions can be improved in this way, it is unclear what we learn from the exercise; indeed, one should be surprised if one did *not* find wage moderation in periods when there is consensus about it, especially since it is difficult to define such periods without looking at actual outcomes.

A second objection has to do with the lack of a firm theoretical basis. In none of the studies are wage equations derived in a general form which encompass the wide spectrum of institutional conditions observed in the countries under review. Instead an equation is typically derived only for wage setting under 'non-corporatist' conditions and then used for *ad hoc* comparisons of responsiveness parameters across various institutional arrangements.

Our criticism of the corporatism literature suggests two lines of analysis. First, it seems worthwhile to take the studies at face value and sort out whether the results claimed for a monotonic relation between corporatism and macroeconomic performance could be interpreted more precisely as a monotonic relation between centralization and macroeconomic performance. This would contradict our hump-shape hypothesis. Section 4.4. focuses on this topic. Second, our discussion points to the need for a consistent analytical framework, which we develop in Section 5.

4.4. Empirical studies revisited

Since most definitions of corporatism include centralization as an important component, it is of interest to check whether the studies that find a significant role for corporatism can also detect a role for centralization. This is an easy way of examining if, among the several characteristics which make up corporatism, centralization is empirically relevant. All that is required is to replicate previous studies, simply substituting a centralization indicator for the corporatism indicator originally used.

When this strategy is applied to the studies of Bruno and Sachs (1985) and McCallum (1983), no specific effect of centralization can be detected. The detailed results are shown in Appendix B, and are obtained by distinguishing between the three groups of countries in Table 2: centralized, decentralized and intermediate economies. The centralization variable is insignificant in both the original Bruno–Sachs equation and in an updated version based on later observations. In McCallum's equations, the centralization variable is significant in only one out of four equations (compared to three out of four for the corporatism variable in the original study). Indeed, some of the equations now perform very badly. Updated versions work even worse. In the inter-country comparisons in Newell and Symons (1987) no clear-cut conclusion can be drawn from inter-country comparisons if we neglect the distinctions between 'corporatist' and 'non-corporatist' periods. The smallest responsiveness of unemployment to wages is found in the US, and the largest in Japan. And there is a larger response in the UK than in Germany.

Another series of tests follows the procedure employed by Bean *et al.* Using a number of estimated wage equations, the countries are ranked according to the responsiveness of wages to some of their standard determinants (unemployment, the wedge, and productivity). The rankings thus obtained are correlated with our centralization ranking shown in the first column of Table 1. We use six studies and report the resulting correlations in Table 5.

Table 5. Monotonic effects of centralization: correlation between wage responsiveness and centralization ranking

		Response to unemployment		Response to wedge		Response to productivity decline	
		Short-run	Long-run	Short-run	Long-run	1973–78	1979–85
1	Bean, Layard and Nickell	0.25 (0.08)*	0.29 (0.05)*	−0.18 (0.16)	−0.36 (0.02)*		
2	Newell and Symons	0.02 (0.46)	−0.14 (0.24)	0.04 (0.42)	0.06 (0.38)		
3	Grubb, Jackman and Layard	−0.03 (0.44)					
4	Grubb	−0.06 (0.37)	−0.01 (0.47)				
5	Gordon	0.64 (0.001)*		−0.36 (0.04)*		−0.18 (0.20)	−0.21 (0.16)
6	Coe and Gagliardi	−0.13 (0.30)					

Notes: Figures in parentheses indicate levels of significance. An asterisk indicates significance at the 10% level. For Bean *et al.* and Newell and Symons the wage responses refer to the product real wage. The short-run effect is the first-year effect. The long-run effect measures the steady-state effect on the *level* of the product real wage. The same applies to Newell and Symons with the exception that the *change* and not the level of the wedge is an explanatory variable. In studies 3–6, wage responses refer to the effect on the consumption real wage. These Phillips-type studies give relations between the change of the real wage and unemployment, but no long-run steady-state effect on the *level* of real wages can be solved out. The exception is Grubb who relates wage changes to both unemployment and the real wage gap (the long-run effect of unemployment in this case, hence, refers to the steady-state effect on the latter variable). In Gordon the output gap is substituted for unemployment, and the wedge refers to the ratio between consumer and output prices. An exact description of how the various effects have been calculated is available from the authors on request.

Row 1 shows the replication of Bean *et al.* for our indicator of centralization. Row 2 uses the specification of Newell and Symons (1985). Both studies confirm that the level of real wages depends *inter alia* on unemployment.[5] They give different results. In Bean *et al.* both the short-run and the long-run responses of wages to unemployment and the long-run responses to the wedge are significantly correlated with centralization. No such link emerges from the Newell–Symons specifications. The other four studies, Grubb, Jackman and Layard

[5] The main difference is that Newell and Symons (for unclear reasons) explain the *level* of real wages by *changes* in the wedge.

(1983), Grubb (1986), Gordon (1985) and Coe and Gagliardi (1985), are all traditional Phillips curve estimations. In three of them we did not find any significant correlation between centralization and the responses of wages to slack. The exception was Gordon (who measures slack by the output gap instead of unemployment). In his study more centralization also significantly reduces the effect on wage inflation of changes in the wedge, measured as the ratio between consumer and output prices. The estimated responses of wages to the productivity slowdowns after 1973 are, however, unaffected by centralization. The robustness of these results can be checked by repeating the same correlation tests using the other rankings in Table 1. With the Cameron ranking, there emerge no significant correlations at all, whereas the other rankings behave more or less as our own. Interestingly enough, the Bruno–Sachs ranking did not perform much better than the others, indicating that the results claimed for corporatism do not even appear very robust across studies.

The evidence, therefore, is that centralization is not that component of corporatism which may explain a monotonic relation between corporatism and economic performance, if any such relation actually exists. How about the non-monotonic relation with respect to centralization that seemed to emerge from Tables 2 and 3? We tested also for this in the price and wage equations under study. In the Bruno–Sachs and McCallum equations we allowed for worse outcomes in the group with intermediate centralization than in the two other groups, but the equations then in general performed even worse than above. The correlation analysis in Table 5 was also replicated with the rankings designed to capture the hump shape from Table 4. The results were mixed. With respect to wage responses to unemployment, significant relations were found in the majority of cases for the rankings derived from the original Cameron one, but not for the rankings derived from our classification. The latter rankings, however, performed well with respect to the wedge and productivity shocks in the Gordon study – as did the Cameron ones – and for long-run changes in the wedge in the Bean *et al.* study.

In conclusion, we do not find much support for the interpretation that the results claimed for corporatism based on price and wage equations are due to centralization. But nor do such studies provide clear evidence in favour of a non-monotonic relation between centralization and macroeconomic performance. We do not find this outcome surprising given the lack of an adequate theoretical framework behind the test procedure. What is needed, therefore, is a well specified model of wage setting in which centralization can be introduced. This is the purpose of the next section.

5. A theoretical framework and numerical illustrations

Our approach is to introduce our definition of centralization, the extent to which various unions and various employers cooperate, in models of union wage setting and bargaining. The proposed framework may help to account for the findings in the preceding section. Indeed we can now predict how centralization influences the levels of real wages and (un)employment. This is very different from attempts to discover some effects of centralization on the size of various response parameters, such as the responsiveness of real wages to unemployment. This section provides a clear economic interpretation of the effects involved as well as numerical illustrations.

The analysis is conducted with a stylized model economy consisting of 64 separate industries. The detailed set-up is presented in Appendix C, so that only a brief description is offered here. Each industry consists of a large number of perfectly competitive price-taking firms. Each firm operates with a fixed capital stock but can vary its labour input (with the same constant-elasticity-of-substitution production function). The goods of various industries are imperfect substitutes in demand for each other. The goods may be aggregated into broader and broader groups, at five levels. Each group of goods at one level can be treated as a single good at the next higher level.

