Explaining the OECD Wage Slowdown: Recession or Labor Decline?

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Abstract

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 labor 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 labor 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% each year. U.S. 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 labor 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, Coe, and Prywes 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 labor 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 labor governments each offer organized labor 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-labor parties (Western 1997; Katz 1993; Baglioni and Crouch 1990; Piven 1991; Huber and Stephens forthcoming). These developments have weakened union influence on labor market outcomes, causing a general slowdown in wage growth.

To investigate these ideas, we analyze newly available data and offer a novel approach to studying institutional change. To analyze 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 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. For instance—in the United Sates, where detailed industry-level data are available—annual growth in hourly manufacturing wages correlates at .96 with wage growth in private sector services, at .95 with wage growth in transportation, and at .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). Because wages are the largest component of household income, wage growth provides an important indicator of 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 1968–1969, European wages climbed by about 5% 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%. Wages rose more slowly in the English-speaking countries. Real earnings grew by about 3% a year in Canada and Britain. U.S. wage growth was sluggish, averaging just under 1.5% a year.

The OPEC oil shock of 1973–1974 opened a new period of poor labor 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, Loveman and Blanchflower 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. Labor demand is reflected in the unemployment rate. Labor supply is measured by productivity growth and inflation.

When labor demand is weak and unemployment is high, wage growth

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	.29
Canada	3.34	1.52	-.11
Denmark	5.75	1.70	1.15
Finland	5.55	1.17	2.19
France	5.06	3.11	.68
Germany	4.56	1.56	2.08
Ireland	6.32	3.77	.83
Italy	5.70	2.41	1.83
Japan	9.05	1.38	1.50
Netherlands	3.70	.94	.70
New Zealand	2.86	-.41	-2.05
Norway	3.79	2.00	1.73
Sweden	4.19	.22	.83
Switzerland	1.74	.67	.87
United Kingdom	3.15	1.01	2.76
United States	1.35	-.49	-.74
Average	4.38	1.45	.85

Source: See Appendix 1.

slows. In competitive labor markets, unemployment restricts wage increases by raising competition among workers for scarce jobs. In unionized labor 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 labor markets (OECD 1997, ch 1; Volgy, Schwarz, and Inwalle 1996; OECD 1994, 3–4; Layard, Nickell, and Jackman 1991, ch. 9).

The quality of the labor 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 labor 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 postwar 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 labor supply is also influenced by inflation. In neoclassical theory, workers supply a quantity of labor in return for a certain real wage. Unexpected inflation causes workers to overestimate the value of their wages and oversupply their labor as a result (Friedman 1968, 7–11). Excess labor 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). Often inflationary expectations are built into union contracts in the form of cost of living adjustments. 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 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 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 labor movements. Two theories describe the impact of organized labor on wages. The first claims that unions use their organizational power to boost wages through collective

bargaining. In the second, centralized unions and labor governments restrain wage growth in return for low unemployment.

Industrial Relations and Labor Government

The positive effect of unions on wages is basic to power resource theories of organized labor (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 work force. 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 labor 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 labor market. The resulting free-rider problem provides individual

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unions with little incentive to restrain 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). Labor 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, Garrett, and Lange 1991; Hicks 1994).

The current focus on institutional features of labor movements may neglect labor militancy as a potential source of wage growth. Although other studies examined the effects of strikes, they focused on the experiences of individual countries (Rubin 1986; Hibbs 1987; Cohn 1993). The utility of strike effects for comparative analysis seems doubtful because real wage growth has been slowest in the Anglo countries where strike activity has been greatest. High wage growth countries like Austria, Germany, and Japan, have very low strike rates (Korpi and Shalev 1979). Comparative analysis of strike effects is also hampered by missing data for some countries.

Labor Decline

Recent research claims that these indicators of labor institutionalization—union density, bargaining centralization, and labor government—play a dif-

ferent role in contemporary labor markets compared to the 1960s and early 1970s (e.g., Streeck 1993; Huber and Stephens forthcoming; Visser 1992a). 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 labor militancy fell sharply (Shalev 1992). In some countries—notably 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 labor 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 likely 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 decline 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, Lange, and Wallerstein 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% 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). In short, 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 has likely declined in the 1980s and 1990s.

In addition to organized labor'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 policy (Huber and Stephens forthcoming). In Scandinavia, Swedish and Norwegian left parties are seen to be "rapidly abandoning social democracy and embrac-

ing 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, 35–38; Huber and Stephens forthcoming; Mjøset, Cappelen, Fagerberg, and Tranøy 1994, 67–70). Outside of 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 labor 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 labor government indicates a broad, but uneven, "deinstitutionalization of labor." In this new institutional context labor movements are less able to pursue to sectional interests in wage growth, or more general interests in wage restraint.

