MICROECONOMIC CHANGES AND MACROECONOMIC WAGE DISINFLATION IN THE 1980s

James H. Chan-Lee, David T. Coe and Menahem Prywes

CONTENTS

The authors are members of the General Economics Division of the Economics and Statistics Department. **They wish to thank Jeffrey Shafer, Axel Mittelstädt and their colleagues in the Country Studies Branch of the Economics and Statistics Department.**

INTRODUCTION

The past six years have seen the most sustained period of wage and price disinflation since the Korean War. Unlike developments after the first oil price shock, when wage growth contributed to high inflation, nominal wage moderation has been an important factor behind the disinflation of the **1980s** (Chart A): average nominal pay increases in the seven largest OECD economies accelerated to 10½ per cent immediately after the second oil price shock but dropped to below 4 per cent by **1986.**

A number of factors contributed to rapid wage disinflation. The overall stance of macroeconomic, particularly monetary, policies did not accommodate the second large oil price increase. Unemployment rates rose sharply and oil and non-oil commodity prices fell. In addition, there was renewed emphasis on enhancing supply-side flexibility and structural adjustment through microeconomic policies. These policies were advocated partly for the support they could offer to the anti-inflationary stance of macroeconomic policy.

These developments suggest a number of questions about microeconomic policy changes and aggregate wage behaviour: *i)* What have been the important changes since **1980** in government microeconomic and regulatory policies affecting the labour market, or in wage setting practices; and *ii)* How have these changes affected aggregate wage developments or the response of wages to economic events? These are the questions addressed in this paper.

The paper is organised as follows: Section I presents a cross-country survey of changes in labour market regulatory policies and wage bargaining arrangements. The number of new developments in these areas has been impressive and has generally been consistent with the goal of enhancing the flexibility of labour markets; but for any single country most of the changes have been relatively modest and comparatively recent. In a number of important areas, however, such as increases in social-security costs and the generosity of unemployment insurance systems and minimum wages, trends established in the **1960s** and **1970s** appear to have been decisively halted, or even reversed. Section II discusses how these microeconomic or institutional changes might affect aggregate wage developments and assesses the quantitative significance of these changes in the context of empirically-estimated wage equations for thirteen OECD economies. There is some evidence that

CHART A

WAGE GROWTH, INFLATION AND UNEMPLOYMENT

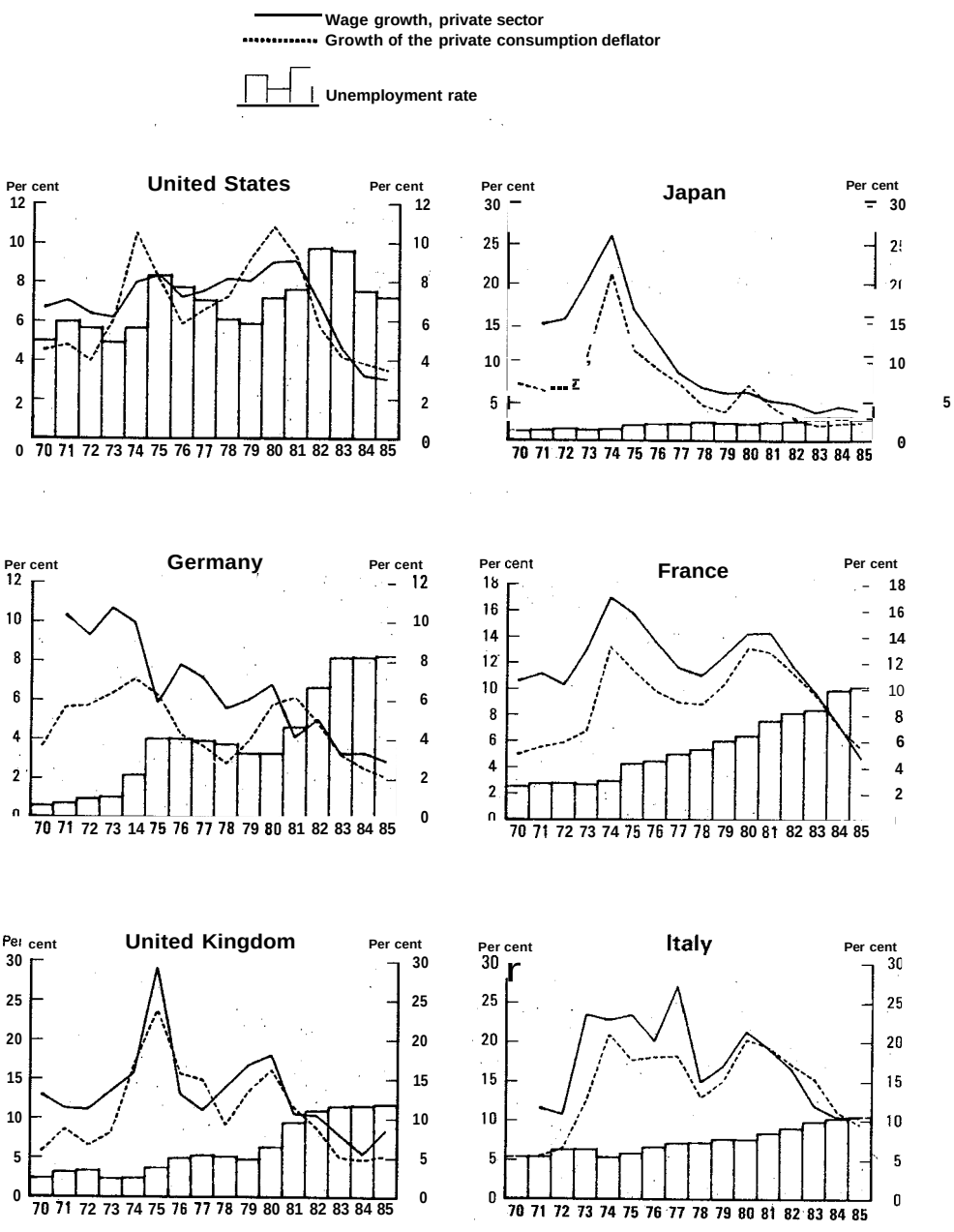
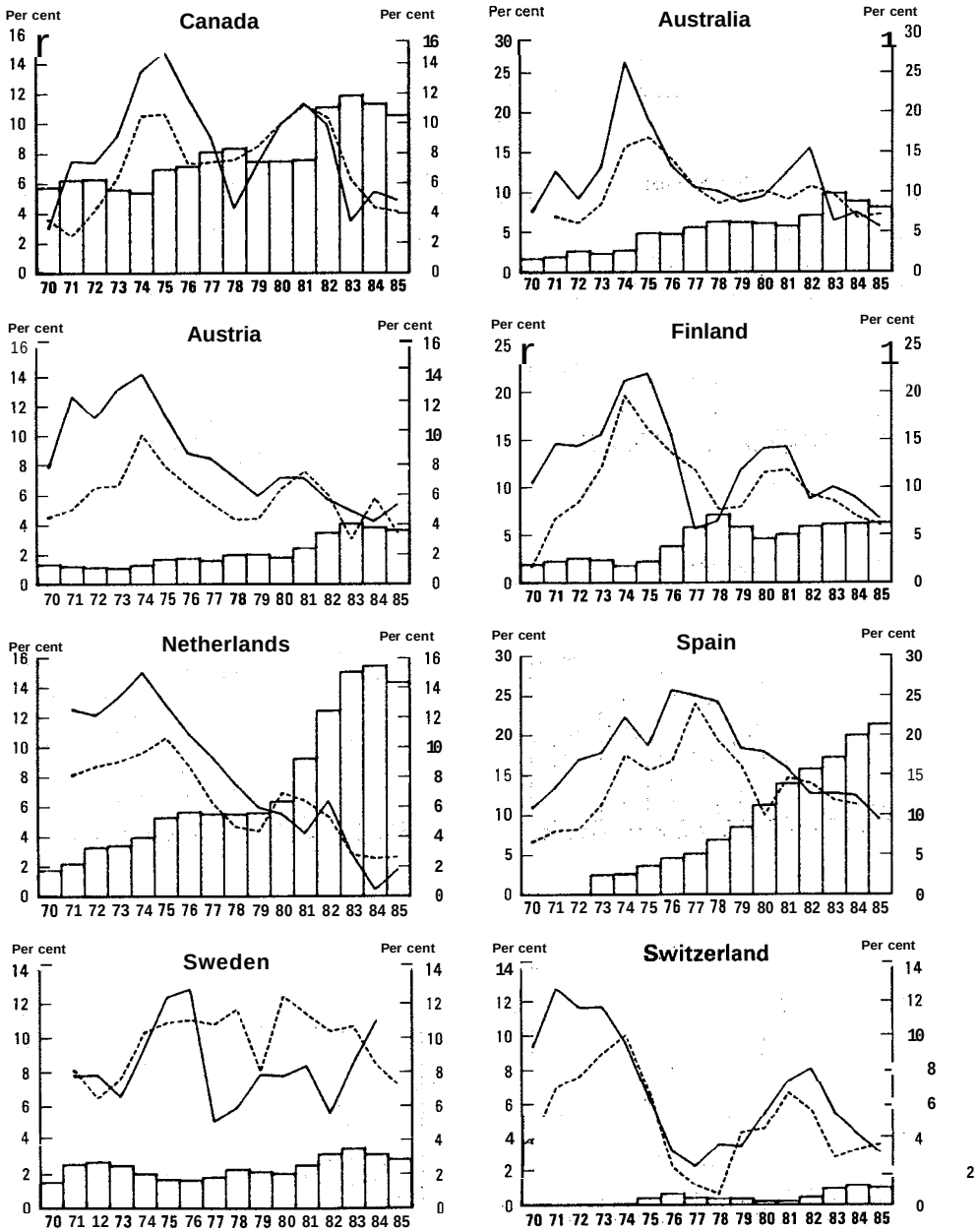


CHART A (continued)

WAGE GROWTH, INFLATION AND UNEMPLOYMENT



government microeconomic policy changes have affected aggregate wage developments; but formal tests indicate that there is little or no statistical evidence to suggest that there has been a change in the way that wages respond to economic events. These results have policy implications which are discussed in the final section.

