Explaining the OECD Wage Slowdown
Recession or Labour Decline?

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Wage growth slowed significantly in OECD countries in the 1980s and 1990s. Market explanations trace the wage slowdown to a recession characterized by inflationary shocks, high unemployment, and slow productivity growth. Institutional accounts focus on the effects of union density, collective bargaining centralization, and labour government. Analysis of time series from 18 countries for 1966 to 1992 yields some evidence for both theories between 1966 and 1974. Bayesian methods indicate a structural break in the wage growth process, linking the wage slowdown of the 1980s to the declining power of labour movements.

The pace of wage growth varies greatly across the advanced capitalist countries. In the late 1960s and early 1970s, European wages rose by about 4 or 5 per cent each year. US wages grew about a third as fast over the same period. In the 1980s and 1990s, real wage growth slowed dramatically throughout Europe and North America. European wage stagnation was associated with high unemployment and rising pressure on the welfare state (OECD, 1994; McFate, 1995). In the United States, falling wages accompanied rising poverty and inequality (Freeman, 1995; Harrison and Bluestone, 1988). The recent wage slowdown thus forms part of a protracted decline in labour-market performance that marks the end of a golden age of rising living standards and rapid economic growth in OECD countries (Glyn, 1995; Harrison and Bluestone, 1988).

The OECD wage slowdown challenges institutional theories of economic processes. If institutions explain cross-national difference, why was wage growth halted at similar times across so many institutional contexts? Market explanations that minimize institutional influences may be more promising. Such explanations emphasize the effects of productivity growth, unemployment, and inflation (Chan-Lee *et al.*, 1987; OECD, 1997). For

market explanations, the first oil crisis signalled the beginning of a sustained period of slow economic growth which arrested the rise in wages.

We propose an alternative account that focuses on the institutionalized power resources of organized labour movements. The key idea is that wages depend on industrial relations and political institutions that shape and advance workers' interests (e.g. Korpi, 1983; Goldthorpe, 1984; Scharpf, 1991). Unionization, collective bargaining centralization, and labour governments each offer organized labour movements collective control over wage growth. To explain the wage slowdown, we draw on research that documents the fall in union density, bargaining decentralization, and a rightward shift in the policies of pro-labour parties (Western, 1997; Katz, 1993; Baglioni and Crouch, 1990; Piven, 1991; Huber and Stephens, 1998). These developments have weakened union influence on labour-market outcomes, causing a general slowdown in wage growth.

To investigate these ideas, we analyse newly available data and offer a novel approach to studying institutional change. To analyse wage movements we construct a complete series of real wage trends, combining OECD and national sources from 18 countries between 1966 and 1992. The impact of

Table 1. *Summary of annual percentage growth in real hourly manufacturing wage rates, 18 OECD countries*

	1966–1973	1974–1982	1983–1992
Australia	2.14	1.30	−1.53
Austria	5.31	2.61	1.98
Belgium	5.91	2.90	0.29
Canada	3.34	1.52	−0.11
Denmark	5.75	1.70	1.15
Finland	5.55	1.17	2.19
France	5.06	3.11	0.68
Germany	4.56	1.56	2.08
Ireland	6.32	3.77	0.83
Italy	5.70	2.41	1.83
Japan	9.05	1.38	1.50
Netherlands	3.70	0.94	0.70
New Zealand	2.86	−0.41	−2.05
Norway	3.79	2.00	1.73
Sweden	4.19	0.22	0.83
Switzerland	1.74	0.67	0.87
United Kingdom	3.15	1.01	2.76
United States	1.35	−0.49	−0.74
Average	4.38	1.45	0.85

Source: See Appendix 1.

unions is measured using new time-series data from Visser (1996) and Golden, Lange, and Wallerstein (1997). Finally, we present a Bayesian method for estimating the effects of institutional change on wages. This method yields clear evidence for a structural break in the process of wage determination.

Wage Growth in 18 OECD Countries, 1966–1992

Table 1 summarizes trends in manufacturing sector wages that form the dependent variable for this paper. These data show the percentage growth in real hourly wage rates in manufacturing industries. Despite our focus on manufacturing wages, these data provide a good indication of wage movements in a country as a whole. This is illustrated by correlations from wage series in different sectors. For example, growth in hourly wage rates for Dutch public and private sector workers correlate at 0.88 for a time series beginning in 1985 (Netherlands Central Bureau of Statistics, 1986–1995). Longer and more detailed series are available for Sweden

(Nordic Council, 1972–1995). From 1971 to 1994 there is a correlation of 0.91 between real wage growth in the metals industries and in construction. Perhaps inter-industry wage growth is highly correlated in these European countries because industrial relations are relatively centralized. However, the same pattern holds in the United States. Annual growth in US hourly manufacturing wages correlates at 0.96 with wage growth in private-sector services, at 0.95 with wage growth in transportation, and at 0.91 with wage growth in all service industries. In general, wage levels vary greatly across industries, countries, and demographic groups, but wage trends are significantly more homogeneous (OECD, 1997: 6–11). In sum, manufacturing sector wage growth is highly correlated with wage movements in other sectors, and manufacturing wage trends thus provide an important indicator of general trends in living standards.

From the mid-1960s to the 1970s, pay rises accelerated in Europe. Spurred by rapid inflation and the strike waves of 1968–69, European wages climbed by about 5 per cent annually. An unprecedented economic boom in Japan helped drive the fastest rate of wage growth in the OECD – an extraordinary annual rate of around 8 per cent. Wages rose more slowly in the English-speaking countries. Real earnings grew by about 3 per cent a year in Canada and Britain. US wage growth was sluggish, averaging just under 1.5 per cent a year.

The OPEC oil shock of 1973–74 opened a new period of poor labour-market performance. Where wage growth was slow, real wage declines replaced the small pay rises of the previous decade. In the United States, estimates show that real wages for workers from nearly all education and experience groups fell between 1979 and 1991 (Katz *et al.*, 1995: 33). In Europe, the rapid pace of wage growth slowed significantly. In France, Germany, and Italy, wage growth was halved in the 1980s and 1990s compared to the period before the oil crisis. How can we explain the general stagnation of the rise in living standards in the advanced capitalist countries?