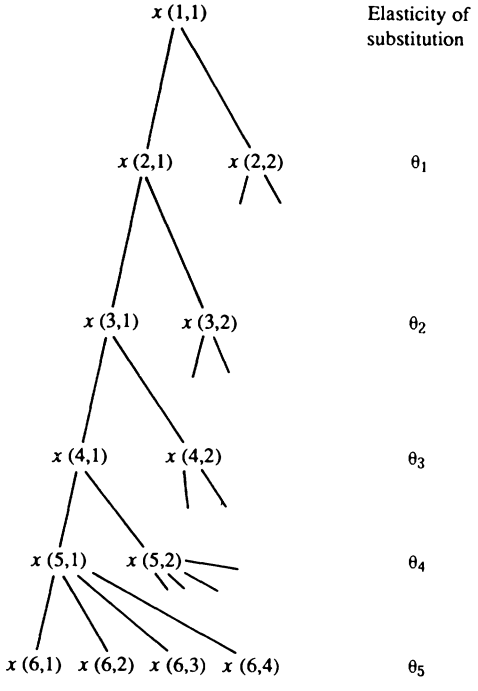

Figure 2. The structure of demand

Goods demand thus has the tree structure illustrated in Figure 2. At any level of aggregation, goods within a group are closer substitutes for each other than for goods belonging to other groups, and goods from different groups are more distant substitutes the longer the distance one has to travel along the branches in the tree in order to move from one good to another. Total nominal demand in the economy is controlled by the government. The economy is completely symmetrical in the sense that the world looks exactly the same from the point of view of each individual firm, sector and union. In equilibrium, wages, prices, output and employment will, therefore, be the same in all sectors.

The labour force is entirely unionized, and unions take into account both employment and the welfare of their employed members. Welfare is measured by the consumption real wage, i.e. the nominal wage deflated by a consumption price index. Unemployed union members receive unemployment benefits.

The model is used to analyse the effects of various wage setting structures ranging from highly centralized, as in Austria and the Nordic countries, to largely decentralized, as in Canada, the US, Switzerland and Japan. The effect of centralization is studied under various assumptions on the degree of substitutability between goods produced by the different sectors, the power of unions in wage setting, and the financing of unemployment benefits. Parameter values for the elasticity of labour demand, union welfare functions, the amount of unemployment benefits, etc., are chosen so as to conform to conventional estimates.

5.1. The monopoly union case

The simplest representation of wage setting – the so-called monopoly-union model – describes unions as able to decide wages unilaterally leaving firms with the choice of employment, which is of course inversely related to the real cost of labour – the product real wage i.e. the money wage deflated by the output price – (Oswald, 1986). As they set wages, unions have to trade off the welfare gain of an increase in the consumption real wage – the money wage deflated by the consumer price index – against the welfare loss of the resulting fall in employment. Unions can only set a *nominal* wage, given total nominal demand in the economy and the nominal wages set by other unions. They do this so as to reach a desired consumption real wage, which is always positively related to the product real wage.

Centralization increases when individual unions form groups within which they determine wages jointly. At the most decentralized level, labour in each firm is organized into separate unions, each acting on its own. Some centralization occurs when these firm-level unions form

64 separate industry unions organizing all the labour in each industry, and setting industry wages. The next step of centralization is when the 64 industry unions form 32 pairs of more aggregate unions, with each pair determining wages jointly. A further level of centralization could involve the 32 pairs joining up to make 16 groups of 4. The final step is reached when a single economy-wide union confederation sets wages for all unions jointly. We assume throughout that when industry unions amalgamate, they always do so by forming coalitions within sectors producing the closest substitutes. This is a crucial assumption which seems to conform to the observed pattern of unionization. It can also be shown that the perceived utility gains of cooperation are greater when the goods involved are close substitutes (Calmfors and Driffill, 1988). In Figure 2, increasing centralization is thus synonymous with climbing up the tree. At the lowest level of cooperation, industry union (6,1) first cooperates with union (6,2). The next step involves cooperation between these two unions and unions (6,3) and (6,4), so that (5,1) forms an aggregate union, which then at the next higher level of centralization cooperates with union (5,2) to form effectively the more aggregate union (4,1) etc.

The impact on wages of increasing centralization depends on two forces which work in opposite directions: market power and the effects of wages on prices. As unions get larger, they acquire greater market power. In an individual firm, workers have little market power. Indeed, any isolated increase in the nominal wage results in a large employment fall, since the firm is unable to raise its output price unless all firms in the industry do so. But, if the union were to control labour supply to all firms within the industry, its market power would grow. Indeed, each firm within the industry has the same incentive to raise its output price which, therefore, rises in the whole industry. Substitution now occurs only in relation to firms outside the industry, and no firm faces a fall in demand relative to other firms in the same industry. The consequence is that the total elasticity of demand for labour with respect to the nominal wage becomes lower, because the rise in the product real wage due to a given nominal wage increase is reduced. Consequently, an industry union tends to set a higher wage. A similar argument explains why wages tend to become progressively higher as unions encompass more sectors. The larger union enjoys a lower total nominal wage elasticity of demand for its labour than did the constituent members, because a given nominal wage increase results in a larger output price rise the more sectors that it encompasses. The rise is larger, and thus also the incentive to raise wages, the larger the elasticity of substitution between the goods produced by the cooperating sectors.

However, the effect of nominal wages on the aggregate price level provides the opposite incentive. Nominal wage increases by small unions have only small effects on the consumption price level, so that consumption real wages rise by approximately the same amount as nominal wages. As unions become larger, the effect of nominal wages on the consumption price level increases. Hence, the real wage gains of a given nominal wage increase are reduced. This tends to moderate wages as centralization proceeds. Obviously, this moderating effect grows with the size of the unions which cooperate. Hence, the incentive to increase nominal wages is smaller in the case of cooperation of large unions.

Centralization can also be seen as the progressive internalization of an externality (Calmfors, 1987). When each union sets its wage independently from all other unions, it maximizes its own welfare, and ignores the effects on other unions. But when two industry unions cooperate, each can be thought of as setting its own nominal wage taking the welfare implications for the other into account. There are two such effects. First, demand substitution transmits the sector's output price increase to the output price of the other sector, hence, an increase in employment there (the effect being larger, the closer substitutes are the goods involved). Second, by contributing to price rises in general, it tends to reduce the purchasing power of nominal wages in the other industry. If, at the wage which maximizes each union's welfare when it acts independently, the marginal effect of an increase of its wage on the welfare of the other union is positive, then cooperation results in higher wages than independent actions and vice versa.

Increased centralization thus produces two opposite influences on wages. The net effect may go in either direction, and certainly there is no need for the relationship to be monotonic. Indeed, it is likely to be hump shaped, if the elasticities of substitution between goods are larger at lower levels of aggregation (for instance, butter and margarine are closer substitutes than food and cars). In this case, while the increase in market power is larger when small unions choose to cooperate according to our postulated pattern, the price effects are small. When large unions join up the opposite holds. The argument for a hump shape can also be seen by comparing complete centralization with one economy-wide union and maximum decentralization with firm-specific unions: the outcomes are *identical* if unemployment benefits are financed totally out of a profits tax. Indeed, in both instances the union effectively chooses a consumption real wage under the constraint that the relative price of the own sector's output will be unaffected. (With complete centralization wage – and price – increases are always the same in *all* sectors; with maximum decentralization the output price is given for the individual firm.) All intermediate cases produce higher wages

than these polar cases, since a given increase of the real consumption wage in a sector is associated with an increase in the relative price of the sector's output, which reduces the increase in the product real wage and thus also the fall in employment. This reduces the incentive to hold back wages.[6]

A numerical illustration of the effects of different degrees of centralization is presented in Table 6. It is assumed that unemployment benefits are paid for by a profit tax (an assumption reconsidered in Section 6.3). The examples are constructed so that complete centralization and complete decentralization at the firm level give a (product and consumption) real wage 4.6% above the full employment level, with unemployment at 5.1%. The effects of centralization on real wages and employment are shown on the right panel. The simulations correspond to different patterns of substitutability among goods produced by the different industries. Simulation 1 sets the elasticity of substitution in demand to 2.5 at all levels of aggregation. In this case the gain in market power when industry unions amalgamate is never large enough to dominate the price effect: increased centralization results in progressively lower wages. The effects of small industry unions joining up (when the number of unions falls from 64 to 16) are small. The biggest changes come when large unions get together, because the externality that is internalized is larger.