In the institutional approach, the effects of labor supply and demand are shaped by the shift of institutional control away from labor. The negative effect of unemployment on wage growth is likely to become more severe as union aggressiveness in wage bargaining deteriorates. Labor decline has also reduced the 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. Consequently, the positive impact of productivity growth on wages should also decrease in the

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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
Labor Government	−	+	0
Union Density	+	−	0

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 golden age of labor 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 reduces wage growth, perhaps in combination with labor 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 Labor 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 labor 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, Jaeger, and Baker 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. Labor government is measured by the proportion of cabinet seats held by labor, 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 1997). We measure bargaining centralization with a 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. Countries with decentralized firm-level or industry 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

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

	(1)	(2)	(3)	(4)	(5)	(6)
Australia	5.03	.15	1.85	.68	.40	51.25
Austria	2.44	-.03	3.16	.33	.72	64.07
Belgium	6.93	-.06	2.80	.51	.23	70.46
Canada	7.60	-.04	1.28	.11	.67	34.57
Denmark	5.62	-.16	1.43	.78	.43	79.52
Finland	4.40	-.09	3.07	.63	.48	78.24
France	6.13	.00	2.74	.33	.31	18.60
Germany	3.68	.02	2.62	.33	.40	40.37
Ireland	7.79	.04	3.11	.54	.15	59.49
Italy	10.24	-.07	3.84	.77	.18	53.89
Japan	1.96	-.18	4.33	.33	.00	31.08
Netherlands	5.87	-.03	2.09	.63	.18	37.79
New Zealand	3.00	-.10	.90	.62	.34	40.45
Norway	2.53	-.07	2.63	.91	.56	63.34
Sweden	2.45	-.10	1.66	.85	.73	86.62
Switzerland	.51	.02	1.49	.33	.29	33.28
United Kingdom	6.68	-.04	2.01	.33	.35	50.07
United States	6.18	.05	.80	.07	.26	23.22

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

that decentralized but coordinated industrial relations, like the Japanese, 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 (Appendix 2).

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

$$\dot{w}_{it} = b_{0i} + b_1 U_{it} + b_2 \dot{y}_{it} + b_3 \Delta \dot{p}_{it} + b_4 L_{it} + b_5 B_{it} + b_6 D_{it} + e_{it} \qquad (1)$$

where $\dot{w}$ is the annual percentage growth in real manufacturing wages, U

is the unemployment rate, $\dot{y}$ is real productivity growth, $\Delta\dot{p}$ is the annual change in the inflation rate, L is labor 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.

Theories of labor 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 effects 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:

$$
\begin{aligned}
\dot{w}_{it} \;=\;\; & b_{0i} + b_1 U_{it} + b_2 \dot{y}_{it} + b_3 \Delta\dot{p}_{it} + b_4 L_{it} + b_5 C_{it} + b_6 B_{it} + \\
& D(k)_{it} \times (b_7 + b_8 U_{it} + b_9 \dot{y}_{it} + \\
& \qquad b_{10} \Delta\dot{p}_{it} + b_{11} L_{it} + b_{12} C_{it} + b_{13} B_{it}) + e_{it}
\end{aligned}
\tag{2}
$$

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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 labor 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 artifact 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 labor'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 $p < .01$. 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
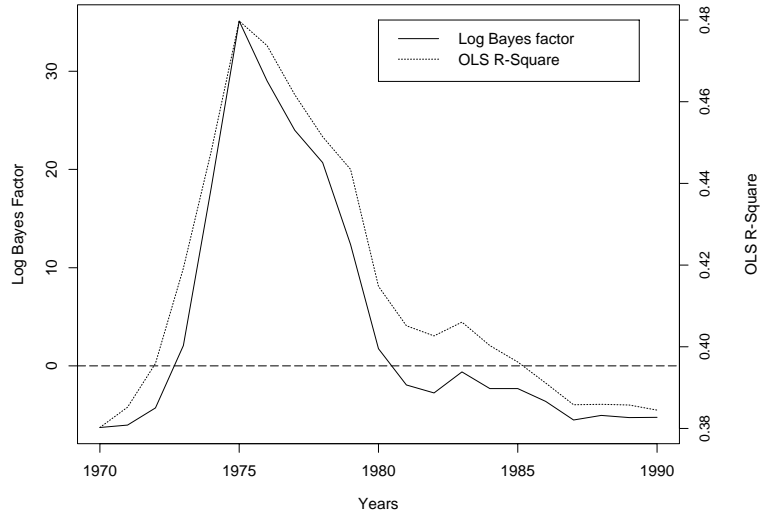
Figure 1. Log Bayes factors and OLS R^2 statistics from a model of a structural break in the determinants of real growth.

from 1975 to 1992 compared to 1966–1974. The constant-effects model assumes the wage slowdown results only from changes in the independent variables. On this assumption, 60% 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% 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 sizable unexplained variation.