Market Forces and Wage Growth

Market explanations appear to provide a convincing and general account of wage trends in

OECD countries. These explanations focus on the forces of supply and demand. Labour demand is reflected in the unemployment rate. Labour supply is measured by productivity growth and inflation.

When labour demand is weak and unemployment is high, wage growth slows. In competitive labour markets, unemployment restricts wage increases by raising competition among workers for scarce jobs. In unionized labour markets, workers are prevented from under-bidding union wages. In this situation, unemployment increases the threat of lay-offs or business failures and unions bargain less aggressively as a result. The negative relationship between real wage growth and unemployment has thus been observed in both unorganized and highly unionized labour markets (OECD, 1997: ch. 1; Volgy *et al.*, 1996; OECD, 1994: 3–4; Layard *et al.*, 1991: ch. 9).

The quality of the labour supply also influences earnings. For neoclassical theory, market competition ensures workers are paid their marginal product; productivity growth thus drives wage growth (Hicks, 1963: 8). The assumption of competitive markets is not vital however. In unionized labour markets, employers finance wage rises out of productivity gains, and productivity increases are often written into union contracts (Flanagan *et al.*, 1983). Comparative studies of post-war time series of OECD countries thus find that sustained wage growth has depended on continuous improvements in productivity (OECD, 1997: 22; cf. Volgy *et al.*, 1996).

The labour supply is also influenced by inflation. In neoclassical theory, workers supply a quantity of labour in return for a certain real wage. Unexpected inflation causes workers to overestimate the value of their wages and oversupply their labour as a result (Friedman, 1968, 7–11). Excess labour supply then drives down wages. In an alternative interpretation, inflation reduces real wages because employment contracts specify nominal rather than real quantities (Keynes [1935] 1964, ch. 2). Cost-of-living adjustments often build inflationary expectations into union contracts. Even in these cases, unexpected inflation can reduce wages. Simple models of inflationary expectations involving first differences consistently show the dependence of wages on price movements (Layard *et al.*, 1991, ch. 9; OECD, 1997; Chan-Lee *et al.*, 1987; Volgy *et al.*, 1996).

Supply and demand trends fit the main pattern of variation in wage growth. Following the first oil shock, economic growth slowed throughout all OECD countries. The purported causes of slow growth include low rates of investment, deflationary policy, the globalization of financial markets, and the growth of service-sector employment (e.g. Glyn, 1995; Epstein and Schor, 1992; Gershuny, 1983). Whatever the precise causes, the effects appear clear: a general downturn in productivity growth; a secular rise in unemployment, particularly severe in Europe; and a period of relatively high inflation in the 1980s. The fall in productivity growth constricted pay rises. Rising unemployment shifted the balance of market power from wage-earners to employers. Finally, the purchasing power of wages was dissolved by price shocks and persistent inflation. The generality of economic explanations is suggested by econometric research which finds that political factors add little explanatory power and that slow wage growth in the 1980s depends mostly on inflation and unemployment trends (Chan-Lee *et al.*, 1987; OECD, 1997: ch. 1; cf. O'Connell, 1994).

Institutions and Wage Growth

Market forces only partly explain wage trends, because earnings are also influenced by the institutionalized power resources of labour movements. Two theories describe the impact of organized labour on wages. The first claims that unions use their organizational power to boost wages through collective bargaining. In the second, centralized unions and labour governments restrain wage growth in return for low unemployment.

Industrial Relations and Labour Government

The positive effect of unions on wages is basic to power-resource theories of organized labour (O'Connell, 1994; Cohn, 1993; Rubin, 1986). In this approach workers and employers have conflicting interests in wage growth. Workers want rapid wage growth to expand their incomes; employers want slow wage growth to control production costs. Armed with the threat of strikes, unions use their

organizational strength to push for higher wages. The positive effect of unions on wages thus depends on the level of union organization, or union density – the percentage of unionized workers in the workforce. Positive unionization effects have been found in a wide variety of contexts, in studies of microdata on the union wage premium and in comparative research on aggregate wage effects (Blanchflower and Freeman, 1992; O'Connell, 1994).

With centralized collective bargaining, strong unions may restrain rather than fuel wage growth (Olson, 1982; Crouch, 1985; Calmfors and Driffill, 1988). Centralized bargaining transforms conflict between unions and employers into cooperation. In this theory, the costs of wage growth in terms of unemployment are distributed throughout the economy. Under centralized bargaining, union leaders represent the entire labour force in national wage talks. Consequently, the unemployment effects of wage claims are directly experienced by the union's constituency. Centralized unions thus have an incentive to restrain wage claims. With decentralized bargaining, union pay rises narrowly benefit workers in a given plant or firm, but the costs are distributed over the whole labour market. The resulting free-rider problem provides individual unions with little incentive to restrain wage militancy. Empirical studies thus find evidence of wage restraint in countries with national or sectoral bargaining (Layard *et al.*, 1991: ch. 9).

Political parties may also contribute to wage restraint (Crouch, 1985: 109; Headey, 1970). Labour governments assist wage restraint by offering tax and social welfare guarantees to unions. These policies maintain incomes while unions restrain their bargaining power. Conservative governments have less cooperative relations with unions, obstructing a coordinated approach to economic policy. Conservatives may also be less inclined to reflationary measures like social spending. Previous research thus associates the combined impact of social democratic parties and centralized unions with low unemployment and strong economic growth (Scharpf, 1991; Alvarez *et al.*, 1991; Hicks, 1994).