When the elasticities of substitution at lower levels of aggregation are progressively raised as in simulations 2, 3 and 4, the real wages set by small industry unions progressively fall, while those set by larger unions remain unchanged. It does not require very large elasticities of substitution to give a hump shape. In simulation 2, the real wage reaches a maximum with 8 unions. The same pattern is more pronounced for larger degrees of substitutability at lower levels of aggregation in simulations 3 and 4. The hump shape also appears (at 4 unions) with the low but still increasing elasticities of substitution at more disaggregated levels in simulation 5: here the main difference is that the real wage reduction when going from 2 unions to 1 is magnified. The explanation is that the gain in market power is now smaller.

[6] If we let U^i = utility of the union in firm i, W_i = the money wage for the union; P = the consumer price index, L_i = employment in firm i and P_i = the output price for firm i, maximization of $U^i = U(W_i/P, L_i)$ subject to $L_i = L(W_i/P_i)$ and $P/P_i = H(W_i/P)$, where $W_i/P_i = (W_i/P) \cdot (P/P_i)$, gives $U_1 + U_2 L_1 \cdot [(P/P_i + (W_i/P)d(P/P_i)]/d(W_i/P) = 0$. If the union acts on its own, $dP = dP_i = 0$. If it acts together with all other unions in the economy, so that all money wages are raised equally, $dP/P = dP_i/P_i$. In both cases $d(P/P_i) = 0$. In all other cases $d(P/P_i) < 0$.

Table 6. Centralization with the monopoly union model

	Elasticity of substitution						Number of unions					
	θ_1	θ_2	θ_3	θ_4	θ_5		64	16	8	4	2	1
1	2.5	2.5	2.5	2.5	2.5	Real wage	14.3	14.0	13.5	12.5	10.2	4.6
						Employment	−16.5	−16.1	−14.6	−13.5	−11.1	−5.1
2	2.5	2.5	2.5	5.0	5.0	Real wage	9.8	11.2	13.5	12.5	10.2	4.6
						Employment	−10.6	−12.2	−14.6	−13.5	−11.1	−5.1
3	2.5	2.5	2.5	10.0	10.0	Real wage	7.6	9.7	13.5	12.5	10.2	4.6
						Employment	−8.3	−10.6	−14.6	−13.5	−11.1	−5.1
4	2.5	2.5	2.5	80.0	80.0	Real wage	5.6	8.3	13.5	12.5	10.2	4.6
						Employment	−6.2	−9.1	−14.6	−13.5	−11.1	−5.1
5	1.0	2.0	2.5	2.5	2.5	Real wage	14.6	15.0	15.7	17.1	17.1	4.6
						Employment	−15.7	−16.2	−16.8	−18.4	−18.4	−5.1

Notes: Real wages and employment are measured as percentage deviations from the full-employment levels. For the interpretation of elasticities of substitution, see Figure 2.

5.2. The bargaining case

The monopoly-union approach allows no role for the employer side in wage setting. An alternative is the so-called 'right-to-manage' model of Nickell and Andrews (1983): firms continue to determine employment unilaterally, but wages are set through direct bargaining between firms (that care about the real value of profits) and unions (with the same objectives as before). The precise form of the bargaining is explained in Appendix C. Essentially, the outcome is a nominal wage such that both sides always split the total (welfare) gains from the bargain compared to a complete breakdown of negotiations – here involving an industrial dispute. With bargaining, wages are always lower than those that monopoly unions would unilateraly set, which is quite natural as bargaining implies that the profit considerations of employers are now allowed to influence wage setting.[7]

Just as unions may form larger union confederations, employers can join into larger employer federations. Increased centralization is now taken to mean that both unions and employers *simultaneously* form larger groups. For example, if the steel industry and coal industry unions form a single union in order to negotiate together with employers, we assume that steel industry and coal industry employers form a single federation. This captures the stylized fact that centralization usually goes together on the two sides of the labour market. In consequence we assume that the scale of industrial disputes increases when bargaining breaks down, and that the conflict levels of welfare for individual employees and individual firms are unaffected by the size of bargaining units.[8]

In general the effect of increased centralization now depends on the impact of wage increases on both marginal benefits to unions and marginal real profits of firms. Much as in the case of union welfare,

[7] As shown recently in game theory (Rubinstein, 1982), the outcome of the bargain can be represented as the solution to a non-cooperative game reached by a sequence of alternating offers and responses. Under not too restrictive assumptions it is equivalent to the appropriately specified cooperative Nash bargaining solution. The result in our case is a money wage that maximizes an exponentially weighted product of the gains in utility made by each player relative to the utility obtained in the absence of an agreement. This means that the wage is set so that the marginal benefit to the union of a wage increase is traded off against the marginal welfare loss for the employer. Such models have been used in a similar context to ours by Davidson (1985), and Horn and Wolinsky (1985, 1987).

[8] There may be good reasons for the assumed symmetry. Cooperation on one side of the labour market is likely to enhance the bargaining strength of that side by letting each union (or employer) have access to larger conflict funds if it gets involved into a labour conflict. That is likely to change the optimal degree of cooperation on the other side as well. An *ex ante* increase in the conflict level of utility due to increased cooperation on one side may, of course, be consistent with an *ex post* unchanged level, if the consequence is larger bargaining units on both sides, so that the scale of disputes increases.

Table 7. Bargaining model of wage determination

	Elasticity of substitution						Number of unions					
	θ_1	θ_2	θ_3	θ_4	θ_5		64	16	8	4	2	1
1	2.5	2.5	2.5	2.5	2.5	Real wage	11.3	11.0	10.6	9.7	7.7	2.6
						Employment	−18.3	−12.0	−11.5	−10.6	−8.4	−2.9
2	2.5	2.5	2.5	5.0	5.0	Real wage	7.3	8.6	10.6	9.7	7.7	2.6
						Employment	−8.0	−9.4	−11.5	−10.6	−8.4	−2.9
3	2.5	2.5	2.5	10.0	10.0	Real wage	5.3	7.3	10.6	9.7	4.8	2.6
						Employment	−5.8	−7.9	−11.5	−10.6	−8.4	−2.9
4	2.5	2.5	2.5	80.0	80.0	Real wage	3.6	6.0	10.6	9.7	7.7	2.6
						Employment	−4.0	−6.6	−11.5	−10.6	−8.4	−2.9
5	1.0	2.0	2.5	2.5	2.5	Real wage	11.6	12.0	12.6	13.8	13.8	2.6
						Employment	−12.6	−13.0	−11.5	−14.9	−14.9	−2.9

Note: For explanations see Table 6.

two conflicting effects work on firms' real profits as centralization proceeds (Calmfors and Driffill, 1988). A given nominal wage increase in a sector results in a higher output price. The potential for a price rise is larger, the more sectors that are simultaneously affected by wage increases and, hence, money profits are less adversely affected. However, this is accompanied by a stronger effect on the aggregate price level, hence less of an increase in *real* profits. The first effect tends to raise wages, the second to reduce them. Alternatively, if we view centralization as an internalization of externalities, wage increases in one industry tend to increase money profits in others, since product demand spillovers increase output prices there too. But at the same time the tendency to an increase in the general price level reduces the real value of profits in other industries.

Table 7 shows that bargaining leads to the same pattern as before with the the tendency to higher wages dominating only for cooperation at lower levels. Much as for employment, the cross effects of nominal wage increases on nominal profits are largest between sectors producing close substitutes which, we assume, cooperate first. The important implication is that the effects of centralization on real wages and employment are qualitatively insensitive to the relative bargaining strength of employers and unions.

5.3. Fiscal externalities

In many popular models of the labour market, there is a well known conflict of interest between the employed and the unemployed. For the unemployed to get a job, the real product wage and, hence, also the real consumption wage of the employed must fall. This conflict is reduced if unemployment benefits are financed by an income tax paid for also by the employed workers instead of being levied on corporate profits only. It is still the case that an increase in employment requires a reduction in the real product wage (the pre-tax nominal wage deflated by the output price). But as employment increases, the tax base (the value of GDP in the case of a uniform income tax) grows and expenditure on unemployment benefits falls. This induces a fall in the tax rate which tends to offset the fall in the *net* consumption real wage (the after-tax consumption real wage).