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

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

	Model		
	(1)	(2)	(3)
Model Description	M	$M + P$	$M + P + I$
Number of coefficients	24	25	31
R^2	.37	.45	.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 (2) and (3) to the baseline model (1).
[a] Percentage of the decline in the average rate of wage growth between 1966–1974 and 1975–1992 explained by the model.

99% 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 labor demand 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 were 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% annually in Italy, Germany, and France before 1975, contributing more than point to real wage growth. U.S. productivity growth averaged four-fifths of a percentage point before the oil shock, generating less than one-quarter of a point in wage growth.

While market effects are generally weak, labor movements strongly influenced wages before 1975. Contrary to theory, wages grew faster in countries with centralized bargaining and labor governments. The positive effect of labor government is large and significant at conventional levels. These estimates weaken the claim that centralized representation of labor movements cultivated a general interest in wage restraint. One possible interpretation places these results in historical perspective. In the late 1960s and early 1970s, labor governments supported their working class electorates by maintaining wage standards. During this time, labor parties backed central union wage policies for low-pay workers. Social democrats also intervened less in industrial relations compared to conservatives who more commonly preempted 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-pay workers and general support for wage standards may partly explain the positive wage effects of labor government. (Following other research [Alvarez et al. 1991; Hicks 1994], we also experimented with interactions between bargaining level and labor government, but these were not significant). Supporting the power resources theory of union wage effects, wages also grew faster in coun-

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

	Main Effects	Period Interactions	Post-1975 Net Effects
	(1)	(2)	(1) + (2)
Intercept	-.23	1.10	.87
	(.19)	(1.73)	(.91)
Unemployment	-.08	-.17	-.26
	(.80)	(1.88)	(5.40)
Inflation	-.01	-.25	-.25
	(.12)	(3.15)	(4.72)
Productivity Growth	.28	-.25	.03
	(4.24)	(2.69)	(.42)
Bargaining Centralization	.68	-1.64	-.96
	(1.17)	(2.38)	(1.90)
Labor Government	.80	-1.06	-.26
	(1.94)	(2.13)	(.86)
Union Density	.40	-.26	.13
	(1.99)	(2.14)	(.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 $V(b_M) + V(b_I) + 2cov(b_M, b_I)$.

tries 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% of the time. After 1975, positive wage growth accompanied productivity increases just 60% of the time. This suggests that workers and their representatives less successfully asserted 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 labor 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 labor and social democratic government. Again, this result contradicts historical evidence that labor movements were increasingly unable to pursue general interests in wage restraint in the 1980s and 1990s. Still, similar to 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. Although unions in several cases maintained their organizational strength, this suggests 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 wages increases obtained by unionized workers. These results are consistent with U.S. studies show 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, nonlinearities 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 labor 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 labor 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 labor 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 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.

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 labor 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 labor market outcomes. These findings parallel other research. Studies of the U.S. labor market find growing instability of employment and earnings (Bernhardt, Morris, Handcock and Scott 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 contributes to a more general trend to 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 labor markets are deeply political forums for economic allocation. By this we mean that labor 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, the 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, shifting to the disadvantage of wage-earners, when the institutional position of organized labor movements is 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 labor movements.

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 have been used in some cases, owing to missing data. Australian data have been 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 have been 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, p. 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 have been used where available. Unstandardized figures based on the number of unemployed as a percentage of the civilian labor force have been 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).

Labor Government   To obtain the percentage of cabinet seats held by labor 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 take 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 or 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 combines from the gross density series of Visser (1992b, 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 A.1. 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 A.1). The results are robust to changes in the models, and specification uncertainty does not substantively change the inferences reported above.

Table A.1. Cross-validation and extreme bounds sensitivity analyses of real wage growth analysis, 18 OECD countries, 1966–1992.

	Jackknife	Extreme Bounds
Intercept	[-1.00, .84]	[-.36, 3.24]
Unemployment	[-.16, -.05]	[-.22, -.03]
Inflation	[-.06, .02]	[-.05, .04]
Productivity Growth	[.18, .32]	[.26, .37]
Bargaining Centralization	[.14, 1.23]	[.26, .98]
Labor Government	[.34, 1.06]	[.26, 1.01]
Union Density	[.26, .61]	[.18, .51]
$D(k)$	[.78, 1.33]	[-3.38, 1.10]
$D(k) \times$Unemployment	[-.22, -.13]	[-.17, -.02]
$D(k) \times$Inflation	[-.27, -.21]	[-.26, -.15]
$D(k) \times$Productivity growth	[-.28, -.15]	[-.36, -.18]
$D(k) \times$Bargaining Centralization	[-2.25, -1.09]	[-2.34, -1.24]
$D(k) \times$Labor Government	[-1.38, -.51]	[-1.44, -.42]
$D(k) \times$Union Density	[-.39, -.16]	[-.46, -.14]

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

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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

$$I_i = 2\pi(p_i/2) + \log |V(\hat{\theta})|/2 + \ell_i$$

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

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