The current focus on institutional features of labour movements may neglect several other related sources of wage growth. First, one strand of research studied the effects of labour militancy, although this work typically focused on the experiences of individual countries (Rubin, 1986; Hibbs, 1987; Cohn, 1993). Strike effects lack face validity in comparative analysis because real wage growth was slowest in the Anglo countries where strike activity was greatest. This is in contrast to rapid wage growth in Austria, Germany, and Japan – all countries with low strike rates (Korpi and Shalev, 1979). The analysis of strike effects is also hampered by missing data. Second, some researchers have recently argued that bargaining centralization affects wage behaviour in tandem with the prevailing monetary regime (Hall, 1994; Iversen, 1998). In this argument, growth in nominal wages might be offset by tight monetary policy sponsored by independent central banks or regional exchange rate coordination. For now, we bracket the role of the monetary regime. Still, because inflation is the ultimate target of monetary policy, the influence of monetary regimes will be reflected in inflation effects.

Labour Decline

Recent research claims that the indicators of labour institutionalization – union density, bargaining centralization, and labour government – play a different role in contemporary labour markets compared to the 1960s and early 1970s (e.g. Streeck, 1993; Huber and Stephens, 1998; Visser, 1992*a*). The changing impact of institutions is linked to three main developments:

1. the declining bargaining power of unions;
2. the growth of local wage bargaining; and
3. the rightward shift of left-wing parties.

Unions lost power in the 1980s and 1990s due to organizational decline and growing political and economic adversity. Union density fell in nearly all OECD countries in the 1980s (Western, 1997). As a result, the power of the strike was severely weakened, and labour militancy fell sharply (Shalev, 1992). In some countries – notably the United States and the United Kingdom – density decline was linked to anti-union campaigns by conservative governments (Western, 1997). These campaigns also defused aggressive wage bargaining by weakening legal protections for strikes (Weiler, 1990; Marsh, 1992). Economic conditions also diminished bargaining power. Persistent high unemployment in

Europe constrained union wage claims. The growth of foreign trade placed unionized labour in the North in competition with low-wage exporters of the South (Wood, 1994). In addition to organizational losses, unions thus lost bargaining power through political attacks on industrial action, recession, and new competitive pressures from abroad.

These developments have two empirical implications. First, the effect of union density on wage growth may be unchanged, but wages fall because union density falls. Second, declining bargaining power will be likely to change the effect of union density on wage growth. Due to lost bargaining power, even unions that maintain organization may be unable to sustain wage growth in the 1980s and 1990s. In short, the positive effect of unions on wages is likely to have declined in the last two decades.

While the pursuit of their sectional interest in higher wages was weakened, unions also met new obstacles to their general interest in wage restraint. Due to the growth of firm-level bargaining in OECD countries during the 1980s, central wage agreements decreasingly influenced aggregate wage trends. The extent of bargaining decentralization is disputed by comparative researchers. Lange, Wallerstein, and Golden (1995; Golden et al., 1993) find significant continuity in collective bargaining through the 1970s and 1980s in a sample of 16 OECD countries. Still, other research finds that local bargaining has flourished alongside centralized wage talks (Katz, 1993; Baglioni and Crouch, 1990). In Norway, for example, national bargaining was uninterrupted during the 1980s, but local wage drift consumed 80 per cent of all wage increases by the mid-1980s (Moene and Wallerstein, 1993). Regular industry-level wage rounds were also conducted in Germany through the 1980s, but firm-level wage bargaining in works councils also expanded significantly during this period (Thelen, 1993). Thus the influence of centralized bargaining may have eroded through the 1980s and 1990s, even where formal measures of bargaining centralization show little change. As a consequence, the negative effects of centralized bargaining on wage growth have probably declined in the 1980s and 1990s.

In addition to organized labour's eroded industrial position, comparative researchers also point to a 'decline of social democracy'. While many leftist parties were in opposition through the 1980s (Pontusson, 1995; Piven, 1991), those that retained power were unable to support their traditional working class constituencies through social welfare and full employment policies (Huber and Stephens, 1998). In Scandinavia, Swedish and Norwegian left parties are seen to be 'rapidly abandoning social democracy and embracing market liberalism' (Moene and Wallerstein, 1993: 385). Through the 1980s and early 1990s, social democrats in Norway and Sweden cut industry subsidies, privatized state firms, deregulated financial markets and generally focused on price stability over full employment in economic policy (Pontusson, 1994: 3538; Huber and Stephens, 1998; Mjøset et al., 1994: 67–70). Outside Northern Europe, left parties in France, Australia, and New Zealand also turned to policies of deregulation, decentralization, and privatization throughout the 1980s (Ross and Jenson, 1994; Stilwell, 1993; Massey, 1995: ch. 3). This policy shift damaged the political exchange of public policy for wage moderation. As a result we expect that the negative effect of labour governments on wage growth will decrease in the 1980s and 1990s.

In sum, the erosion of union bargaining power, the rise of local bargaining, and the rightward shift of labour government indicates a broad, but uneven, 'deinstitutionalization of labour'. In this new institutional context labour movements are less able to pursue sectional interests in wage growth, or more general interests in wage restraint.

In the institutional approach, the effects of labour supply and demand are shaped by the shift of institutional control away from labour. The negative effect of unemployment on wage growth is likely to become more severe as union aggressiveness in wage bargaining deteriorates. Labour decline has also reduced the use of cost-of-living adjustments in wage contracts (Western, 1996a). As a result, the negative influence of inflation on wage growth should increase in the 1980s and 1990s. Finally, unions are in a weaker position to assert claims on the gains from technological improvements. This suggests that the positive impact of productivity growth on wages should also decrease in the recent period.