Such fiscal externalities affect wage setting. In general they tend to lower the wages set at higher degrees of centralization. Large unions realize that the real after-tax gains of nominal wage rises are reduced as taxes are raised when spending on unemployment benefits increases and the tax base shrinks. For the same reasons, the profit consequences of nominal wage increases for employers become more adverse. The

Table 8. Monopoly union model: Unemployment benefits financed by an income tax

Parameters						Number of unions					
	θ_1	θ_2	θ_3	θ_4	θ_5	64	16	8	4	2	1
1	2.5	2.5	2.5	2.5	2.5	Product real wage	23.4	21.4	18.8	13.7	3.4	0
						Net consumption real wage	8.2	8.0	7.5	6.2	1.8	0
						Employment	−24.9	−22.8	−20.1	−14.8	−3.7	0
2	2.5	2.5	2.5	5.0	5.0	Product real wage	14.3	18.5	18.8	13.7	3.4	0
						Net consumption real wage	5.1	6.0	7.5	6.2	1.8	0
						Employment	−15.4	−17.0	−20.1	−14.8	−3.7	0
3	2.5	2.5	2.5	10.0	10.0	Product real wage	10.6	13.3	18.8	13.7	3.4	0
						Net consumption real wage	5.1	6.0	7.5	6.2	1.8	0
						Employment	−11.5	−14.3	−20.1	−14.8	−3.7	0
4	2.5	2.5	2.5	80.0	80.0	Product real wage	9.3	10.3	18.8	13.7	3.4	0
						Net consumption real wage	3.9	5.2	7.5	6.2	1.8	0
						Employment	−8.4	−12.0	−20.1	−14.8	−3.7	0

Note: For explanations see Table 6.

effect of a proportional income tax is illustrated for the monopoly-union case in Table 8. The main pattern remains unchanged. However, comparing with Table 6, under relatively decentralized bargaining (number of unions = 64, 16, 8 and 4), unions set a higher product real wage but a lower net consumption real wage. But highly centralized bargaining (2 unions, or a single economy-wide union) leads to lower product and net consumption real wages, and higher employment. Indeed, an economy-wide union confederation would now even lower wages all the way to the full employment level.[9] The conclusion is that the internalization of tax effects is likely to lower real wages under centralization substantially compared to decentralization. Income taxes on workers break the symmetry between maximum centralization and maximum decentralization to the level of individual perfectly competitive firms. This provides a theoretical argument for why the hump-shaped relation should look as in Figure 1, with lower real wages under high centralization than under far-reaching decentralization.

5.4. The model and the facts

Our theoretical framework provides a rationale for the hump-shape hypothesis. But it has nothing to say about the pattern of the various response parameters that most empirical studies have focused on. Instead it predicts a relation between real wages and employment on the one hand and centralization on the other. This is why we tend to put more emphasis on the stylized facts in Section 2 than on the results from wage and price equations discussed in Section 3.

Yet we face a puzzle. The results of Section 2 have established a strong relationship between centralization and *changes* in employment performance between the periods after and before the find oil shock. The theoretical link is with *levels* of employment, and empirical support when levels are considered is weaker. A resolution of the puzzle is possible if one accepts the view that the theoretical framework is better

[9] In fact, under the present assumptions, a given set of exogenous factors may give rise to two equilibria, one with low unemployment and a low tax rate, and one with high unemployment and a high tax rate. The reason is that the net consumption real wage falls as the pre-tax wage rises beyond a certain point: the increase in the tax rate needed to make up for increased costs for unemployment benefits and a reduced tax base then more than offsets the rise in the pre-tax consumption real wage. This has been labelled 'fiscal increasing returns to scale' by Blanchard and Summers (1987). Equilibria with fiscal increasing returns are possible only at low levels of centralization: large unions will find it in their interest to lower nominal and thus also product real wages in order to raise simultaneously both employment and the net consumption real wage, if this is possible. When these equilibria occur they are always unstable in the sense that in the case of deviations, it is rational for individual unions to change nominal wages in the 'wrong' direction. The table shows only the stable low unemployment equilibria. Computations for the high unemployment ones gave implausibly low levels of employment.

suited to the post-oil shock period. During the 1960s and early 1970s, the labour markets in most countries were characterized by near full employment, which makes it hard to argue that unions were holding wages above market-clearing levels as implied by both the monopoly union and bargaining models. An interpretation of this situation, and of the shift which occured in the mid-1970s, is offered in Figure 3. The early period is represented by point A, where the demand for labour NN was buoyant enough to achieve full employment. (At point A, the union's indifference curve is kinked, so there emerges a corner solution as described in Oswald, 1985.) The supply shocks of the 1970s can be interpreted as having shifted the demand for labour down to $N'N'$, leading unions to pick point B, where indeed less than full employment is traded off against higher real wages. This is the situation described in our framework.

With this interpretation, inter-country (un)employment differences in the 1963–73 period – i.e. the position of the vertical full-employment line in Figure 3 – should be due primarily to differences in structural labour market characteristics reflecting various types of mismatches or labour supply behaviour. Indeed, differences in unemployment among countries were then much smaller than in the period after 1973. Unemployment in most countries was in the 0–3% interval, the outliers being US, Italy and Canada, for which there are good reasons to suspect more serious structural mismatches than elsewhere. The implication is that it may be more relevant to look at *changes* of employment performance between the periods before and after the first oil shock – i.e. how we

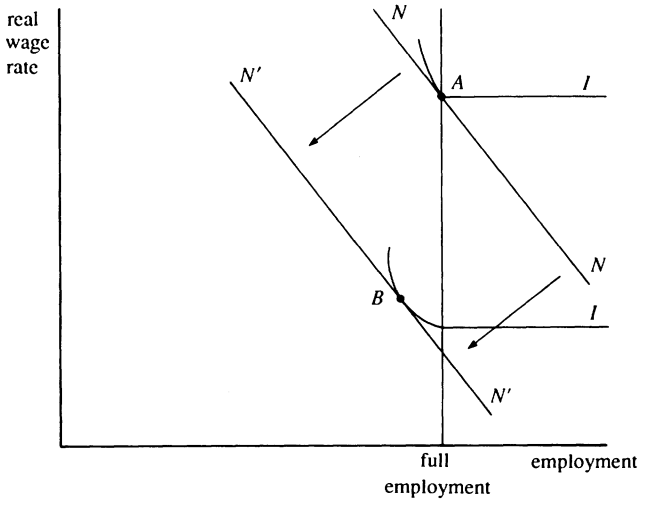

Figure 3. Corner solutions and labour demand shocks

move from point A to point B on Figure 3 – than at the levels. This presupposes that inter-country differences due to structural labour market changes and supply shocks have been of secondary importance as compared to differences with respect to centralization.

5.5. Modifications and extensions

5.5.1. Public sector unions. In many countries, unions are particularly strong in the public sector, where they do not face an explicit market labour demand. But as long as the supply of public services is negatively related to their costs (a plausible case), the demand for labour retains its key feature. Then the analytical framework proposed here retains its usefulness. For example, we might interpret the move from two to one bargaining units in our numerical examples as the result of cooperation between central private sector and public sector bargaining units (with obvious relevance for the Nordic countries where such cooperation does not exist).

5.5.2. Professional unions. We do not account for the type of professional unions which exist in the UK for example. A key issue then becomes whether increased cooperation occurs between unions within the same profession but in different industries, or between various professional unions within the same industry. The former case is exactly analogous to the earlier analysis. The second case is amenable to a similar analysis since nominal wage increases for one union lead to both general price rises and cross effects on employment. If the professions being the closest substitutes cooperate first, all our results survive: a hump shape is again likely to emerge, and the strongest fall in wages should occur when going from a small number of unions to one. Indeed, this experiment would be highly relevant for a comparison of Austria (with one all encompassing union confederation) and Sweden (with separate central organizations for white-collar and blue-collar workers).

5.5.3. Monopolistic competition. In our framework, firms cannot individually change their output price when nominal wages increase. If individual firms have some ability to set their prices (as under monopolistic competition) the market power of firm specific unions is enhanced, and they will typically set higher wages than a completely centralized union.[10] This is another reason behind the shape of Figure 1. Allowing

[10] The reason is that an increase of the consumption real wage in an individual firm now is perceived to increase the relative price compared to other firms. See footnote 6. See also Strand (1987).

for monopolistic competition also makes it possible to consider the case of wage setting in individual plants (working places) of the same firm as occurs in the UK and the US. This adds an additional layer of decentralization. If the firm allocates its output between alternative plants, a nominal wage increase in one plant may shift output to other plants, increasing employment there. This effect reinforces the arguments for a hump shape.