I. MICROECONOMIC POLICIES AND INSTITUTIONAL CHANGES AFFECTING THE LABOUR MARKET

This section presents a survey of post-1980 changes in government microeconomic policies relevant to the labour market and of changes in wage-setting practices which may have been affected by changes in government policies or regulations, or may have been a reflection of broader macroeconomic developments. Most of the material presented in this section is based on individual OECD Country Surveys published since 1980, many of which have included special chapters on the labour market'.

A. Changes in government microeconomic policies related to social protection

For most OECD countries, the 1980s have witnessed a halt or reversal of the trend in many government policies towards increased labour or social protection – which is taken here to include unemployment insurance, minimum wages, health and safety standards, job security, redundancy pay, hiring and firing rules, union rights and other aspects of the social safety network that impose constraints or alter incentives in labour markets (Table 1). To a large extent this development has reflected concern that the efficient functioning of labour markets may have been impaired by regulations and policies directed towards alleviating specific problems, but that were based on too narrow a view of the economic and social effects.

1. Unemployment insurance replacement ratios

Unemployment insurance replacement ratios – unemployment benefits as a proportion of the average wage – have been reduced in a majority of OECD countries since 1980. Stricter eligibility conditions have also been applied virtually everywhere and the right to refuse lower-skilled jobs has been reduced in some countries (e.g. the United States and Germany). A number of governments have increased work incentives by widening the wedge between compensation for activity and non-activity in other ways – by, for example, taxing unemployment benefits. At the

Table 1. Summary of statutory and institutional changes in the 1980s

	Unemployment insurance replacement ratios[a]	Minimum wages[a]	Public sectc pay[a]	Industrial relations		Indexation procedures	Non-wage labour costs
				Strike rights	Dismissals and redundancies		
United States	low falling	low falling	high stable			weak failing	low stable
Japan	average falling	not relevant[b]	high falling				low rising
Germany	high falling	no legal minimum	high falling	ıore ıstrictive			average stable
France	high stable	high stable	falling		easier	strong falling	high rising
United Kingdom	average falling	not relevant[c]	average stable	ıore ıstrictive			low falling
Italy	stable	no legal minimum	average stable			strong falling	high stable
Canada	high falling	low falling	high falling			weak falling	low stable
Australia	low rising	set by wage tribunal	average stable		more costly	strong	low rising
Belgium	high falling	lower rate for youth				strong temporary reduction	average stable
Denmark	high falling	no legal minimum	high falling			strong abolished	
Netherlands	high falling	high falling	falling			strong suspended	average stable
Norway	high stable	no legal minimum	average stable				average stable
Spain	high falling	average falling	high falling		easier	strong falling	
Sweden	high rising	no legal minimum	falling				high stable

a) Relative to the wage of average production workers.
b) Minimum wage is well below the market wage.
c) Applies to a small proportion of the work force covered by Wage Council agreements; lower minimum rates exist for youth.
Note: Blanks indicate no available information or stability. Indicated levels (low. average or high) refer to country experience relative to the group Of countries surveyed

same time, supplementary or extended benefits for specific groups, especially for older workers, have become increasingly common as initial benefits have been exhausted with long duration Unemployment (e.g. the United States, Germany, France, the Netherlands and Switzerland).

One perspective on the changes that have occurred in this area is given by Table 2, which presents hypothetical *microeconomic replacement ratios* drawn from

Table 2. Microeconomic unemployment insurance replacement ratios[a]

Per cent

	A. HYPOTHETICAL For a hypothetical married unemployed worker who earned the average wage, with two children and a non-working spouse: for the first year of unemployment							
			1980[d]			1982 to 1983[f]		
	1974[b]	1978[c]	Non-working spouse	Working spouse	1981[e]	For an unemployed worker whose salary is:		
						Average	Two-thirds average	Twice average
United States	60				48			
Germany	68	88	66-56	85	65	70-72	100	53
France	64	86-97	82-98	92-99		72-71	89	57
United Kingdom	61	85	80	99	58	74-76	87	44
Italy						90-80	..	
Canada	81		63	81	70			
Australia	..				55			
Belgium	..					80-82	..	
Denmark	..					97-93	..	
Ireland	..		..	..		90-80	..	
Netherlands	..					88-82	..	
Sweden	..		92-40	96		..	..	..

	B. ACTUAL REPLACEMENT RATIOS[g]					
	1968	1975	1978	1980	1982	1983
United States				39		
United Kingdom	87	75	79	73	60	60

a) These estimates are of net replacement ratios (except for columns 3 and 4. The numerator is unemployment insurance benefits plus family allowances plus other social transfers minus taxes. The denominator is the average income plus social transfers minus taxes minus social security contributions.

b) From OECD (1979)

c) From OECD (1982) These figures are for the first six months of unemployment and are not strictly replacement, but income maintenance ratios, i.e. the average annual income of unemployed workers over the average income of similar employed workers, all net of taxes Income maintenance ratios tend to be greater than replacement ratios because workers may not be unemployed for an entire year

d) From Centre d'Etudes des Revenus et des Coûts (1982). When two numbers are shown they represent different insurance systems Sweden and Germany have insurance and public assistance systems; coverage by insurance is the most common The figures for France are for workers unemployed for reasons specific to them (70 per cent) and for economic reasons (30 per cent)

e) From OECD (1984). The U.S. figure is for Michigan, the Canadian figure is for Ontario.

f) From La Commission des Communautés Européennes (1986). The first figure under average salary is after one month of unemployment (July 1982); the second is after thirteen months of unemployment (July 1983). The Italian figures are for the industrial sector only

g) U.S. estimates are from Vroman (1980). The U.K. estimates are from Dilnot and Morris (1983). Both studies are based on individuals' actual incomes

Table 3. Macroeconomic unemployment insurance replacement ratios[a]

Per cent

	United States	Japan	Germany	France[b]	United Kingdom[c]	Italy	Canada	Australia[d]	Belgium	Denmark	Nether-lands	Norway	Spain[d]	Sweden	Switzer-land[b]
1960	13	22	38	41	25	4	29			31		23		47	
1961	15	26	41	49	25	6	29			27		25		40	
1962	13	39	62	60	26	6	29			29		22		37	
1963	11	47	83	84	32	7	29			26		24		33	
1964	11	46	61	78	27	7	29		53	37		19		32	
1965	10	46	58	63	28	8	31		53	36		19		38	
1966	9	41	41	67	27	6	37		45	41		19		32	
1967	10	38	42	50	36	5	39		44	54	55	17		41	
1968	9	37	45	44	35	5	40		38	58	60	15		41	
1969	9	36	70	50	32	5	43		38	59	75	18		41	
1970	11	39	89	39	31	4	40		37	59	95	17		34	
1971	12	42	84	32	32	7	43		43	64	71	20		27	
1972	12	38	71	29	34	5	60		48	68	57	20		33	
1973	9	38	60	30	28	5	63		46	71	51	18	28	32	
1974	11	40	46	28	32	8	60		46	65	53	13	34	40	
1975	17	36	48	28	27	9	54		53	67	41	14	43	35	86
1976	15	29	38	29	27	8	49		46	65	42	21	34	41	98
1977	11	29	31	29	27	6	43	27	47	62	40	20	35	49	84
1978	8	28	35	30	24	7	43	25	46	63	39	21	33	50	60
1979	8	27	40	34	21	8	41	24	46	62	46	24	34	52	59
1980	10	29	40	35	22	7	41	23	44	60	49	31	37	51	51
1981	8	28	42	37	20	9	37	26	45	60	46	31	36	50	61
1982	9	28	37	39	24	10	36	33	40	59	43	31	28	50	80
1983	9	24	30	40	19	10	36	28		56	34	33	21	57	72
1984	7	24	26	36	18	10	38	29		54	32	32	18	53	55

a) Unemployment insurance replacement ratio = (standard national accounts unemployment compensation payments / number of unemployed) divided by (compensation in manufacturing / number of production workers in manufacturing). Unlike the estimates in Table 2, these figures exclude other social transfers and are not adjusted for tax.

b) Unemployed do not include early retirees.

c) Does not include supplementary benefits received by the unemployed which are a part of the general U.K. welfare system.

d) These ratios were calculated using total economy average compensation instead of that for production workers in manufacturing. They are therefore higher than ratios calculated with compensation of production workers because pay in manufacturing is higher.

a variety of published sources[2]. These are for an unemployed, married worker earning the average wage, with two children and a non-working spouse; the replacement ratios are for the end of one year of unemployment and tend to drop over time, especially in the United States where coverage periods are much shorter. A comparison between the final three columns of Table 2 underlines the sensitivity of replacement ratios to past wage levels; and the importance of family status and tax reductions on the spouse's income are shown in columns 3 and 4. For those countries where data are available, these show a tendency for hypothetical replacement ratios to rise in the 1970s and fall in the 1980s. The second panel of Table 2 gives estimates of actual micro replacement ratios calculated from data on individuals' income for the United States and the United Kingdom. Of the countries for which data are available, micro replacement ratios are lowest in the United States and Australia and highest in Denmark, Italy, Ireland and the Netherlands.