The predicted effects of the market and institutional variables are summarized in Table 2. The first column shows the effects of all variables in the

Table 2. *Predicted effects of market and institutional variables on real wage growth, 18 OECD countries, 1966–1992*

	Golden Age regime	Change in Effect	Slow growth regime
Unemployment	−	−	−
Inflation	−	−	−
Productivity growth	+	−	0
Bargaining centralization	−	+	0
Labour government	−	+	0
Union density	+	−	0

Table 3. *Means of the independent variables used in the analysis of real wage growth in 18 OECD countries, 1966–1992*

	(1)	(2)	(3)	(4)	(5)	(6)
Australia	5.03	0.15	1.85	0.68	0.40	51.25
Austria	2.44	−0.03	3.16	0.33	0.72	64.07
Belgium	6.93	−0.06	2.80	0.51	0.23	70.46
Canada	7.60	−0.04	1.28	0.11	0.67	34.57
Denmark	5.62	−0.16	1.43	0.78	0.43	79.52
Finland	4.40	−0.09	3.07	0.63	0.48	78.24
France	6.13	0.00	2.74	0.33	0.31	18.60
Germany	3.68	0.02	2.62	0.33	0.40	40.37
Ireland	7.79	0.04	3.11	0.54	0.15	59.49
Italy	10.24	−0.07	3.84	0.77	0.18	53.89
Japan	1.96	−0.18	4.33	0.33	0.00	31.08
Netherlands	5.87	−0.03	2.09	0.63	0.18	37.79
New Zealand	3.00	−0.10	0.90	0.62	0.34	40.45
Norway	2.53	−0.07	2.63	0.91	0.56	63.34
Sweden	2.45	−0.10	1.66	0.85	0.73	86.62
Switzerland	0.51	0.02	1.49	0.33	0.29	33.28
United Kingdom	6.68	−0.04	2.01	0.33	0.35	50.07
United States	6.18	0.05	0.80	0.07	0.26	23.22

Column headings are as follows: (1) unemployment; (2) inflation; (3) productivity growth; (4) bargaining centralization; (5) labour government, and (6) union density.

golden age of labour-market performance. The market explanation suggests that real wage growth depends negatively on unemployment and inflation, but positively on productivity growth. For the institutional explanation, centralized bargaining induces wage restraint, perhaps in combination with labour government. Union density, however, raises wage growth. Wage determination in the slow growth period operates differently, however. We expect the unemployment and inflation effects to become more negative. The positive productivity effect should go to zero. All institutional effects should also move towards zero, as the collective influence of wage-earners declines.

A Model of Real Wage Growth and Labour Decline

Table 3 reports summary statistics for the independent variables (see Appendix 1 for data sources). A total of 483 country-years are used for analysis, consisting of time series from 1966 to 1992 for all countries except Australia, whose series ends in 1989. Standardized unemployment rates are used, where available, to measure labour demand. Unemployment is likely to be endogenous to wage growth, so unemployment effects may be inflated. Other research on similar data-sets suggests estimation

with instrumental variables has little effect (OECD, 1997: 21), so we prefer the simple single-equation model here. (Bound *et al.*, 1995 describe the pitfalls of instrumental variables estimation.) Like earlier research, price movements are measured by the change in the inflation rate of the consumer price index (Layard *et al.*, 1991; Volgy *et al.*, 1996). Productivity growth is given by the percentage change in real gross domestic product (GDP) per employed person.

Following Janoski, McGill, and Tinsley (1997), all institutional measures vary over time. Labour government is measured by the proportion of cabinet seats held by labour, social democratic, socialist, or communist parties. Union density is measured by the total number of union members (including those retired and unemployed) as a percentage of all wage and salary earners plus the unemployed. Time series are common for unionization and left government measures, but unusual for indexes of bargaining centralization (Crouch, 1993: 14; cf. Hicks and Kenworthy, 1998). We measure bargaining centralization with a longitudinal four-point scale reported by Golden *et al.* (1997). High scores indicate countries with national or sectoral bargaining that binds union affiliates to no-strike agreements. Next come countries with sectoral bargaining, but without no-strike agreements. Below the sectoral level are industry-level bargaining systems. Finally, countries with decentralized firm-level bargaining score lowest. Centralization is scaled to vary between 0 and 1, so centralized settings like Norway and Sweden average close to 1, while the United States and Canada are close to 0. It is sometimes argued that decentralized but co-ordinated industrial relations, like the Japanese system, can function similarly to centralized bargaining (Soskice, 1990). We investigate this idea with diagnostics that assess the sensitivity of results to data from Japan, and other countries in the sample. Diagnostics show that even when Japan is excluded from the analysis, we obtain essentially identical conclusions to those reported below (Appendix 2).

The basic model for country i ($i = 1, \ldots, 18$) at time t ($t = 1966, \ldots, 1992$) is written:

$$w_{it} = b_{0i} + b_1 U_{it} + b_2 y_{it} + b_3 \Delta p_{it} + b_4 L_{it} + b_5 B_{it} + b_6 D_{it} + e_{it}$$

(1)

where w is the annual percentage growth in real manufacturing wages, U is the unemployment rate, y is real productivity growth, Δp is the annual change in the inflation rate, L is labour government, B is bargaining centralization, D is union density, and e is an error term. Subscripts on the intercept indicate that cross-national differences in average wage growth are fit with country-level dummy variables. There is no residual autocorrelation with this model, but error variances differ across countries. We assume that wage growth is conditionally normal, with different variances for each country. This model is estimated with maximum likelihood methods.

At the micro-level, the model assumes workers and unions negotiate increases in the current wage. Wage growth depends on the level of bargaining power in these negotiations, and shifting economic conditions that influence the real value of wages and employers' capacity to pay. With this micro model of wage determination, wage growth is written as a function of the levels of unemployment and power resources variables, which capture bargaining power. Wage growth, however, is also facilitated by rising productivity and falling inflation. Thus changes in, rather than the levels of, these variables help to determine the rate of wage growth.

Theories of labour movement decline suggest that institutional effects may change, but model (1) constrains all effects to be identical over time. Consistent with the slow growth story, model (1) explains the decline in wage growth with a general shift in the values of the independent variables. Change in the effects of the variables can also be treated as a parameter to be estimated. For this approach, the time series is divided into two regimes. At some point, year k, the effects of the independent variables switch from the golden-age wage regime to the slow-growth regime, described in Table 2. For example, suppose we estimate that $k = 1980$, we would expect that union density positively affects wage growth before 1980, but has little effect after this year due to the decline in union bargaining power.