5.5.4. Open economy aspects. Foreign competition dampens the influence of wages on domestic prices. In the polar case of a small economy with a fixed exchange rate, where the tradable sectors produce goods that are perfect substitutes for those produced abroad, all prices can be taken as exogenously determined in world markets. Domestic nominal wage increases in an individual sector can then affect neither the output prices of other sectors nor the general price level. Only the fiscal externalities (see Section 5.3) remain. With the more realistic assumptions that there exists a sizeable fraction of non-tradable sectors and/or that domestically produced tradables are imperfect substitutes for foreign ones, wage increases again influence domestic output and consumer prices. If we continue to aggregate sectors as before, the hump shape should remain, although larger degrees of openness tend to make it less pronounced.[11] If under flexible exchange rates nominal wage increases by some union prompt a depreciation, both channels are affected. The depreciation increases the market power of the union, which would be an incentive for pushing wages up. But the depreciation also raises consumption prices, with the opposite incentives for unions. The overall effect on employment is thus unclear.

5.5.5. Mobile capital. The assumption of fixed capital may give unions greater power to raise wages than they actually have in the long run, when capital investment is able to respond to the rate of return. When capital is mobile within a country, even if it is not mobile internationally, the market power of individual unions is further reduced because the return to capital in a firm or industry cannot fall below the national

[11] Jackman (1987) has argued that a larger extent of openness is likely to reduce the market power to individual unions more than to affect the general price level. Hence, increased centralization should always produce monotonically lower wages. The claim is based on a model of monopolistic competition with only one domestic producer in each sector, who faces competition *only* from abroad and sets prices as a pure mark-up over wage costs. There are no substitution possibilities in demand between various domestic goods but these have a large weight in the domestic consumption basket. The model thus by assumption rules out the varying cross effects on employment that give our results. It is enough to introduce the existence of several plants in the same firm, as in Section 5.5.3, in order to generate the possibility of a hump shape in that framework.

level. Increased centralization then provides a method of squeezing the return to capital, which tends to increase wages under centralization, relative to the case of capital fixity. On the other hand, when capital is mobile internationally, real wages that lower the return to capital below the world rate should lead to international reallocations of capital that reduce demand for domestic labour. As a result, both real wages and employment fall. In fact, in an economy where goods are produced by capital and labour under constant returns to scale, where output prices are given from world markets, and where capital in the long run is supplied perfectly elastically at a constant world rate of interest, there is a unique equilibrium real wage, to which the economy must eventually converge. When domestic and foreign goods are imperfect substitutes for each other, this stringent condition no longer holds but capital mobility still reduces the effects of different degrees of centralization on wages (Jackman, 1987). The differences in wage-setting behaviour may, therefore, be reflected more clearly in employment. This provides a good argument for the focus on employment performance in Section 2.

5.5.6. Intermediate inputs. We have neglected inter-industry sales of goods used as intermediate inputs. A nominal wage increase in one sector affects other sectors also via input prices. For employers this creates additional cross effects on profits. For employees there will be cross effects on labour demand, the direction of which depends upon whether labour and the intermediate inputs are substitutes or complements. It is likely that the internalization of these input price effects result in lower wages. Cooperation between sectors (or firms) producing close substitutes may, however, entail relatively minor changes: for example, when various unions in the mining industry cooperate, there may not be much of inter-industry trade to internalize as compared to the case of cooperation between unions in the mining, steel and automobile industries. The main effect of intermediate inputs would, therefore, seem to be to reduce wages at high degrees of centralization, rather than to affect the hump shape *per se.*

5.5.7. 'Jealousy' effects as discussed by Oswald (1979, 1986) and Gylfason and Lindbeck (1984), occur when each union in addition to real wages and employment also cares about the level of its members' wages relative to others. To the extent that such jealousy effects exist, the wage moderation effects of centralization increase. However, like Oswald (1979), we remain skeptical about the importance of jealousy effects: most likely wage changes elsewhere mainly provide information on the potential for wage increases rather than creating envy. The welfare of one union may also be affected by wage decisions in other sectors,

because they affect the probability with which disemployed members can find employment elsewhere, and at what wages. It is not clear whether this effect would cause wages to rise or fall with centralization.

5.5.8. The hysteresis argument. It is a common argument that any fall in employment tends to become permanent, if unemployed workers lose union membership and become disenfranchised from the wage-setting process, so that wages are set only in the interest of the employed. Wage-employment outcomes then become indeterminate, and largely a function of recent history (Blanchard and Summers, 1986). This could affect our analysis in two ways.

First, consider gradual shifts over time in the degree of centralization within a given country. Starting from complete centralization, wages rise and employment falls. Once the top of the 'hump' is reached, there are no longer incentives for monopoly unions to lower wages again when decentralization increases further under the assumption of unemployment benefits being paid for by a tax on profits as in Section 5.1: only the previously employed workers decide on wages and they do not care about reductions of unemployment. A similar reasoning applies to movements from an initial level of high decentralization. If this is correct it argues against abandoning gradually either very high or very low centralization, once one is there.

A more common point relates to how recent downward employment shocks have tended to perpetuate unemployment. It has been argued, e.g., by Blanchard and Summers (1986) that these hysteresis effects are stronger in more decentralized systems because of a larger tendency for laid-off workers to drop out of local than out of industry or national unions. However, it remains to be shown that this is actually the case, and that this is reflected in differences with respect to how much the interests of the unemployed influence wage setting. The empirical evidence on hysteresis effects on wage setting is also mixed. Gregory (1986), Layard and Nickell (1986) found support for it, whereas Coe and Gagliardi (1985), Blanchflower and Oswald (1987) and Eriksson (1987) do not.

5.5.9. Relative wages and centralization. A growing body of evidence seems to support the view that more decentralized wage setting allows for a more efficient labour market, freer to respond to firm or industry specific factors (OECD, 1985; Martin 1986; Newell and Symons, 1987). Clearly, this line of reasoning adds to the benefits of decentralization and is a powerful argument against centralization. The issue of relative

wage flexibility concerns the relation between centralization and employment at a given average real wage. Our framework is designed to study something quite different: the relation between centralization, the average real wage and employment. An integration of these two issues is clearly desirable but beyond the scope of this article. It is likely that such a synthesis would not contradict the hump-shaped relation between real wages and centralization.

6. Conclusions

Our paper questions the conventional belief that centralization of wage bargaining is always preferable to decentralization from the point of view of macroeconomic performance. We find instead that both highly centralized and highly decentralized economies are likely to do better than intermediately centralized ones. The argument does not rest on larger relative-wage flexibility under decentralization but on the existence of a hump-shaped relation between centralization and the aggregate real wage. The suggested extensions of our theoretical analysis are not likely to change this fundamental conclusion.

If our hypothesis holds true, both those who argue in favour of more centralization and more decentralization may be right. Intermediate systems (such as, for instance in, Belgium and the Netherlands, and maybe also in Germany!) with bargaining at the industry level are likely to contribute the least to wage restraint. If so, one should go either for complete centralization with wages determined at the national level (Austria) or for extreme decentralization with wage bargaining at the level of individual firms or plants (US, Japan or Switzerland). No substantial effects will emerge from pushing intermediate systems a bit in one direction or the other.

In a system like the Swedish one with negotiations between a small number of central organizations, coordination among these would be highly beneficial. But it may be impossible to achieve because there are always strong arguments in favour of decentralization so as to let wages of individual groups respond better to their specific conditions. Therefore, wage bargaining at the level of individual firms or plants may be preferred. The main point remains that what one should not do is to go only part of the way to a somewhat more decentralized system with, say, industry-level bargaining. In economies with wage setting at this level one should not resist tendencies to enterprise bargaining in order to preserve some coordination. And countries with very decentralized wage setting may do best to remain where they are, since complete centralization may not be a feasible alternative anyway.

Discussion

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This paper is an interesting and provocative addition to a very topical and important area. The main thesis of Calmfors and Driffill is that 'both heavy centralization and far-reaching decentralization are conducive to wage restraint, whereas intermediate degrees of centralization are harmful'. In addition, they demonstrate the lack of robustness of the empirical studies which try to establish the link between good macroeconomic performance and a high degree of corporatism.