A second perspective is given by Table 3, which presents ***macroeconomic unemployment insurance replacement ratios*** (unemployment compensation per unemployed person relative to manufacturing compensation per employee). Although there are important conceptual and statistical problems, macro replacement ratios give a broad indication of the relative "generosity" of unemployment insurance schemes. Macro replacement ratios are substantially lower than comparable micro ratios due to work-eligibility requirements, limited benefit periods, the exclusion of other social transfers (such as family allowances) and the influence of the tax system[3]. With the exception of Italy, Norway and Sweden, this indicator shows sharp declines from earlier peaks. For most countries macro replacement ratios have been stable or declining since 1980[4]. These general trends – high and rising in the late 1960s and early 1970s, falling in the 1980s – are consistent with the micro replacement ratios reported in Table 2.

2. *Minimum wages*

In the 1980s, minimum wages were frozen in nominal or reduced in real terms in the United States (Federal minimum wages), Canada (for Ontario and Quebec), the Netherlands and Spain (Table 4). Lower minimum wages for youth became more common in Europe: the Netherlands reduced nominal minimum wages for workers under 23 by 10 per cent in 1983; Greece cut its minimum wage for apprentices in 1984; Belgium reduced its minimum wage for workers under 21 in 1978; the United Kingdom recently removed workers under 21 from the jurisdiction of its wage councils which set minimum wages for about 11 per cent of workers.

A few countries increased minimum wages in real terms following changes in government. In France real minimum wages increased by about 20 per cent relative

Table **4. Minimum wages**

	1965	1970	1975	1980	1981	1982	1983	1984	1985	1986
United States										
$ per hour	1.25	1.60	2.10	3.10	3.35	3.35	3.35	3.35	3.35	3.35
Relative wage[a]	38.57	36.79	32.51	30.85	30.40	28.02	27.18	26.24	24.98	
Real minimum wage[b]	3.04	3.23	3.07	3.10	3.07	2.90	2.79	2.68	2.59	2.54
France										
FF per hour	1.98	3.42	7.27	13.80	16.30	19.18	21.50	23.53	25.44	26.52
Relative wage[a]	31.81	35.76	36.34	35.69	36.42	36.33	36.30	36.52	37.30	
Real minimum wage[b]	6.09	8.38	11.84	13.80	14.45	15.28	15.65	15.97	16.37	16.69
Canada										
C$ per hour[c]	0.94	1.44	2.48	3.26	3.52	3.70	3.70	3.91	..	..
Relative wage[a]	38.04	40.48	41.46	32.63	30.37	28.94	26.97	28.07	..	..
Real minimum wage[b]	2.35	2.96	3.67	3.26	3.17	3.02	2.84	2.87	..	..
Netherlands										
Gld per year			18 694[d]	23756	24535	25805	26 420	25 669	25641	25641
Relative wage[a]			72.60[d]	70.91	70.10	71.68	69.53	65.82	64.10	62.54
Real minimum wage[b]			25 177	23756	23066	23042	22 954	21 754	21 173	21 173
Spain										
Ptas per month	1 800	3 465	7988	21 933	24907	28440	32 160	34 740	37170	40140
Relative wage[a]	40.04	42.82	43.44	42.50	41.72	41.89	41.60	40.92	40.01	
Real minimum wage[b]	9 730	14 230	18534	21 933	21 649	21 641	21 786	21 196	20849	20752

a) Minimum wage as a proportion of the average wage in manufacturing (per cent).
b) Minimum wage relative to the private consumption deflator (1980 = 1.0).
c) Weighted average of minimum wages in Ontario and Quebec.
d) 1976.
Source: OECD, *Main Economic Indicators* and national statistical bulletins.

to consumer prices from **1981** to **1986;** and real minimum wages in Greece increased substantially between **1980** and **1985.** In Germany, Italy, Norway and Sweden there are no legal minimum wages. In Japan, Portugal, Finland and New Zealand, minimum wages are set *so* low as to have no practical effect.

3. *Non-wage labour costs*

Non-wage labour costs (NWLCs) – which refer to employers' contributions for social security and pensions but do not include holiday or annual leave, sick pay, etc. – are a significant component of total labour costs in most OECD countries, with the actual proportion ranging up to 40 per cent of the wage bill. The importance of NWLCs grew rapidly during the **1960s** and **1970s** in most OECD countries with the expansion of health and pension schemes and higher unemployment (Klau and Mittelstadt, **1986).** Since **1980,** the increase has been halted in most countries and NWLCs as a proportion of the total wage bill have been relatively constant (Table **5).**

In countries where NWLCs are very high, there have recently been modest attempts to alleviate financing burdens on employers. In Italy, employers' total social-security contributions were reduced in **1980.** In France, efforts to stabilize and spread social-security costs more evenly have included the removal of ceilings and a temporary **1** per cent tax on household income in **1983.** Greater variation in

Table 5. Non-wage labour costs as a percentage of wages and salaries, total economy

	1960	1965	1970	1975	1980	1981	1982	1983	1984	1985[a]	1986[a]
United States	8.7	9.9	12.1	16.5	19.4	19.7	20.2	20.5	20.6	20.5	20.6
Japan	..	7.9	9.0	9.9	12.4	13.9	14.1	14.5	14.6	14.7	14.7
Germany	15.9	15.3	17.1	20.9	22.4	22.7	22.8	23.4	24.0	24.2	24.0
France	..	31.1	31.9	34.2	37.4	37.3	38.4	39.6	39.9	40.9	41.3
United Kingdom	7.4	8.7	10.1	13.5	15.2	16.0	15.8	16.0	15.5	15.0	14.8
Italy	35.2	33.7	38.5	39.6	35.3	34.6	35.5	38.0	38.3	38.2	38.7
Canada	..	7.6	8.6	9.6	10.4	11.0	11.3	11.8	11.8	11.8	11.9
Australia	..	3.4	3.5	5.0	5.8	6.1	6.7	7.2	7.7	8.0	8.0
Belgium		..	15.3	16.7	16.0	15.5	14.6	15.3	15.8	..	
Finland	11.1	14.3	16.1	20.3	22.8	22.5	22.1	21.1	21.3	22.5	..
Netherlands		..	20.6	24.3	25.2	25.2	24.8	26.5	26.4	26.2	26.4
Norway			..	17.5	17.2	17.3	17.3	17.0	17.0	..	
Portugal	9.1	10.4	12.3	15.5	16.8	17.3	18.6	20.2	20.4	20.8	..
Sweden	..	11.5	15.1	24.5	37.2	38.7	38.4	38.0	37.6	..	
Switzerland	11.5	11.5	12.2	13.8	14.7	14.5	14.7	14.9	15.0	..	

a) Estimates
Source OECD, *National Accounts* and OECD estimates

rates has also been introduced by waiving charges for target groups (youth and part-time workers) or restructuring rates to remove the bias against hiring of the low paid. Belgium recently reduced social-security contribution rates for youth, initial hirings and job sharing. In the United Kingdom, the 1985 budget restructured social-security contribution rates in an attempt to stimulate demand for low-paid labour, while maintaining revenue neutrality. This was achieved by lowering rates for the low paid and abolishing ceilings on contributions.

B. Changes in other government microecsnomic policies

1. Industrial relations and employment legislation

Although there have been few major changes in industrial relations legislation in recent years, there has been a clear tendency, in many countries, to a stricter interpretation of existing strike legislation and union certification rights. In the United Kingdom the Industrial Relations Act (1980-84) introduced secret ballots for the election of officials and for strike action, introduced more restrictive voting requirements for closed shops, and banned secondary picketing in industrial disputes. In Germany, there has been legislation suspending unemployment insurance benefits for workers rendered redundant through strike action in other industries. This legislation, if upheld by the courts, would reduce the advantages of selective strikes as a way of reducing the financial costs of industrial actions to workers and unions.

In some European countries (e.g. France and Spain) the scope and coverage of employment security legislation has been reduced by easing hiring and firing and redundancy requirements. A fairly widespread trend has been the easing of legal requirements for hiring of new workers into relatively unprotected jobs (e.g. Germany and France, see OECD *Employment Outlook,* 1985).