To study change points in wage determination, we define a dummy variable, $D(k)$, which scores zero for all observations before year k, and one for observations from year k onwards. The change-point model augments model (1) with the main effect of $D(k)$ and interaction effects:

$$w_{it} = b_{0i} + b_1 U_{it} + b_2 y_{it} + b_3 \Delta p_{it} + b_4 L_{it} + b_5 C_{it} + b_6 B_{it}$$
$$+ D(k)_{it} \times (b_7 + b_8 U_{it} + b_9 y_{it} + b_{10} \Delta p_{it} + b_{11} L_{it}$$
$$+ b_{12} C_{it} + b_{13} B_{it}) + e_{it}$$

(2)

Bayesian methods for model selection are used to decide between the constant-effects model of equation (1) and the change-point model (2) (see Western, 1996b). Letting $D(k)$ shift over a range of possible break points, $k = 1970, \ldots, 1990$, we use the data to determine if and when a structural break has occurred. This approach extends the historical time-series analysis of Isaac and Griffin (1989), by treating change points in statistical regimes as quantities for estimation and inference.

The change-point model simplifies the historical record by assuming a clear break in the wage growth process whose timing is identical across countries. Although this assumption is certainly false, it offers a useful simplification. With no clear break or heterogeneous timing of breaks across countries, the analysis yields only weak evidence for a unique change-point. A more realistic model would allow change points to vary across countries. This specification, however, would add over 100 new parameters, running the risk of unidentified parameters and over-fitting. The simplified approach of model (2) captures the main idea that labour markets function differently in the recent period of slow growth than in the golden age of the 1960s. If this is not approximately true, evidence for the change-point will be weak.

Results

The Bayes factor measures evidence for the change-point model (see Appendix 3). Positive log Bayes factors show that the change-point model is more probable than the constant-effects model. Figure 1 reports a time series of the log Bayes factors for a range of alternative break points, $k = 1970, \ldots, 1990$. The year with the highest Bayes factor identifies the change-point with highest posterior probability. The data offer clear evidence for a structural break in wage determination at 1975. This is shown by the sharp peak in the time series at this year. There are no other local maxima,

and the change-point model has much higher posterior probability than the constant-effects model. This suggests that changes in wage determination occur at roughly the same time for all countries – in 1975. (The result is unlikely to be an artefact of volatility in 1975, as robust regression analysis that downweights outliers yields substantively identical estimates.)

The figure also reports a time series of R^2 statistics from a naive OLS fit for all possible break points. The R^2 statistics tell the same story as the Bayes factors. Adding a dummy variable for years 1975 and after, and interactions with the dummy variable, raises the percentage of explained variance by one-quarter. Like other research that locates the end of labour's golden age at the mid-1970s (Esping-Andersen, 1990: 186; Crouch, 1993: 291; Goldthorpe, 1987), the structural break identified in this analysis coincides with the recession following the first oil crisis.

Table 4 reports goodness-of-fit statistics for three models: the constant-effects model, the change-point model, and a compromise model that includes the period dummy variable, allowing a mean shift in wage growth after 1974. All models contain 17 country-level dummy variables. Log-likelihood and R^2 statistics indicate that the models with period effects fit best. The change-point model fits significantly better than the period effect model, passing a chi-square test at $p < 0.01$. The Bayes factor applies a more stringent test by penalizing highly parameterized models (Raftery, 1995). The Bayesian criterion also supports the change-point model. The model also fits well in the qualitative sense of capturing substantively important patterns of variation. Average wage growth in the OECD area was 3.25 percentage points slower from 1975 to 1992 compared to 1966–74. The constant-effects model assumes that the wage slowdown results only from changes in the independent variables. On this assumption, 60 per cent of the slowdown in average wage growth is explained. The change-point model, which allows the determinants of wage growth to change over time, explains 80 per cent of the wage slowdown in the post-oil shock period. The slow growth account of wage stagnation based chiefly on rising inflation and unemployment and slow productivity growth leaves sizeable unexplained variation.
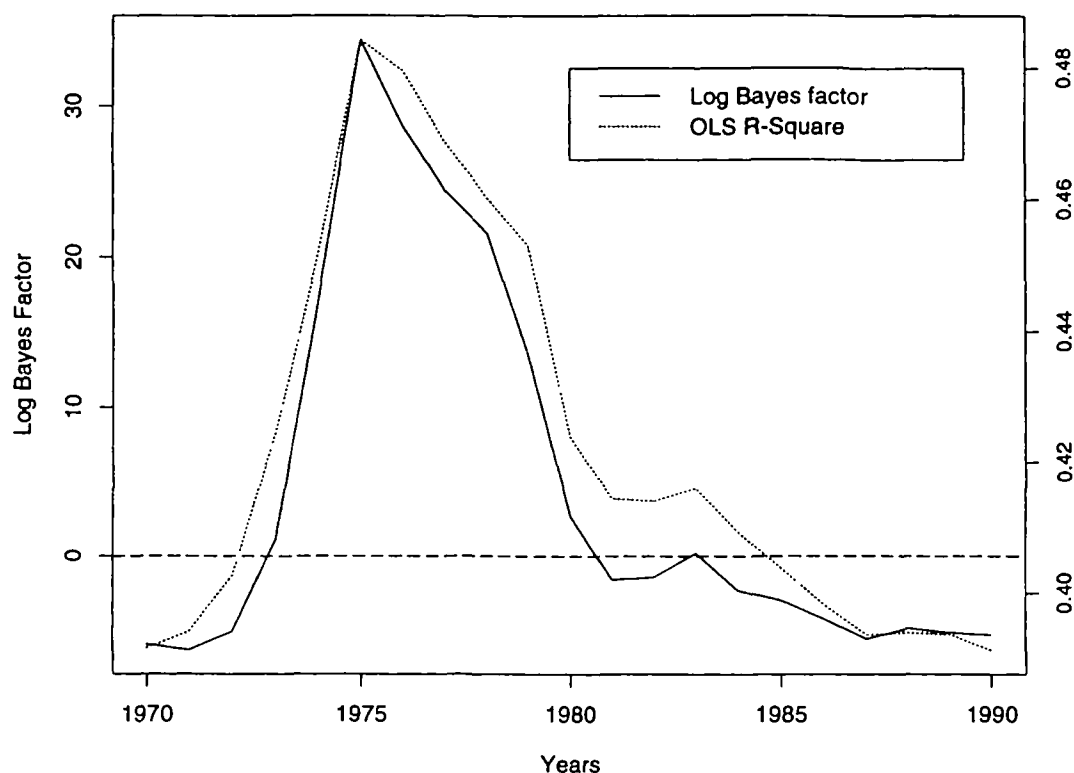
Figure 1. *Log Bayes factors and OLS R^2 statistics from a model of a structural break in the determinants of real growth.*