The positive contribution of the paper is the development of a model to analyse the influence of the degree of centralization which according to the authors is the main element of corporatism. The analysis is carefully founded on the recent theoretical work on trade union behaviour, and both a model of a monopoly union and formal bargaining theory are used. Calmfors and Driffill compute the levels of real wages and employment for different degrees of centralization in their model: with this they show that a non-linear, hump-shaped relation exists between real wages and centralization. The model thus provides an explanation for their main thesis.

This is an interesting experiment, but I have two broad reservations about it in addition to those discussed by the authors themselves. First, the objectives and means of influence of the unions are kept unchanged when the economy becomes more centralized. While the assumption may be a natural starting point, it must be recognized that, in reality, more encompassing unions typically have different goals and means of influence when compared with small unions. Big and powerful unions typically have strong political connections with the government, so that they can influence political decision-making as well as wage bargaining. This happens in Austria, Finland, and Sweden for example. Examples of union influence on government policy include legislation regarding working time, work conditions, and profit-sharing. Further, insider–outsider problems may be less acute in large centralized unions, who may care more about unemployment. While it is hard to incorporate all these features into a formal model, they must be borne in mind when evaluating the results.

The second aspect which is not discussed by Calmfors and Driffill concerns union welfare and the degree of centralization. This is another natural variable to look at, but it is not reported in the relevant tables. Union welfare can be an indicator for the motives for the centralization of the unions, and perhaps we should also consider whether there is an optimal degree of collusion? An answer to this kind of question might

well lead to some useful information about the economic reasons for the different degrees of centralization observed in different countries.

As regards the empirical evidence for the hump-shape, I find the use of stylized facts in Section 2 to be quite unconvincing. With only 17 observations it is likely that only a few changes in the relative rankings are going to have a large influence on the outcome, especially as one is considering a non-linear relationship. The most that can be claimed is that the evidence presented does not contradict the existence of a hump shape. Proper testing of the hypothesis requires careful econometric work on panel data.

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I might begin by noting that the authors' basic thesis regarding a hump-shape relationship has received support elsewhere (see Heitger, 1987), albeit for somewhat different reasons (Heitger emphasizes the fact that decentralized systems permit variations in inter-firm wages which promote resource allocation).

The view that industrial relations systems characterized by a high centralization of the wage-bargaining process may not be the only ones to deliver good macroeconomic performance is appealing in the 1980s. Austria, the success story of corporatism in the 1970s, is now lagging behind in economic performance. At the same time, the US, the typical example of a very decentralized bargaining system, has been the fastest growing among the industrialized countries. Calmfors and Driffill do provide an elegant argument for a hump-shaped relationship. However, the empirical results in the paper are unconvincing. In part, this is because the authors concentrate on centralization to the exclusion of other relevant features of the industrial relations system.

This matters because a neo-corporatist system is one in which unions share a vision of economic policy similar to that of the government, and try to enforce it in the labour market. In order to work, such a system needs two conditions: consensus (the sharing of objectives), and enforceability. The dimension that the authors single out – centralization – is crucial for enforceability, but centralization without consensus may not work. For example, the time-series results of Newell and Symons (1987), referred to in the paper, suggest that the performance of the same labour-market institutions is quite different at times of consensus than it is during periods of conflict: an example is West Germany under SPD governments, compared with coalitions led by the CDU.

The degree of union internal democracy, and thus the responsiveness of union leaders to their members, is also important. Unions that are

unresponsive to their members find it difficult to enforce the agreements reached in centralized bargaining. Lange (1983) has compared European industrial relations systems and found significant differences in the degree of internal democracy. Therefore, one should account for all these different dimensions of an industrial relations system (centralization, consensus, arbitration procedures, internal union democracy).

Some work along these lines has been done by Tarantelli (1986). He accounts for three different dimensions of an industrial relations system – centralization, consensus, and arbitration rules. Tarantelli finds that centralization is correlated with good economic performance: both unemployment and the misery index (the sum of inflation and unemployment) are decreasing functions of the degree of centralization of the industrial relations system. Although centralization is the most important variable, there is some evidence that consensus and bargaining rules help. Therefore, Tarantelli's results cast some doubt on the validity of the Calmfors–Driffill hypothesis.

The ranking of 17 countries according to the degree of cooperation among unions and employers' associations is also rather problematical. For example, Calmfors and Driffill place Switzerland among the very decentralized systems, like the US and Canada, because wage bargaining takes place mostly at the level of the individual firms. This is in sharp contrast to the political science literature (see for example, Parri, 1984) which characterizes Switzerland as an example of a neo-corporatist system. The point is that the political scientist distinguishes between the 'outcome' of a corporatist system – namely the participation of organized interests in the design of economic policy – and the 'structures' through which organized interests are represented. The Swiss system is characterized by low centralization of structures, but high participation – of employers' associations in particular – at the stage of economic policy design. Thus placing Switzerland next to the US is correct from the viewpoint of how the bargaining process is organized, but misses an important aspect of the way in which organized interests participate in the making of economic policy.

A second case where I disagree with the authors' ranking is the placing of France in the intermediate group. Such a ranking is justified by the structure of wage bargaining in France, but this fails to recognize the fact that the French Government is unusually resistant to pressures of organized interests. Therefore, some political scientists (see for example, Salvati, 1982) usually place countries like France in another group. Finally, the authors place Italy among the relatively decentralized systems: although it is true that working rules in Italy are negotiated at the firm level, wage bargaining is centralized, and the system – three

large unions divided according to political affiliation – is very similar to the Belgian system that is ranked in the intermediate group.

General discussion

Olivier Blanchard expressed some disappointment at the relative neglect of possible hysteresis effects. In a decentralized context, there is no obvious reason why the textile union should care about unemployed steel workers. It is, therefore, much more likely that the interests of unemployed workers are represented in centralized bargaining. Hence, it is likely that unemployment would be less persistent in centralized economies.

Roland Vaubel felt that the relationship between centralization and relative wage regidity deserved greater emphasis. With decentralized wage setting, relative wage flexibility would help reduce structural unemployment, and presumably, this was a key issue. Sushil Wadhwani concurred, reminding the authors that the single most important reason for the breakdown of successive British incomes policies was the pressure that built up as a consequence of the erosion of skill differentials.

Olivier Blanchard said that he found it surprising that the paper did not discuss the links between centralization and *nominal* wage rigidity, as it was this issue which interested most US macroeconomists.

Daniel Cohen agreed with Giavazzi that it was hard to believe that the French labour market could be characterized as being extremely decentralized, as the public sector employed about 20% of the workforce, and a further 10–15% of workers had their renumeration directly linked to the minimum wage announced by the government.

Richard Freeman reminded the authors that their model depended on there being a hump-shape relation between the degree centralization and wages, and only then to employment. The authors had made no attempt to test for the first link in this causal chain. In his own work (this issue), Freeman had found a hump-shaped relationship between employment and wage dispersion (as a proxy for decentralization) but much less evidence of an equivalent hump-shaped relation between dispersion and real wage levels. Sushil Wadhwani said that the authors were wrong in claiming that the commonly-followed procedure of correlating centralization with the responsiveness of wages to unemployment (as, say, in Bean, Layard, and Nickell, 1986) lacked a theoretical basis. The effect of the level of unemployment on wages was after all, a measure of the influence of outsiders, and Blanchard had reminded

us that he would expect wages in centralized economies to respond more to unemployment.

Wadhwani then urged the authors to examine within-country evidence on the effects of centralization, as there were serious difficulties associated with cross-country comparisons. For example, there was some evidence in the UK that the diminishing importance of national agreements over the last 20 years had raised wages. Incidentally, this British evidence was entirely at odds with the authors' view that enterprise bargaining was preferable to industry-level bargaining. Wadhwani also reminded the authors that comparisons of unemployment rates were hazardous, and that, just as some of their results were sensitive to how Switzerland was classified it would also have been valuable to see the effect of excluding Japan. This was especially important in the light of the voluminous literature on the mis-measurement of unemployment in Japan.

Steve Nickell thought that the relative neglect of intermediate inputs was important. For example, in the UK, labour costs were only about 20% of turnover at the firm level, but, yet, were about 70% of value added at the aggregate level. This was consistent with the view of many managers that labour costs were relatively unimportant. Of course, this perception would change dramatically if bargaining were conducted at a centralized level.