2. Public sector pay

Almost all OECD countries introduced public sector pay restraint over the past several years. Pay freezes (the United States and New Zealand) or reduced indexation coverage (France, Italy, Belgium, Denmark and the Netherlands) have been common. In a substantial number of countries, public sector pay increases were held systematically below those in the private sector (Japan, Germany, the United Kingdom, Austria, Denmark, Ireland, Greece, Spain and Sweden). In the Netherlands public sector wages were even cut in nominal terms (by 3 per cent in 1984).

Public sector pay restraint encountered strong organised resistance, partly because in many countries public sector employees are more highly unionised than in the private sector, and may exercise substantial political influence as well. However, governments have shown increasing resolve to sit out bitter or prolonged strikes such as those in the Netherlands, Denmark, Belgium and Finland in **1984-85,** the **1985** coal-miners' strike in the United Kingdom, and the **1986-87** transport workers strike in France. In one of the more dramatic cases, the United States Federal government reacted to the illegal air controllers' strike in **1981** by dissolving the union. In some countries, governments reinforced public sector wage restraint through the introduction of cash limits (the United Kingdom) or cuts in government employment (the United States, the United Kingdom and Canada). In some countries the squeeze on professionals in the public sector may have reached the point where further compression would hamper recruitment and retention. Indeed, high-level U.K. civil servants received very large increases (often over 50 per cent) in **1986,** a year in which average public sector pay increases may be comparable with those in the private sector. In Germany public sector wage settlement in **1986** may match those in the private sector following three years of below-average increases; Finnish and Swedish public sector settlements in **1986** may also exceed those in the private sector.

3. Competition and incomes policies

Wage behaviour can be influenced by a number of forces, including competition on goods markets or through government involvement in the setting of wages and prices. As discussed below, wage concessions in some high-wage industries in the United States were a direct consequence of deregulation of the transportation industry or increased foreign competition. There has been widespread deregulation of financial markets and privatisation of the telecommunications industry; but there also appears to have been a notable trend in the **1980s** towards restricting foreign competition in goods markets. This is apparent in the rapidly growing proportion of foreign trade subject to quota restrictions, voluntary export restraints and non-tariff barriers (OECD, **1985,** *Costs and benefits of protection).*

Apart from Austria and the Nordic countries, and more recently France, Spain and Australia, prices and incomes policies fell out of favour in the **1980s.** This reflected the perceived failure of incomes policies in the **1970s** to restrain inflation except for very short periods without distorting relative prices and/or wages. Prices and incomes policies thus played a comparatively minor role in the **1980s.** Instead governments have attempted to deregulate labour markets and encourage a closer link between pay and the financial circumstances of individual firms or industries

thereby weakening wage emulation and widening wage differentials. Exceptions to this trend have been France and Spain, where incomes policies were adopted within a framework of ex ante indexation based on inflation targets; and Australia, where a wage accord was established in 1983.

C. Changes in indexation procedures and wage setting practices

1. Changes in indexation procedures

Formal or informal wage indexation plays a critical role in wage determination in all countries. Possibly the most important change in wage setting practices in the past five to seven years in Europe has been a weakening of formal indexation provisions. The 1980s have been characterised by a trend towards de-indexation in countries with formal or strong indexation links (Belgium-Luxembourg, France, Denmark, Greece, Iceland, Italy, the Netherlands and Spain; Belgium-Luxembourg subsequently reintroduced indexation). There has also been a slight tendency to prolong the indexation adjustment period (Italy, Belgium and Switzerland). Even in countries where formal indexation is unimportant, *de facto* indexation has weakened. In Germany, for example, the 1981-82 wage rounds resulted in contractual wage increases below the going rate of inflation.

In the United States, the cost of living adjustment (COLA) component of union wage contracts has declined. The unionised sector placed high priority on COLAs in wage negotiations in the 1970s. a period of rapid inflation. The proportion of workers covered by COLAs under collective agreements rose from 25 to over 60 per cent from 1970 to 1977. By 1983, the proportion had dropped to about 55 per cent. These developments have not been a particularly unusual response to falling inflation since the proportion of workers covered by COLAs in the United States has tended to be positively related to the level of inflation. In Canada, the proportion of workers covered by COLAs has dropped from 35 per cent in the late 1970s to below 20 per cent in 1986.

2. Innovations in U.S. contract bargaining

The most striking change in pay arrangements in OECD countries has been the wave of concessions made by U.S. unions since 1981, often taking the form of freezes on base wages or pay cuts. Wage concessions are not unusual in the United States – nominal wages in manufacturing fell in 1955 and again in 1959; what is unusual is the prolonged nature of concessions after the cyclical trough and the large number of workers affected[5]. Other exceptional features of recent U.S. bargaining have been the adoption of two-level pay schemes in some industries whereby new

employees are paid less than established workers (e.g. airlines and supermarkets); and the breakdown of uniform industry pay levels, with settlements varying with the financial situation of the firm or individual plant (e.g. automobiles, rubber and steel).

Concession bargaining in the United States may have represented a normal reaction to high and increasing levels of unemployment. To some extent these wage concessions may also have reflected a competitive reaction to the steady widening of wage differentials in the 1970s between high- and low-pay industries[6]. Wage concessions have been concentrated in high-wage, highly-unionised sectors such as automobiles, steel, equipment manufacturing and food processing; or in industries affected by deregulation such as airlines, trucking and other transportation.

II. HOW HAVE THESE MICROECONOMIC AND INSTITUTIONAL CHANGES AFFECTED WAGE DEVELOPMENTS AT THE MACROECONOMIC LEVEL?

The first part of this section discusses, in the context of the inflation expectations-augmented Phillips curves, how the microeconomic and institutional changes discussed in the previous section might affect wages. Estimates of aggregate wage equations are presented and some tests for direct impacts of microeconomic and institutional changes are discussed. The second part of the section looks for indirect evidence in the residuals of the estimated equations and presents the results of formal stability tests.

A. Microeconomic changes and aggregate wage equations

1. How would the microeconomic and institutional changes affect wage developments?

The Phillips curve is often represented graphically as a negative short-run relationship between wage growth and unemployment, for a given level of inflation expectations and other determinants of wage growth. If the unemployment rate is above the natural rate, there are disinflationary pressures in the labour market and, as these are incorporated into inflation expectations, the short-run Phillips curves shift downward; and ***vice versa*** for unemployment rates below the natural rate. Thus, the long-run equilibrium Phillips curve is commonly thought to be vertical at the natural rate of unemployment, indicating that there is no durable trade-off

between unemployment and inflation. In the context of this "model" of how the labour market functions, the microeconomic and institutional changes discussed in Section I can affect wage developments in one of three ways:

i) By affecting the responsiveness of wages to economic developments, i.e. by changing the estimated parameters, including perhaps the slope of the short-run Phillips curve;

ii) By affecting important determinants of wage growth such as unemployment, expected inflation, productivity growth, etc., i.e. there may be a movement along a short-run Phillips curve (in the case of changes in unemployment) or shifts in the short-run Phillips curves for changes in the other determinants of wage growth;

iii) By affecting the natural rate of unemployment.

A weakening of indexation provisions, for example, suggests a reduction in the rapidity with which changes in inflation get reflected in wages, i.e. the short-run Phillips curve may have shifted down less rapidly as inflation declined in the early-1980s. Reductions in labour power, perhaps influenced by industrial relations legislation or its enforcement, might have increased the sensitivity of wages to labour market conditions, i.e. the slope of the short-run Phillips curve may have steepened, implying a greater decline in wage growth for a given increase in the unemployment rate.

More generally, it has been argued that the widespread adoption of non-accommodating policies after the second oil price increase, in some countries supported by public sector pay restraint, etc., represented a change in policy regime which might itself have changed the structure of macroeconomic wage determination relationships (Lucas, **1976** and Sims, **1982).**

Microeconomic and institutional changes may also have affected the natural rate of unemployment. As defined by Friedman **(1968),** the natural rate is a general equilibrium concept reflecting all the structural characteristics of labour and commodity markets. Changes in policies related to social protection, by affecting the reservation wage, would be expected to change the natural rate. Similarly, the system of industrial relations, competition policies, labour power, etc., are all structural features of the economy which may affect the level of the natural rate. As shown in the Appendix, the specification of the aggregate wage equations discussed below implicitly assumes a natural rate which, together with trend productivity growth, is subsumed in the constant term. Changes in the natural rate should, therefore, be reflected in shifts in the estimated constant term.

Aside from possible effects on the natural rate, some of the structural and institutional changes discussed in Section I may affect nominal wage growth only

indirectly. Changes in employers' social-security contributions, for example, will have an indirect impact on wage developments as they alter costs and prices. Similarly, deregulation of specific industries may affect aggregate wage developments via the effects of increased competition on prices.

Labour market changes such as concession bargaining in the United States may themselves have been a reflection of high rates of unemployment. That is, concession bargaining might have been a normal, albeit highly publicised, example of wage inflation falling because of high rates of unemployment. In this case, the specification of the estimated wage equations already allows for any impact from concession bargaining. By the same token, weakening labour power in Europe, the growing trend to decentralised bargaining and the emphasis on linking wages to ability to pay may be related to postwar high unemployment, rather than representing a change in the wage adjustment process.