Table 4. *Goodness of fit statistics for three models of wage growth*

Model description	M	M+P	M+P+I
Number of coefficients	24	25	31
R^2	0.37	0.45	0.47
Log likelihood	−1060	−1029	−1010
Log Bayes factor	—	28.9	40.0
Explained decline[a] (%)	60	70	80

Note: M = main effects, P = period effect, and I = period interaction effects. The log Bayes factor compares models (M + P) and (M + P + I) to the baseline model (M).
[a] Percentage of the decline in the average rate of wage growth between 1966–1974 and 1975–1992 explained by the model.

Table 5 reports regression estimates from the change-point model, for $k = 1975$. These estimates are conditional on the change-point, so conventional (unconditional) standard errors and t-statistics will be optimistic. Since the 1975 change-point is overwhelmingly preferred by the data this bias is extremely small. (Of all the change-point models, $k = 1975$ has 99 per cent posterior probability; averaging over possible change-points for unconditional inference thus yields essentially identical results.) The first column of the table describes wage growth between 1966 and 1974. These results provide modest evidence for the influence of market forces. Consistent with theory, wage growth is negatively associated with inflation and unemployment. However, the coefficients are small with large variance. In the late 1960s and early 1970s unemployment rates were generally low, showing little variation. These trends combined with the small unemployment coefficient suggests labour demand

Table 5. *Regression results in a model of real wage growth in 18 OECD countries, 1966–1992 (absolute t-statistics in parentheses)*

	Main effects (1)	Period interactions (2)	Post-1975 net effects (1) + (2)
Period Effect	−0.23	1.10	0.87
	(0.19)	(1.73)	(0.91)
Unemployment	−0.08	−0.17	−0.26
	(0.80)	(1.88)	(5.40)
Inflation	−0.01	−0.25	−0.25
	(0.12)	(3.15)	(4.72)
Productivity growth	0.28	−0.25	0.03
	(4.24)	(2.69)	(0.42)
Bargaining centralization	0.68	−1.64	−0.96
	(1.17)	(2.38)	(1.90)
Labour government	0.80	−1.06	−0.26
	(1.94)	(2.13)	(0.86)
Union density	0.40	−0.26	0.13
	(1.99)	(2.14)	(0.95)

Note: The second column reports interactions with the period dummy variable indicating observations from 1975 to 1992. The period effect is the intercept term in column one and the coefficient for the period dummy variable in column two. Union density coefficients have been multiplied by 10. Coefficients for country-level dummies have been suppressed. In column 3, variances for the sum of main effects, b_M, and interactions, b_I, equals $V(b_M) + V(b_I) + 2\text{cov}(b_M, b_I)$.

exerted little influence on real wage growth before the oil crisis. While unemployment was low, the end of the golden age featured several large inflationary shocks in the late 1960s. The inflation effect indicates that the real value of wages was shielded from steep price rises at this time. Productivity growth provides the most powerful economic effect of the golden-age wage regime. The coefficient is large and statistically significant. This estimate usefully distinguishes trends in wage growth in Europe and North America. Productivity grew at about 4 per cent annually in Italy, Germany, and France before 1975, contributing more than a percentage point to real wage growth. US productivity growth averaged four-fifths of a percentage point before the oil shock, generating less than one-quarter of a point in annual wage growth.

While market effects are generally weak, labour movements strongly influenced wages before 1975. Contrary to theory, wages grew faster in countries with centralized bargaining and labour governments. The positive effect of labour government is large and significant at conventional levels. These estimates weaken the claim that centralized representation of labour movements cultivated a general

interest in wage restraint. One possible interpretation places these results in historical perspective. In the late 1960s and early 1970s, labour governments supported their working class electorates by maintaining wage standards. During this time, labour parties backed central union wage policies for low-paid workers. Social democrats also intervened less in industrial relations compared to conservatives, who more commonly pre-empted collective bargaining with wage freezes (Flanagan *et al.*, 1983 provide evidence for the Netherlands and Denmark). In addition, social democrats allowed large public-sector wage increases which spilled over into the economy as a whole. In short, solidaristic policies to raise wages among low-paid workers and general support for wage standards may partly explain the positive wage effects of labour government. (Following other research (Alvarez *et al.*, 1991; Hicks, 1994), we also experimented with interactions between bargaining level and labour government, but these were not significant.) Supporting the power-resources theory of union wage effects, wages also grew faster in countries with extensive unionization. A 50-point difference in union density − the average difference between

Sweden and the United States — is associated with a 2 percentage point difference in wage growth in the golden-age wage regime.

The wage growth process changed markedly after 1975. Interactions describe the change in effects after the oil shock (column 2, Table 5). The sum of the interaction and main effects provide the net effects for the slow-growth period (column 3, Table 5). Supporting the idea that wages are more vulnerable to unemployment when union bargaining power is weak, the net negative impact of unemployment tripled in the slow growth period. The increasingly negative effect compounds the rise in joblessness, suggesting the extremely large influence of unemployment on recent European wage trends. Inflationary shocks also checked wage growth after 1975. This result underlines the diminishing influence of cost-of-living adjustments in union contracts. Despite these estimates, market mechanisms did not unambiguously expand their influence in the slow growth period. The effect of productivity growth moves towards zero after 1975. Although productivity growth drove pay rises before the oil crisis, productivity trends are weakly related to wage movements afterwards. Before 1975, years of positive productivity growth coincided with positive wage growth more than 90 per cent of the time. After 1975, positive wage growth accompanied productivity increases just 60 per cent of the time. This suggests that workers and their representatives have been less successful in asserting claims on productivity improvements over the last two decades.