Appendix A. Index of centralization of wage bargaining

A1. Basic structure

The first column of Table A1 indicates the levels of coordination *within* national union confederations and within national employer organizations. 3 indicates national level, 2 industry level, 1 enterprise level and 0 occupational level within enterprises (in the case of labour). For Australia and New Zealand, 1 represents a compromise between the large element of wage setting on the occupational level and the centralization imposed by the arbitration tribunals and government income policies.

The second column reflects the number of existing central union confederations and the extent of their cooperation, and the number of existing central employer federations and their cooperation: 3 indicates one dominating union confederation and one dominating private-sector employer organization, 2 the existence of 2–5 union confederations and/or 2–5 central employer organizations, and 1 the absence of a central organization on one or both sides of the labour market. Plus and minus signs indicate minor differences between countries.

Table A1. Construction of the index

		Coordination level within central organizations	Existence of parallel central organizations and their cooperation	Total score
1	Austria	3	3	6
2	Norway	3	2	5
3	Sweden	3	2	5
4	Denmark	3–	2	5–
5	Finland	3–	2	5–
6	Germany	2–	3–	5– –
7	Netherlands	2	2+	4+
8	Belgium	2	2	4
9	New Zealand	1	3	4
10	Australia	1	3	4
11	France	1+	2	3+
12	UK	0+	3	3+
13	Italy	1+	2	3+
14	Japan	1	2	3
15	Switzerland	1	2	3
16	US	1	1	2
17	Canada	1	1	2

Sources: Bratt (1986), Faxen (1982), Flanagan *et al.* (1983).

A2. More specific judgements

Norway is ranked above Sweden because of (slightly) less fragmentation at the union confederation level and (significantly) less apparent inter-union conflicts on distribution (Flanagan *et al.*, 1983). The minus signs in the first column for Denmark and Finland reflect a larger element of decision-making power on the local levels (Crouch, 1985). Denmark is ranked above Finland because of less fragmentation at the union confederation level. The plus sign in the second column for the Netherlands is due to the existence of coordination between unions that belong to independent confederations at the central level (Flanagan *et al.*, 1983). The mixture of centralized and decentralized elements make the ranking of New Zealand and Australia compared to Belgium difficult. We judge the differences with respect to the first column to be larger than with respect to the second. New Zealand is ranked above Australia in conformity with Blyth (1979), and Bruno and Sachs (1985). The plus signs for France and Italy reflect a certain element of industry bargaining. The same applies to a lesser extent to the UK, where government incomes policies before 1979 imposed some centralization. Our relative rankings of the three countries conform to Blyth and Schmitter in Table 1. Japan is ranked above Switzerland because of a larger synchronization in time of wage negotiations. Canada is ranked

Table B1. The Bruno and Sachs equations.
Dependent variable: change of average annual inflation rates between subperiods

Subperiods							
first	second	Constant	Change of average GDP growth rates	Central-ization index	Standard error	Coefficient of determination	Durbin–Watson statistic
1965–72	1973–79	7.24*	0.70	−1.18	2.87	0.03	1.91
		(4.51)	(1.15)	(−1.39)			
1961–72	1973–85	8.46*	1.12*	−1.22	2.47	0.17	1.86
		(4.85)	(2.06)	(−1.63)			

Notes: (*) significant at the 10% level; t-statistics in parentheses. The centralization index is: 2 for Austria, Norway, Sweden, Denmark and Finland, 1 for Germany, Netherlands, Belgium, New Zealand and Australia, and 0 for Switzerland, France, UK, Italy, Japan, US and Canada.

Table B2. The McCallum equations
Dependent variable: Second subperiod inflation[a]

1st subperiod	1971–72	1971–72	1971–72	1971–72	1963–73	1977–78
2nd subperiod	1973–79	1973–79	1973–79	1973–79	1974–85	1979–85
Constant	4.03*	−10.13*	−3.34	6.97*	2.87	−1.30
	(2.9)	(4.5)	(1.4)	(4.1)	(0.97)	(1.08)
1st subperiod inflation[a]	0.57*	1.39*	1	1	1	1
	(5.3)	(6.7)				
Change in growth rate[b]	−0.07	−0.62*				
	(0.3)	(2.4)				
Money velocity factor[c]	−0.046*	−0.054				
	(1.8)	(1.7)				
Strike activity[d]	1.40*	2.08*	1.84*			
	(5.9)	(8.5)	(4.7)			
Centralization index[e]	−0.28	−0.029	−1.00	−2.17*	0.46	−0.23
	(0.9)	(−0.0)	(1.7)	(2.4)	(1.13)	(0.48)
2nd subperiod unemployment[f]			−1.04*	−1.08	−0.32	−0.10
			(1.8)	(1.1)	(0.85)	(0.76)
Coefficient of determination	0.94	0.90	0.79	0.37	0.15	0.05
Standard error	0.92	1.22	1.50	2.55	2.87	1.25
Durbin–Watson statistic	1.13	1.94	2.24	2.51	2.43	1.88

Notes: (*) Significant at the 10% level; t-statistics in parentheses. (a) average annual rate of change of consumer price index; (b) change in rate of growth rate of real GDP per person employed (adjusted for changes in terms of trade); mean growth rate over 1973–79 less mean growth rate over 1965–72; (c) see explanation in Appendix B; (d) log of average annual working days lost per 1000 non-agricultural employees, 1950–69; (e) same as in Table B1; (f) standardized OECD rate of unemployment.

below the US because of larger fragmentation of the union side at the central level.

Appendix B. Reestimations of Bruno–Sachs and McCallum equations

The velocity factor is $(\hat{m}\text{-}\hat{y}\text{-}\hat{p})(\sigma\text{-}\bar{\sigma})$ where:
$\hat{m}$ is the average annual rate of growth of narrowly defined money supply in 1972–78; $\hat{p}$ is the first subperiod average annual inflation rate (CPI); $\hat{y}$ is the trend annual growth rate of real GNP in 1972–78; σ is the standard deviation of annual rates of $\hat{m}$ in 1970–79; $\bar{\sigma}$ is the mean value of σ over all countries.

This somewhat peculiar looking term is meant to capture the idea that 'people will place more weight on anticipated rates of monetary expansion in forming their expectations, the more stable or predictable is their country's monetary policy'.

Appendix C. The simulated model

C1. Production

Each of 64 identical industries has a CES production function

$$Y_i^E = AK_i^E + (1-A)L_i^E \tag{C1}$$

where $Y_i \equiv$ output of industry i, $K_i \equiv$ capital employed, and $L_i \equiv$ labour employed. $1/(1-E) = \sigma$ is the elasticity of substitution between labour and capital. The capital stock in each sector is fixed, so that $K_i = 1.0$.

C2. Consumption

All consumers have a nested CES utility function, with five levels, and elasticities of substitution θ_1 (at the most aggregated level) to θ_5 (at the least aggregated level).

Thus if consumption of good j at level i is $x(i, j)$ we can write

$$x(i,j) = [x(i+1, 2j-1)^{(\theta_i-1)/\theta_i} + x(i+1, 2j)^{(\theta_i-1)/\theta_i}]^{\theta_i/(\theta_i-1)} \tag{C2}$$

for $i = 1, 2, 3, 4$, and $j = 1, 2 \ldots 2^{i-1}$. At the lowest level (5), we have four goods in each group so that

$$x(5,j) = \left[\sum_{k=1}^{4} x(6, 4j+1-k)^{(\theta_5-1)/\theta_5}\right]^{\theta_5/(\theta_5-1)} \tag{C3}$$

for $j = 1, \ldots 16$.

$x(1, 1)$ is the individual's consumption of the most aggregated good, and his utility is a constant elasticity function

$$u(x) = \frac{[x(1, 1)]^{1-\alpha}}{1-\alpha} \tag{C4}$$

$\mathbf{x}$ is the vector of basic goods consumed, $\mathbf{x} \equiv (x(6, 1), \ldots, x(6, 64)$, α is the individual's relative risk aversion, set equal to 2.0. This value falls within the range found in empirical studies of union behaviour (0.8–0.4 in the studies by Carruth and Oswald, 1985; Farber, 1978; and Forslund, 1986).