2. *Estimates of aggregate wage equations*

Estimates of aggregate nominal wage equations for 13 countries are reported in Table 6. The equation specifications are similar to those previously reported in Coe (1985)[7]. The equations, which are estimated by two-stage least squares, generally perform well judged by the standard statistical criteria (significance of variables, absence of serial correlation, goodness of fit, etc.). The following paragraphs briefly summarise the main features of the estimated equations, particularly with regard to the impact of government microeconomic policies.

The unemployment rate, as a proxy for the excess demand for labour, is specified to affect wage growth linearly except for Japan, Germany, Austria, the Netherlands and Spain. Inflation expectations are assumed to be adaptive, usually with a two- to three-semester distributed lag on current and past inflation, except in North America where the lags are found to be longer reflecting the prevalence of multi-year contracts. The long-run estimated coefficients on inflation expectations are not significantly different from unity.

Cyclical productivity growth is included in the equations for the United States, Japan, Germany, Finland, Spain and Switzerland. Shifts in the terms of trade, proxied by the difference in the growth of the private consumption deflator and the growth of the GDP deflator, enter the equations for Japan, Austria and Switzerland. Although both of these variables, cyclical productivity growth and shifts in the terms of trade, are closely related to the ability of firms to pay, aggregate measures of profits or profitability have not been found to have important effects on nominal wage growth.

Table 6. *Aggregate wage equations*[a]

	Constant	Unemployment rate (U)			Inflation[c]	Productivity growth[d]	Other[e]	SEE	DW	$\bar{R}^2$
		U (elasticity)[b]	lnU	1/U						
United States 1964II-85II	4.19 (0.32)	-0.60 (0.07)			1.00 (0.13)	0.27 (0.09)		0.51	2.04	0.76
Japan 1970II-85II	-2.97 (1.00)	[-1.66]		6.82 (2.61)	1.04 (0.15)	0.64 (0.27)	-0.79 (0.33)	1.07	2.05	0.92
Germany 19641-8511	0.32 (0.64)	[-0.14]	-0.42 (0.16)		0.99 (0.19)	0.65 (0.14)		0.84	2.30	0.79
France 1964II-84II	2.31 (0.27)	-4.33 (0.05)			1.09 (0.09)		0.10 (0.03)	0.64	1.78	0.87
United Kingdom' 19641-8411	2.28 (0.56)	-4.15 (0.07)			0.94 (0.10)			1.50	2.14	0.74
	1.85 (0.48)	-0.44 (0.17)			0.98 (0.09)			1.43	2.32	0.77
Italy 197111-8311	5.58 (2.67)	-0.60 (0.31)			0.96 (0.21)			2.02	2.03	0.59
Canada 196611-851	4.77 (0.70)	-0.51 (0.10)			0.89 (0.18)			1.29	2.07	0.58
Australia 1970II-85II	2.11 (2.55)	-0.39 (0.15)			1.14 (0.55)			1.94	1.99	0.66
Austria 1970II-85I	2.66 (1.02)	[-0.74]	-1.67 (0.47)		0.81 (0.29)		-0.79 (0.37)	1.02	2.38	0.73
Finland 197111-851	2.12 (1.22)	-0.49 (0.20)			1.0 (--)	0.91 (0.45)		1.84	2.40	0.29
Netherlands 197111-8511	3.48 (1.59)	[-0.32]	-1.58 (0.50)		1.10 (0.23)			0.87	2.08	0.87
Spain 19651-841	2.98 (1.76)	[-0.23]	-1.61 (0.51)		0.99 (0.16)	0.82 (0.44)	0.09 (0.06)	1.74	2.15	0.60
Switzerland[g] 1969II-84II	-29.52 (12.67)	0.45 (0.19)			1.00 (0.15)	0.26 (0.11)	-0.41 (0.28)	0.96	2.50	0.71

a) The dependent variable is the growth of the wage rate as defined in the data appendix. All equations are estimated by two-stage least squares on seasonally-adjusted semiannual data; per cent changes refer to semi-annual changes. The standard error of the estimate (*SEE*), the Durbin-Watson statistic (*DW*) and the adjusted proportion of explained variation ($\bar{R}^2$) are calculated using the actual values of the independent variables; $\bar{R}^2$ is based on the error sum of squares. Standard errors appear in parentheses below the coefficient estimates. Dummy variables are reported in Table A1

b) For those countries where a non-linear specification of the unemployment rate is used, the figures in square brackets give the elasticity of wages with respect to the unemployment rate evaluated at the mean unemployment rate for the sample period. These bracketed figures are comparable to the coefficient estimates in the countries with a linear specification.

c) Inflation is defined as a moving average of current and past growth of the personal consumption deflator for all countries. A two-period weighted moving average is used for Japan (weights of 0.67, 0.33), Germany (0.75, 0.25) and Italy (0.6, 0.4). For the other countries, the inflation term is a simple moving average of either two semesters (France, Australia, the Netherlands, Switzerland), three semesters (the UK., Austria, Finland), four semesters (Spain), five semesters (Canada) or seven semesters (the U.S.). The coefficient of inflation in the Finnish equation is constrained to one.

d) Productivity growth is specified as a two period moving average for the US. (weights 0.67, 0.33), Japan (0.67.0.33) and Germany (0.5, 0.5); for Finland and Spain, it is a simple three-period moving average; for Switzerland it is unlagged.

e) The equations for France and Spain include the growth of the minimum wage relative to the lagged growth of aggregate wages. The difference between the growth of the private consumption deflator and the growth of the GDP deflator, as a proxy for shifts in the terms of trade, is included in the equations for Japan, Austria and Switzerland.

f) In the second U.K. equation the unemployment rate is entered as the difference from a lagged eight-period moving average of unemployment.

g) The activity variable for Switzerland is a measure of the employment rate defined as total employment divided by a lagged two period moving average of the labour force, multiplied by 100.

For the United Kingdom, two equations are reported which differ in the specification of the unemployment rate term: the level of the Unemployment rate in the first equation and the difference of the unemployment rate from its lagged four-year average in the second equation. This latter change specification implies that the inflationary or disinflationary impact on wages from a given level of unemployment disappears over time. The importance of changes in, rather than the level of, the unemployment rate has often been discussed and appears to receive the strongest support in the U.K. data (Rowlatt, **1986).** Recently a change specification has been associated with the hypothesis of hysteresis in the natural rate (Blanchard and Summers, **1986** and Coe, **1985).**

Of the microeconomic and structural factors discussed in Section I, only minimum wages explicitly enter the aggregate wage equations, and for only France and Spain (although they have been tested in all countries for which data are available)[8]. As discussed above minimum wages relative to average wages in manufacturing have fallen since **1980** in the United States, Canada, the Netherlands and Spain (Table 4). Thus developments in minimum wages since **1980** have probably contributed to wage disinflation in these countries. Only for France has the growth of the minimum wage since **1980** outpaced manufacturing or aggregate wage developments. Based on the coefficient estimates reported in Table 6, which summarise direct impacts as well as indirect effects from wage emulation, the relative growth of the minimum wage may have reduced aggregate wage inflation in Spain by an average of about ½ per cent per year from 1980-84 (actual wage inflation averaged about **13** per cent per year over the same period); in France, the relative increase in minimum wages may have ***increased*** aggregate wage inflation **by** an average of about 0.2 per cent over the same period (average actual wage inflation of about **11** per cent per year).

Macro unemployment insurance replacement ratios (Table 3) and non-wage labour costs (Table 5) are the only other structural variables discussed in Section I for which adequate time-series data are available. Changes in replacement ratios are generally expected to have a direct effect on the reservation wage, and hence would be one factor influencing the natural rate of unemployment; and wage growth could be affected by a backward-shifting of non-wage labour costs if bargaining took place over the total compensation package. Possible effects on aggregate wage behaviour of changes in the macro replacement ratios or non-wage labour costs were tested, but estimated coefficients were not found to be significant or to have the expected sign in any of the countries studied here. These results suggest that to the extent that developments in non-wage labour costs and unemployment insurance replacement ratios have affected wage developments, it has been indirectly via their impact on prices and, perhaps, on the natural rate of unemployment.

Adequate quantitative measures or proxy variables are not available for many of the microeconomic and institutional factors discussed in Section I. It is thus not possible to directly test for their influence on wage growth, or to see if their quantitative importance has changed[9]. In the absence of direct quantitative measures of such policies, weaker evidence of their influence on wages can be obtained by comparing wage developments in periods when such policies were in effect and periods when they were not. In the case of incomes policies, this is usually done using dummy variables. With the exception of Finland, all of the estimated equations include temporary shifts in the estimated constants, generally for unusual events in the late 1960s or early 1970s, although only in a few cases do these appear to be related to incomes policies (Table A1). The important exception is the Netherlands where the estimated coefficient on a dummy variable for changes in indexation provisions and reductions in bonuses may have reduced aggregate wage growth by as much as 8 per cent in the year from mid-1980 to mid-1981 (Netherlands Central Bank, 1980).