Results for the institutional effects also show significant differences with the pre-oil-shock period. Unexpectedly, the bargaining centralization effect turns significantly negative in the slow growth period. Despite the growth of local bargaining, this estimate provides evidence of centrally organized wage restraint. This estimate may result from the increasing importance of centralized bargaining during recessions or in contexts of intensified economic volatility. Thus case studies show that centralized bargaining produced wage restraint in Austria in the 1980s and in many of the small European countries in the late 1970s (Katzenstein, 1985; Scharpf, 1991; Flanagan *et al.*, 1983). Whatever the interpretation, there appears significant evidence for institutional continuity in collective bargaining and little support for a universal deregulation of OECD labour markets.

The left government effect for the 1980s changes similarly to the bargaining-level effect. The data show that wage growth was relatively slow under labour and social democratic government. Again, this result contradicts historical evidence that labour movements were increasingly unable to pursue general interests in wage restraint in the 1980s and 1990s. Still, in common with other research (O'Connell, 1994), the net effect for the post-oil shock period is small, and not statistically different from zero.

Finally, the positive effect of union density that we find before 1975 is close to zero afterwards. Although unions in several cases maintained their organizational strength, this suggests that their bargaining power was severely weakened. Local unions were less able to pursue their sectional interests in higher wages, and the relationship between union density and wage growth flattened. In countries where unions lost membership, as in the United States or the United Kingdom, the impact of deunionization seems especially severe. In these cases, the capacity of unions to protect living standards suffered a double blow: declining organization reduced the reach of union wages, while diminished bargaining power reduced wage increases obtained by unionized workers. These results are consistent with US studies showing the decline of union membership and the increasing incidence of concession bargaining in the 1980s (Farber, 1989; Mitchell, 1993).

A variety of other models were also studied for this analysis. In addition to the results reported we also examined the effects of trade, economic growth, interactions between economic and institutional variables, non-linearities in centralization effects, and a range of alternative institutional variables. The results from the simple model reported here are the most robust and among the strongest, but similar models yield similar conclusions. A systematic survey of alternative models reports intervals of coefficients, obtained when estimating all possible subsets of the independent variables. Sensitivity of the results to information from individual countries was also assessed with a jackknife analysis. Both types of sensitivity analyses are reported in Appendix 2, demonstrating the robustness of the reported findings to outliers and model assumptions.

Discussion

This analysis provides novel evidence of a structural break in the process of wage determination some time in the mid-1970s in the advanced capitalist labour markets. Before the break, wages were insulated from the effects of unemployment and inflation, while productivity growth assisted a continuous rise in earnings. Union organization, bargaining centralization, and labour government are all associated with rising wages in the golden age. The oil crisis initiated a novel type of recession that set all the advanced capitalist labour markets on a new path of development. Not only did the values of key variables change in a way that hurt wages in the mid-1970s; the causal process of wage determination also shifted. In the the slow-growth era, wage-earners were vulnerable to rising unemployment and inflation and less able to share in the gains of technological progress. The institutional determinants of wage growth also changed. The power of union density to raise wages was substantially curtailed. The power of state actors to affect wages was also weakened. In contrast to claims of the dissolution of centralized bargaining, however, there is strong evidence of centralized wage restraint in the 1980s and 1990s.

These results also carry several important limitations. First, the analysis only examines manufacturing wages. Although there is evidence that industry-level wage trends strongly covary, greater economic openness in industrialized democracies suggests union power is diverging across sheltered and exposed sectors (Garrett, 1998: 148–50). Future analysis could thus fruitfully examine more disaggregated wage series. Second, the broader institutional context involving monetary regimes and social policy have been bracketed from analysis. Although these institutions certainly influence living standards, the current focus on wages has neglected these non-market mechanisms for economic allocation. Third, analysis of wage trends has overlooked distributional patterns in which earnings inequality rose unevenly across OECD countries (e.g. Katz et al., 1995). A more complete account of the impact of labour-market institutions on wages should also consider these distributional trends.

Despite these limitations, methodological, substantive, and theoretical conclusions can be drawn from this study. First, this paper contributes to the methodology of institutional analysis. Recently, comparative researchers have been urged to view institutions dynamically, as changing over time (Janoski et al., 1997). In some cases, however, indexes of formal institutional features neglect changes in informal features, or changes in context which shape institutional effects. Such developments suggest institutional effects may change over time, even when institutions are measured longitudinally (Isaac and Griffin, 1989). We treat this as a problem of parameter estimation, in which the sample data help decide the most likely change-point in institutional effects. In this approach, dynamic processes generate not just a change in the value of institutional variables, but also a change in institutional effects.

From a substantive viewpoint, the general pattern of results indicates a significant transfer of risk in capitalist economies from employers and the state to wage-earners. The emergence of unemployment and inflation effects suggests that living standards are increasingly sensitive to market fluctuations. The declining effect of union density indicates that collective action in the labour market has become less effective for maintaining wages. The political sources of wage growth were also eroded. Only the increase in the bargaining centralization effect provides evidence of resilient collective control over labour-market outcomes. These findings parallel other research. Studies of the US labour market find growing instability of employment and earnings (Bernhardt et al., 1997; Gottschalk and Moffitt, 1994). Moreover, income support in the United States and Europe increasingly ties social benefits to tougher conditions for job searching and training (McFate, 1995). Changes in the process of wage determination thus contribute to a more general trend towards the receding role of social protection and the growing role of markets in the allocation of living standards in the advanced capitalist countries.

Most generally, the analysis also suggests that labour markets are deeply political forums for economic allocation. By this we mean that labour-market outcomes are shaped by the surrounding balance of power between owners and wage-earners. This idea is illustrated most clearly with evidence for institutional effects. More fundamentally perhaps, power relations between owners and workers also

appear to affect the relationships among economic variables. Thus the link between productivity growth and wages is less a necessity of competitive markets and more a contingent fact of the capacity of wage-earners to assert claims on the dividends of technical progress. Similarly, the negative effects of unemployment and inflation on wage growth are also historically variable. The analysis indicates that these effects shifted to the disadvantage of wage-earners when the institutional position of organized labour was weakened. From this perspective, the OECD wage slowdown seems proximately and partly caused by the economics of the slow-growth era, but fundamentally dependent on the declining power of organized labour movements.