Each worker has only wage income if employed. If unemployed, he receives an unemployment benefit and may enjoy leisure, the sum of which is equivalent to getting a real wage rw_f, where $r = 0.57$ and w_f is the real wage at full employment. Total nominal demand in the economy is $M = 64$. The total demand for goods in the economy is equivalent to that of a representative consumer with nominal income $M = 64$, facing the price vector $\mathbf{P}$, and with the utility function above.

C3. Union behaviour

In each industry, the labour union cares about the utilitarian function

$$U^i = L_i v(W_i/P) + (\bar{L}_i - L_i)\bar{v}, \qquad i = 1, \ldots 64 \tag{C5}$$

where $P(\mathbf{P})$ is the price index that can be derived from the direct utility function above, $v(W_i/P)$ the utility of a worker with real wage income W_i/P, $\bar{v}$ the utility associated with unemployment benefits, and $\bar{L}_i$ the labour force available to union i, which we set equal to 1.0, since for the whole economy we assume that $\bar{L} = \Sigma_{i=1}^{64} \bar{L}_i = 64$.

C4. Equilibrium with monopoly unions

For an arbitrarily given vector of nominal wage rates $\mathbf{W}$ there exists an equilibrium price vector $\mathbf{P}$ such that (i) demand for each good maximizes the utility function given $\mathbf{P} \cdot \mathbf{x} = 64 = M$; (ii) supply of each good equals demand, $x(6, i) = Y_i$, $i = 1, \ldots, 64$; and (iii) the marginal product of labour in each industry equals the real product wage, from which follows that $L_i = L(W_i/P_i)$. The elasticity of labour demand with respect to the product real wage in sector i is $\varepsilon_i = -\sigma/(1 - S_{Li})$, where S_{Li} is the share of labour costs in total production value: $S_{Li} = W_i L_i / P_i Y_i$. We calibrate the model so that $S_{Li} = 0.7$ at full employment for all i, and set $\sigma = 0.33$. Hence, $\varepsilon_i = 1.1$ at full employment, which is within the range found in recent multi-country studies (OECD, 1985, and Newell and Symons, 1985, 1987).

When each union acts independently it chooses a nominal wage which maximizes its utility, taking as given all other unions' *nominal* wages. In general we can write the price of each good as a function of the wage, i.e. $P_i = P_i(\mathbf{W})$. Hence, the first order condition is

$$\frac{dU}{dW_i} = (v^i - \bar{v})\frac{dL_i}{dW_i} + L_i\frac{dv^i}{dW_i} = 0 \tag{C6}$$

where

$$v^i = v(W_i/P), \qquad dL^i/dW^i = \varepsilon_i(1-a_{ii})L_i/W_i$$

$$dv^i/dW_i = (1-\alpha)\left(1 - \sum_{k=1}^{64} s_k a_{ki}\right) v_i/W_i$$

$$a_{ki} = d\log P_k/d\log W_i$$

and s_k the budget share of good k in total consumption, i.e. $s_k = P_i x_i/M$. Because all sectors and unions are assumed to be alike, the price, the nominal wage, output and employment in each sector will be the same.

Cooperating unions maximize the unweighted sum of utilities of unions in the group. For example, in the case with two cooperating unions, i and j, union i will choose its nominal wage so that $\phi_i = dU^i/dW_i + dU^j/dW_i = 0$, where dU^i/dW_i is given by (C6), and

$$\frac{dU^j}{dW_i} = (v^j - \bar{v})\frac{dL_j}{dW_i} + L_j\frac{dv^j}{dW_i} \tag{C7}$$

where

$$v^j = v(W_j/P), \qquad dL^j/dW_i = -\varepsilon_j a_{ji} L_j/W_i$$

$$L_j = L(W_j/P_j) \quad \text{and} \quad dv^j/dW_i = -(1-\alpha)\left(\sum_{k=1}^{64} s_k a_{ki}\right) v^j/W_i$$

An identical condition $\phi_j = dU^j/dW_j + dU^i/dW_j = 0$ applies for union j. If $dU^j/dW_i = dU^i/dW_j > 0$ at the wages $W_i = W_j$ that maximize the utility of the two unions when they act independently, it follows that $\phi_i = \phi_j > 0$. Stability conditions then ensure that both wages must be raised in order to fulfill the first order conditions (Calmfors and Driffill, 1988).

The sign of dU^j/dW_i depends on how the cross employment effect (the first term) compares with the cross effect on real incomes (the second term). The first effect is larger, the larger $a_{ji} = d\log P_j/d\log W_i$, which depends upon how close substitutes the two goods are. Alternatively, because of the symmetry assumptions we can also regard the optimization problem when two unions cooperate as one of choosing the same nominal wage $W_i = W_j$ for both, so as to maximize the utility

of each individual union. The ensuing first-order condition $dU^i/dW_i + dU^i/dW_j = 0$ is equivalent to $dU^i/dW_i + dU^j/dW_i = 0$, and the reasoning becomes identical.

C5. Wage setting with bargaining

Employers in industry i are assumed to care about a function of real profits $V(\pi_i/P)$ where $\pi_i = P_i Y_i - W_i L_i$. V is taken to have the same constant elasticity form as consumers' utility,

$$V^i \equiv V(\pi_i/P) \equiv \frac{[\pi_i/P)]^{1-\alpha}}{1-\alpha} \tag{C8}$$

where again $\alpha = 2.0$.

When industries bargain jointly, both unions and employers maximize the unweighted sum of their utilities. For instance, if they each cooperate in groups of J, we assume that in the group (consisting of industries 1 to J), nominal wage rates W_1 to W_J are set (taking all other nominal wages as given) so as to maximize the product of utility gains

$$\sum_{j=1}^{J} [U^j - JU^0] \cdot \left[\sum_{j=1}^{J} V^j - JV^0 \right] \tag{C9}$$

where $V^0 \equiv$ utility of profits during a conflict (set to 0.010); $U^0 \equiv$ union utility during a conflict (set equal to the utility derived if all workers receive unemployment benefits).

The equilibrium involves the first order condition for nominal wage i

$$\frac{V^j - V^0}{U^j - U^0} = -\frac{\Sigma_{j=1}^{J} dV^j/dW_i}{\Sigma_{j=1}^{J} dU^j/dW_i} \tag{C10}$$

The new element compared to the earlier analysis is that we must now also evaluate $\Sigma_{j=1}^{J} dV^j/dW_i$. In the case of two employer associations, 1 and 2, we have for nominal wage W_1 that $\Sigma_{j=1}^{2} dV_j/dW_1 = dV^1/dW_1 + dV^2/dW_1$, where

$$\frac{dV^1}{dW_1} = (1-\alpha)\frac{V^1}{W_1} \cdot \frac{a_{11} - s_{L1}}{1 - s_{L1}} - \sum_{k=1}^{64} s_k a_{k1} \tag{C11}$$

$$\frac{dV^2}{dW_1} = (1-\alpha)\frac{V^2}{W_1} \cdot \frac{a_{21}}{1 - s_{L2}} - \sum_{k=1}^{64} s_k a_{k1} \tag{C12}$$

To the extent that $dV^2/dW_1 > 0$ at the wages which maximize the Nash product at separate bargaining, the effects via the employer side tend to raise wages with cooperation for the same reasons as above. The sign of dV^2/dW_1 depends on how the positive cross effect on

nominal profits (the first term) compares with the negative effect on their real value (the second term). The first effect is larger, the larger is $a_{21} = d \log P_2/d \log W_1$. Because of the symmetry assumptions we can again make the alternative interpretation that the same nominal wages are set for a group of sectors, so as to maximize the Nash product for an individual sector.

C6. Government expenditure and unemployment benefits financed by a proportional income tax

When we assume a proportional income tax in Table 8 the budget balance condition $\Sigma_{i=1}^{64} (\bar{L} - \bar{L}_i)b = t \Sigma_{i=1}^{64} P_i Y_i/P$, is fulfilled, where $b =$ unemployment benefit fixed in real terms and $t =$ the tax rate.

Individual workers and employers' utility now depends on the after-tax value of wages and profits. The utility of a worker, with nominal wage W_i is now $v(W_i(1-t)/P)$. When unions set wages in this case, they recognize that endogenous tax changes drive a wedge between pre-tax and after-tax nominal wage increases.

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