As noted in Section I, the single most important institutional change in many European countries in the 1980s has been a weakening of explicit or implicit indexation provisions. In terms of the estimated equations this might result in a lengthening of the adjustment lag between wages and prices implying increased real wage flexibility[10]. However, it is unlikely that changes in formal indexation provisions would lead to a reduction in the long-run unit elasticity of wages with respect to prices – a theoretical and empirical result independent of indexation practices – which would imply money illusion and sustained changes in income distribution. In general, one- to two-year lag distributions on current and past inflation are used in the equations for European countries, consistent with the predominance of annual wage bargaining cycles in these countries. Given the high degree of collinearity between alternative lag specifications, it has not been possible to identify possible increases in the lag with which wages respond to prices.

B. The stability of the aggregate wage equations in the 1980s

1. In-sample and out-of-sample equation residuals

Tests for possible shifts in the estimated coefficients are presented below. If the estimated coefficients are stable, the equation residuals may be taken as a rough estimate of the combined effect of those institutional and microeconomic policy changes which are not explicitly represented in the estimated equations. Given that virtually all of the microeconomic and institutional changes discussed in Section I

Table 7. Post-1979 errors from the estimated wage equations[a]

Except for the second column, the errors refer to semi-annual percentage growth rates; errors are predicted minus actual

	In-sample errors[b]			Post-sample forecast error[c]	
	Mean	Mean as a per cent of average wage growth	Mean absolute	Mean	Mean absolute
United States	0.11	3.6	0.36	-0.40	-0.60
Japan	0.05	2.0	0.79	-0.78	1.17
Germany	-0.12	–5.6	0.54	0.43	0.70
France	0.08	1.4	0.33	0.51	0.59
United Kingdom	0.26	4.9	1.04	5.12	5.28
	-0.32	6.0	0.90	2.78	3.16
Italy	0.24	2.9	1.10	2.25	2.52
Canada	0.10	2.6	0.59	1.16	1.16
Australia	0.45	9.5	1.42	-0.78	1.48
Austria	-0.04	–1.4	0.83	-0.34	0.85
Finland	0.44	8.2	0.66	–5.76	5.76
Netherlands	0.04	2.3	0.51	-0.30	1.06
Spain	-0.08	1.2	1.50	–1.54	2.36
Switzerland	0.13	4.2	0.53	0.27	0.72

would be expected to contribute to reduced wage inflation, the presumption is that the estimated equations would overpredict wage growth.

An examination of the in-sample residuals of the wage equations shows that the semi-annual growth of wages is overpredicted on average from mid-1979 except for Germany, the United Kingdom (second equation). Austria and Spain (Table 7, first column). These mean errors, however, are generally small relative to average wage growth in the 1980s (second column). For all equations, the mean absolute errors for the 1980s are less than for the period up to mid-1979, i.e. they are less than the standard errors for the full estimation period reported in Table 6.

To the extent that these equation errors can be taken as a rough measure of the microeconomic and structural changes discussed in Section I, these changes have had important effects on aggregate wage developments in some countries. These effects may have been most supportive of the disinflation process in Italy, Australia and Finland, perhaps by as much as ½ to 1 per cent per year; in the United States,

France, Canada and Switzerland these effects may have contributed to wage disinflation by about ¼ per cent per year.

The out-of-sample (static) forecast errors of the same equations estimated up to mid-1979 may be a better indicator of changed behaviour. Except for the United States and Japan, all of the equations for the seven largest economies overpredict wage growth. This overprediction is largest for Canada, Italy, and especially the United Kingdom. In contrast, five of the equations estimated to mid-1979 for the six smaller economies tend to underpredict wage inflation in the 1980s.

2. *Tests for parameter shifts and eqwation stability*

The general tendency for the estimated equations to overpredict wage growth in the 1980s suggests that the microeconomic and institutional changes discussed in Section I, and not explicitly taken account of in the estimated equations, may have contributed to the disinflation of wages. A number of formal stability tests are presented below to assess the importance, in a statistical sense, of these overpredictions and to assess the extent to which the estimated coefficients may themselves have changed. The results of these tests are summarised in Table 8, where an "X" means that the null hypothesis of stability was rejected at the 5 per cent significance level. Most of the tests focus on uncovering a break in wage behaviour in mid-1979, the most likely candidate for a change in policy regime; and at end-1982, near the end of the severe and prolonged recession of the early 1980s. Further information on the stability tests, including the calculated test statistics (Tables A2 to A5), is given in the Appendix.

a) Diagnostic tests for equation stability

Both the Chow and the recursive regression tests are for overall equation stability in the sense that neither focuses directly on specific coefficient estimates. The Chow test compares the residuals of an equation estimated over a sub-period, defined by a break in either mid-1979 or end-1982, with the residuals from an equation estimated over the entire sample period. The test is for whether the observations after the break point obey the same relation as the earlier observations (Chow, 1960). None of the estimated equations fail the Chow tests for either break (Table A2).

In the recursive regression tests, regressions are run over all possible sub-periods and the cumulative sum of squared residuals are used to compute the CUSUM and CUSUM squared test statistics (Johnston, 1984). The recursive regressions are based on ordinary least square estimates without the dummy variables reported in Table A 1. This exclusion of all dummy variables explains why

Table **8. Summary of stability tests**

X indicates that the null hypothesis of equation stability is rejected at the 5 per cent significance level

	United States	Japan	Germany	France	United Kingdom[a]		Italy	Canada	Australia	Austria	Finland	Nether-lands	Spain	Switzer-land
Chow tests														
1979I/79II break														
1982II/83I break														
Recursive regression tests														
Forward: CUSUM	X		X					X						X
CUSUM^2	X	X	X		X			X			X		X	X
Backward CUSUM	X													
CUSUM^2		X	X	X				X	X	X	X		X	X
Tests of parameter shifts														
Constant: 1979I/79II break														
1982II/83I break														
Unemployment: 1979I/79II break					X									
1982II/83I break														
Inflation: 1979I/79II break					X	X			X					
1982II/83I break														
Tests of parameters which begin to trend with time after 1.9791														
Unemployment		X												
Inflation					X	X								
Time trending parameter tests														
F-tests: Test 1				X										
Test 2				X										
Hendry Chi-^{2} tests														
1979I/79II break					X	X	X			X	X		X	
1982II/83I break										X	X		X	
Forecast error t-tests for last observation														
1979I/79II break														
1982II/83I break														

a) The first column is for the first U.K. wage equation reported in Table 6, the second column is for the second equation reported in Table 6.

so many countries fail these tests, particularly the CUSUM squared tests where the large residuals associated with the unusual observations are squared, while passing most of the other stability tests (Table A2)[11]. As noted above, the dummy variables are generally for unusual events in the late-1960s or early-1970s.

b) Tests for parameters shifts

Three types of tests have been carried out in order to isolate possible changes in specific parameters. The first group of tests allowed each of the estimated coefficients to shift after mid-1979 or after end-1982. The results are reported in the third panel of Table 8. Except for the United Kingdom and Australia there is little evidence of statistically significant shifts in either the constant terms or the other estimated coefficients. But the preponderance of negative, albeit insignificant shifts might be suggestive of, for example, a decrease in the natural rate. The standard U.K. equation shows a substantial significant downward shift in the coefficients of unemployment and inflation after mid-1979; the second U.K. equation reported in Table 6 does not show a significant shift in the coefficient of unemployment, and shows a smaller (albeit still significant) downward shift in the coefficient of inflation (Table A3). For Australia there is some evidence of increased sensitivity of wages to inflation after mid-1979.

The possibility of shifts in cyclical productivity growth, shifts in the terms of trade and the relative growth of minimum wages were also tested. Although not significant, there is some evidence of instability in the estimated coefficient on changes in the terms of trade in the Japanese equations. Some alternative specifications of the lag distribution on the terms of trade variable result in an estimated coefficient of minus one, implying that only the growth of domestic output prices (the implicit GDP deflator), rather than consumer prices are important to Japanese wage developments.

The other two tests for parameter shifts are directed to the possibility that the estimated parameters may have changed smoothly over time, either over the full sample period or since mid-1979. Both time trending parameter tests are explained more fully in the Appendix, Table A4. Only the U.K. equations show a statistically significant increasing responsiveness to inflation after mid-1979; this increased responsiveness is much smaller for the second equation reported in Table 6. The French equation does not pass the full sample period time-trending parameter tests.

c) Out-of-sample forecast tests

The out-of-sample performance of an equation is a more stringent test of stability. This is because the equation is confronted with observations which have

not been used to estimate its parameters, although the observations have been used to select the preferred specification. The Hendry Chi-squared test compares the sum of the squared forecast errors (over the post-1979 I or post-1982 II period) with the variance of the residuals over the truncated estimation period (Hendry, 1979)[12]. Austria, Finland and Spain fail the test for both break points; Italy and both U.K. equations fail for the mid-1979 break but pass for the 1982 break (Table A5).

The forecast error t-test is based on an equation estimated up to the break point and then used to forecast the last available observation (as reported in Table 6). For example, for the United States the equation estimated to mid-1979 is used to forecast 1985 II. The forecast error t-statistic tests whether the actual value of the last available out-of-sample observation lies within a 95 or 99 per cent confidence interval. All equations pass this test for both break points (Table A5).