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Appendices

Appendix 1: Data Sources

Real Wage Growth: Annual percentage changes in real hourly earnings in manufacturing are mostly taken from OECD (1996), but national sources were used in some cases, owing to missing data. Australian data were supplemented by the weekly award average weekly earnings series for male wage and salary earners (Australian Bureau of Statistics, 1988: 294; 1989: 190; 1992: 203). Austrian data are from the monthly earnings in mining and manufacturing series of OECD (1993). Danish and Swedish wage data were compiled from tables of wages in mining and manufacturing published by the Nordic Council of Ministers and the Nordic Statistical Secretariat (1974: 185; 1983: 239; 1991: 253; 1994: 238). (Swedish data were adjusted to account for the inclusion of overtime and holiday pay in the earliest table.) Finally, the Dutch series was completed with data for the average hourly earnings of male manufacturing sector workers in tables published by the Netherlands Central Bureau of Statistics (1970: 371; 1971: 313; 1975: 305; 1978: 324; 1980: 344). Where national sources were used to complete OECD series, data were smoothed to eliminate discontinuities and overlapping national and OECD series were compared to ensure comparability.

Unemployment: Standardized unemployment rates were used where available. Unstandardized figures based on the number of unemployed as a percentage of the civilian labour force were used for Austria, Denmark, Ireland, and Switzerland. All data come from OECD (1996), except for New Zealand and Switzerland which also use data from Layard *et al.* (1991: 526–29).

Productivity growth: Annual percentage changes in real GDP per person employed are taken from OECD, 1996.

Inflation: Annual percentage changes in the consumer price index are taken from OECD, 1996.

Labour government: To obtain the percentage of cabinet seats held by labour parties, cabinet representation was coded for every quarter. Where there was a change in cabinet representation, the longest-serving cabinet in the quarter was coded. Annual averages were then taken from the quarterly series.

Information about the party composition of cabinets is taken from Woldendorp, Keman, and Budge (1993). These data were updated with tables reported in Koole and Mair (1994).

Bargaining centralization: A four-point scale describing the highest level at which wages are determined:

1. plant-level wage-setting;
2. industry-level wage setting;
3. sectoral wage-setting without sanctions; and
4. sectoral wage-setting with sanctions (i.e. wage bargains include no-strike clauses).

Golden *et al.* (1997) report time-series data for all countries except Ireland and New Zealand. We supplied codes for these two countries, using Hince (1986), Hince and Vranken (1991), and Gunnigle, McMahon, and Fitzgerald (1995).

Union density: The percentage of workers who are union members. The density series is combined from the gross density series of Visser (1992*b*, 1996). Some missing data were interpolated. Discontinuities in the series owing to data discrepancies were smoothed.

Appendix 2: Sensitivity Analysis

Sensitivity of the results to the data and the model assumptions are studied in Table A1. Sensitivity to the data is studied with a type of jackknife that estimates 18 sets of regression coefficients calculated from reduced data-sets with a single country omitted. The main results are robust to this method and nearly all significant coefficients retain their signs in the jackknife analysis.

Because the model is not known with certainty, results are sensitive to the choice of independent variables. We assessed this sensitivity with an 'extreme bounds analysis' (Leamer, 1983). This involved re-estimating the model using all possible subsets of the economic variables. The highest and lowest coefficient estimates form intervals describing model uncertainty (Table A1). The results are robust to changes in the models, and specification uncertainty does not substantively change the inferences reported above.

Table A1. *Cross-validation and extreme bounds sensitivity analyses of real wage growth analysis, 18 OECD countries, 1966–1992*

	Jackknife		Extreme bounds	
Intercept	[−1.00,	0.84]	[−0.36,	3.24]
Unemployment	[−0.16,	−0.05]	[−0.22,	−0.03]
Inflation	[−0.06,	0.02]	[−0.05,	0.04]
Productivity growth	[0.18,	0.32]	[0.26,	0.37]
Bargaining centralization	[0.14,	1.23]	[0.26,	0.98]
Labour government	[0.34,	1.06]	[0.26,	1.01]
Union density	[0.26,	0.61]	[0.18,	0.51]
D(k)	[0.78,	1.33]	[−3.38,	1.10]
D(k) × Unemployment	[−0.22,	−0.13]	[−0.17,	−0.02]
D(k) × Inflation	[−0.27,	−0.21]	[−0.26,	−0.15]
D(k) × Productivity growth	[−0.28,	−0.15]	[−0.36,	−0.18]
D(k) × Bargaining centralization	[−2.25,	−1.09]	[−2.34,	−1.24]
D(k) × Labour government	[−1.38,	−0.51]	[−1.44,	−0.42]
D(k) × Union density	[−0.39,	−0.16]	[−0.46,	−0.14]

Note: Union density main effect and interaction effect have been multiplied by 10

Appendix 3: Bayesian Analysis of the Structural Break

From the Bayesian perspective, the change-point in wage determination is identified by fitting a range of models with break points, $k = 1970, \ldots, 1990$, and calculating their posterior probabilities. The Bayes factors, B_{k0}, express the posterior probability of the change-point models, M_k, as a ratio of the posterior probability of the constant-effects model with no break point, M_0.

With diffuse prior information the log Bayes factor, B_{ij}, can be approximated using quantities from maximum likelihood estimation,

$$\log B_{ij} = I_i - I_j$$

where

$$I_i = 2\pi(p_i/2) + \log |V(\theta)|2 + \lambda_i$$

where p_i is the number of coefficients in M_i, $V(\theta)_i$ is the covariance matrix of the maximum likelihood estimates of the coefficients, θ_i and λ is the maximized log likelihood. Log Bayes factors in Figure 1 were based on this approximation.

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