The results of this section can be summarised briefly as follows: there has been a general tendency for wage growth to decline more rapidly than would have been predicted by the aggregate wage equations; this overprediction is not large relative to the standard errors of the equation, i.e. it is not "statistically significant"; there is little evidence that there has been a change in the way that aggregate wages respond to economic developments, i.e. the estimated coefficients appear to be stable.

POLICY IMPLICATIONS

Although there have been numerous changes in microeconomic policies affecting the labour market, for any single country the changes have been comparatively modest and relatively recent. With regard to possible direct impacts of these changes on wage inflation, there is evidence that the relative and real decline of Spanish minimum wages have contributed to the decline of wage inflation in Spain in the 1980s; and specific policy actions in the Netherlands in the early-1980s may have reduced wage growth there. Perhaps the most straightforward evidence of possible direct impacts from microeconomic policy changes is the general tendency for nominal wages to grow less than predicted by estimated wage equations. This reduction in wage growth would have contributed to the decline in inflation and may also have helped to increase employment. Regulatory and institutional changes may have also had direct impacts on inflation, thereby indirectly contributing to the decline in wage growth.

There is little or no evidence, however, that the basic structure of the wage determination process at the macroeconomic level has changed. In particular, the

responsiveness of aggregate wage growth to developments in unemployment, inflation and other determinants of aggregate wages appears to be stable. Thus, although changes in government policies appear to have had some effect, the wage disinflation of the 1980s can largely be understood in terms of declines in inflation (related to developments in commodity prices, exchange rates, etc.) and increases in unemployment.

The policy implication is that the short-run unemployment-inflation trade-off is essentially the same as it was before the disinflation process began. What has changed, of course, is that inflation expectations have in all likelihood been reduced along with the reduction in inflation in the 1980s. It is also the case that most estimates of the natural rate of unemployment are below current rates of unemployment, sometimes substantially. Thus although a reduction in unemployment would probably lead to somewhat higher inflation than would otherwise have been the case, the risks of rekindling inflation, in the sense of steadily accelerating inflation, would appear to be minimal. An exception is the United States, where the current rates of unemployment may be approaching estimates of the natural rate.

NOTES

1. Other important sources have been employers and trade union associations such as the Confederation of British Industries, the Confederation of Swedish Industries and the European Trade Union Institute.
2. Most available microeconomic replacement ratios are based on unemployed workers in hypothetical family units. These measure the proportion of a hypothetical unemployed worker's former wage he or she is legally entitled to receive. They thus include a broad range of social transfers as well as unemployment insurance benefits. The actual replacement ratios applying to individuals or household units will differ from these hypothetical ratios for a number of reasons: first, unemployment insurance coverage is incomplete: second, all those qualifying do not receive benefits; and third, the former earnings levels, age and family status of the unemployed is constantly changing and is for the most part unknown.
3. An important disadvantage of macro replacement ratios is that they do not reveal actual work disincentives in the absence of information concerning insurance coverage, eligibility conditions and compositional shifts into and out of unemployment. Macro replacement ratios may fall with no change in policy because new entrants into the work force (who become unemployed) do not qualify for benefits (because they lack the minimum work history) or because the long-term unemployed exhaust their benefits. The proportion of unemployed actually drawing unemployment compensation in the United States fell from 62 per cent in 1975 to 50 per cent in 1980, and then to 31 per cent in 1985. In Japan this proportion fell from 58 to 40 per cent from 1980 to 1985: in Germany it fell from 51 to 37 per cent from 1980 to 1984. Similar declines have been registered in other countries.
4. The low Italian figure reflects the separate treatment of workers in the supplementary wage fund, the Cassa Integrazione Guadagni, who draw up to 60 per cent of their contractual salary and are not considered as officially unemployed. The numbers of individuals covered under this scheme grew rapidly from 1980 to 1984, rising from 142 000 to 400 000 by 1983 and reaching a 1984 peak of 430 000. Preliminary indications are for a decline to below 400 000 in 1985 and further falls in 1986. An adjustment for this factor might raise the macro replacement ratio close to 17 per cent in 1984.
5. In 1981 roughly 190 000 union workers, or 8 per cent of those reaching new settlements in the private sector, accepted first-year wage cuts or freezes. By 1982 the figure reached a peak of 1.5 million or 44 per cent of workers covered under new settlements. The proportion then dropped to 37 per cent in 1983, 27 per cent in 1984 and 15 per cent in 1985. See Current Wage Developments, U.S. Bureau of Labor Statistics, various issues.

6. For example, if petroleum and coal products are compared with apparel – one of the highest relative to one of the lowest-paying two-digit industries – the ratio stood at 2.02 in 1970; in 1982 it was 2.82. At a four-digit industry level a comparison between railroad equipment and carpets and rugs yields a widening ratio from 1.69 in 1970 to 2.45 in 1980. This widening of the gap between wages in high- and low-wage sectors was reflected in a growing dispersion in wages in U.S. industry, unlike experience in Canada, Europe and Japan.

7. For the most part, the estimation results are similar to those previously reported, although sample periods differ and data have been revised or changed for a number of countries. A more comprehensive wage rate concept than in Coe (1985) (private sector earnings per employee) has been adopted for the United States, Japan and Australia (see the data appendix). The most important changes compared with previous results are for the United States, where the specification of inflation expectations has been simplified and there is an additional impact on nominal wage growth from cyclical productivity changes; and for Japan where both cyclical productivity growth and changes in the terms of trade are additional determinants of nominal wage growth. These changes in specification reflect, inter *alia,* the more comprehensive wage concept, particularly the greater weight given to service sector wages in the United States and Japan, as well as the inclusion of more recent observations when shifts in the terms of trade have been particularly large. For the three countries where the definition of the wage rate was changed, all of the specification tests reported in Coe (1985) were repeated. For the other countries, the impact of changes in profits on nominal wage growth was again tested; the results were similar to those reported in Coe (1985).

8. In previous work over a shorter sample period, the effect of Federal minimum wages had been marginally significant for the United States (Coe, 1985). With a different wage concept and the estimation period extended to 1985 II, and perhaps also because the Federal minimum wage has been unchanged in nominal terms since 1981, the relative growth of the minimum wage was not found to exert an important influence in the reported equation for the United States.

9. In previous work (Coe, 1985), the role of direct and indirect taxes did not have significant impacts on aggregate nominal wage growth. This is in contrast with results reported in Andersen (1984) and Knoester and van der Windt (1985). The exclusion of relevant variables in a regression will result in biased parameter estimates only if the excluded variables are correlated with the included variables. Almost by definition, structural and institutional features of the labour market are relatively constant, or change at discrete times, and hence they are unlikely to be correlated with the proxies for inflation expectations, labour-market slack or the other included variables.

10. During a period of stable inflation, a discrete increase in the adjustment period between wages and prices implies a one-time reduction in the level of real wages. In general, if there are lags in the adjustment of wages to prices, and unless the specification explicitly implies an equilibrium level of the real wage (by including, for example, the lagged logarithm of the real wage), any change in inflation results in a change in the level of real wages.

11. The Quandt log-likelihood ratio test, which is also computed from the recursive regressions, indicates that the instabilities are generally associated with those observations where the

dummy variables have been omitted. The distribution of the Quandt log-likelihood ratio test and the small-sample properties of the recursive regression test statistics are not known.

12. This test tends to reject the hypothesis of stability because it assumes that the parameters of the estimated regression equation are known with certainty. This substantially reduces the level of the sum of the squared forecast errors which leads to rejection of the hypothesis of stability. Passing this test is a relatively strong indication of stability, but failure is not conclusive.

APPENDIX

A. Dummy variables

Table A1 reports the dummy variables included in the estimated equations reported in Table 6. An indication of how the exclusion of these dummy variables would affect the estimated equations is given by a comparison of Tables 1 and 11 in Coe (1985).

B. The natural rate in the estimated equations

The expectations-augmented Phillips curve can be written as

$$\dot{w} = a_1 . \text{fie} - a_2 (U - U^*) + a_3 . \dot{q} + (1 - a_3) \bar{q} \qquad [1]$$

where W is nominal wage growth, fie is inflation expectations, U and U^* are the unemployment rate and the natural rate of unemployment, respectively, and $\dot{q}$ and $\bar{q}$ are cyclical and trend productivity growth, respectively. By definition, the labour market is in equilibrium when unemployment is at the natural rate ($U = U^*$); with $a_1 = 1.0$, $\dot{pe} = \dot{p}$ ($\dot{p}$ is actual inflation) and $\dot{q} = \bar{q}$, we then have

$$\dot{w} - \dot{p} = \bar{q},$$

i.e. in equilibrium real wages grow at the same rate as productivity implying constant income shares. U #U* implies an acceleration or deceleration of wages and real wages growing differently from productivity.

If the natural rate (U^*) and trend productivity growth ($\bar{q}$) are constant, equation [1] is equivalent to:

$$W = a_0 + a_1 . \dot{pe} - a_2 . U + a_3 . \dot{q} \qquad [2]$$

where $a_0 = a_2 U^* + (1 - a_3) \bar{q}$. This is the Phillips curve which has been estimated and is reported in Table 6.

C. Stability tests

Tables A2-A5 report the details of the stability tests which were summarised in Table 8. The following explains the time-trending parameter tests shown in Table A5.

Table A1. **Country-specific variables**

	Description	Non-zero values for dummy variables	Estimated coefficient	Standard error
United States	Dummy variable for wage/price controls	1.0 from 701 to 721	–1.00	(0.26)
	Dummy variable for the effect of an increase in the military or civilian wages	1.0 in 671 and 6711	–2.01	(0.40)
Japan	Dummy variable for unusual seasonal pattern	1.0 in 741 and 751, and –1.0 in 7411 and 7511	–3.65	(0.55)
Germany	Dummy variable for the events of 1969 and 1970	1.0 from 6911 to 7011	3.51	(0.54)
	Dummy variable for an unusual seasonal variable	Alternates from 1 to –1 from 711 to 7411	0.99	(0.30)
France	Dummy variable for the events of 1968	1.0 in 6811 and –1.0 in 691	1.74	(0.67)
United Kingdom	Dummy variable for unusually large wage increases, perhaps in anticipation of the imposition of wage controls	1.0 in 701	2.83	(1.53)
	Dummy variable for unusually large wage increases, perhaps associated with the newly-elected Labour government and the contract policy	1.0 from 7411 to 751, and –1.0 from 7511 to 7711	3.93	(0.60)
Italy	Dummy variable for unusually large wage increases	1.0 from 731 to 7311	5.07	(1.54)
Canada	Dummy variable for unusually small wage increases	1.0 in 701	-4.87	(1.33)
	Dummy variable representing possible effects of the Anti-Inflation Board policies	1.0 from 7711 to 7811	–1.62	(0.79)
Australia	Dummy for unusually large wage increases, possibility reflecting an award in the National Wage Case by the Arbitration Commission	1.0 from 741 to 7411	5.81	(2.24)
Austria	Dummy variable for unusually large wage increase, perhaps reflecting buoyant profits and unusually strong demand	1.0 in 711	3.50	(1.40)
	Dummy variable for an unusually large wage increase, perhaps reflecting an unusually large price increase	1.0 in´73II	3.10	(1.08)
Netherlands	Dummy variable for a reduction in indexing and bonuses	1.0 from 8011 to 811	–2.04	(0.50)
Spain	Dummy variable for an unusual seasonal	–1.0 in 811 and 1.0 in 81II	4.07	(1.23)
Switzerland	Dummy variable for exceptionally large wage increases in the construction sector during a period of strong excess demand for labour, which spread rapidly to other sectors of the economy	1.0 in 7011	2.72	(1.01)

Note: These are the estimated coefficients on dummy variables which are included in the equations reported in Table 6.

Table A2. Diagnostic tests

	Recursive regression tests				Chow tests			
	Forward		Backward		Test for a 1979I/79II break		Test for a 1982II/83I break	
	CUSUM	CUSUM²	CUSUM	CUSUM²	Chow statistic	F probability	Chow statistic	F probability
United States	1.14'	0.23'	0.66	0.33**	0.49	0.09	0.30	0.07
Japan	0.64	0.45**	0.11	0.44'	1.34	0.68	0.66	0.32
Germany	0.94'	0.34**	0.46	0.32**	0.81	0.35	0.44	0.16
France	0.69	0.21	0.84	0.5**	0.53	0.14	0.79	0.46
United Kingdom[a]	0.42	0.24'	0.43	0.23	1.75	0.88	0.45	0.23
	0.48	0.23	0.26	0.23	1.20	0.67	0.35	0.16
Italy	0.90	0.21	0.28	0.30	0.58	0.21	0.81	0.54
Canada	1.20**	0.30'	0.49	0.16'	0.29	0.02	0.42	0.11
Australia	0.78	0.19	0.63	0.24'	1.38	0.72	1.11	0.61
Austria	0.41	0.20	0.71	0.44**	1.62	0.79	1.70	0.82
Finland	0.64	0.33'	0.53	0.39**	0.20	0.01	0.26	0.07
Netherlands	0.49	0.16	0.51	0.21	0.4	0.06	0.29	0.06
Spain	0.28	0.28*	0.83	0.27'	1.35	0.74	2.45	0.93
Switzerland	1.0*	0.35**	0.41	0.39**	0.29	0.02	0.14	0.03

* Fails stability test at the 5 per cent level.
** Fails stability test at the 1 per cent level.
a) The first row displays test statistics for the standard U.K. wage equation while the second displays statistics for the hysteresis equation.

The post-7 979 I time-trending parameter test

For the test on the unemployment rate (U), the estimated equation is:

$$w = a_0 + a_{10} \cdot U + a_{11} \cdot U \cdot t_{post\text{-}79I} + \ldots$$

and for the test on the inflation term ($\dot{p}e$), the estimated equation is:

$$w = a_0 + a_{30} \cdot \dot{p}e + a_{37} \cdot \dot{p}e \cdot t_{post\text{-}79I} + \ldots$$

where $t = 0$ through 791 and 1, 2, 3, ... afterwards.

The full-period time trending parameter test

The full-period test compares the ordinary fixed coefficient model:

i) $$w = a_0 + a_{11} \cdot U + a_{21} \cdot pe$$

to:

ii) $$w = b_0 + (b_{10} + b_{11} \cdot t)\, U + (b_{20} + b_{21} \cdot t)\, \dot{p}e$$

and to:

iii) $$w = b_0 + (b_{10} + b_{11} \cdot t + b_{12} \cdot t^2)\, U + (b_{20} + b_{21} \cdot t + b_{22} \cdot t^2)\, \dot{p}e$$

Table A3. **Tests of constant and slope shifts**

Standard errors in parenthesis; each coefficient refers to the estimated shift in the relevant coefficient from a separate estimated equation

	1979117911break			1982II/83I break		
	Constant	Unemployment	Inflation	Constant	Unemployment	Inflation
United States	0.17	0.02	0.03	0.31	0.03	0.13
	(0.23)	(0.03)	(0.07)	(0.33)	(0.04)	(0.16)
Japan	0.20	-0.21	-0.08	0.78	2.07	0.70
	(0.60)	(1.28)	(0.26)	(0.60)	(1.61)	(0.69)
Germany	-0.37	-0.23	-0.09	-0.19	-0.09	0.12
	(0.41)	(0.23)	(0.19)	(0.51)	(0.24)	(0.55)
France	-0.40	-0.07	-0.10	0.35	0.04	-0.15
	(0.44)	(0.06)	(0.09)	(0.55)	(0.06)	(0.21)
United Kingdom[a]	-1.51	-0.451	-0.40*	0.95	0.08	-0.01
	(1.08)	(0.17)	(0.16)	(1.22)	(0.11)	(0.82)
	-0.89	-0.12	-0.31 ■	-0.19	-0.02	-0.31
	(0.72)	(0.09)	(0.14)	(0.87)	(0.07)	(0.451
Italy	-1.17	-0.18	-0.32	-1.29	-0.13	0
	(1.56)	(0.20)	(0.20)	(1.93)	(0.20)	(0.51)
Canada	-0.40	-0.08	-0.17	-0.20	-0.03	0.18
	(0.74)	(0.04)	(0.68)	(1.18)	(0.10)	(0.52)
Australia	1.86	0.26	0.60*	-1.71	-0.19	-0.72
	(1.29)	(0.24)	(0.30)	(1.91)	(0.21)	(0.66)
Austria	0.19	0.33	-0.20	1.20	0.86	0.59
	(0.66)	(0.82)	(0.20)	(0.76)	(0.56)	(0.46)
Finland	1.19	0.21	0.29	1.07	0.17	0.28
	(0.84)	(0.15)	(0.19)	(1.00)	(0.16)	(0.32)
Netherlands	-0.28	0.04	0.04	0.32	0.02	-0.24
	(0.64)	(0.07)	(0.23)	(0.69)	(0.05)	(0.75)
Spain	0.77	0.10	-0.02	1.25	0.06	0.35
	(1.71)	(0.15)	(0.32)	(1.26)	(0.07)	(0.26)
Switzerland	-0.22	-0.003	-0.05	0.39	0.006	0.65
	(0.38)	(0.006)	(0.17)	(0.57)	(0.008)	(0.66)

* Statistically significant at the 5 per cent level.
** Statistically significant at the 1 per cent level.
a) The first row is for the standard U.K. wage equation and the second is for the hysteresis equation.

where t = a time trend (1, 2, 3, ...) over the entire sample period. Two F-statistics are calculated from the residuals of the regressions *i), ii)* and *iii).* The first compares the fixed parameter model *i)* to the model where the parameters depend on time *ii).* The second compares the fixed parameter model to the full model where the parameters depend on time and time squared. A significant F-statistic suggests that the parameters shift over time.

These tests are similar to the post-1979 I time-trending parameter tests. However, they differ in several ways: These are F tests which compare one equation to another; the post-1979 I time-trending parameter tests are t-tests which test single parameters for significant changes.

	Tests of post-19791time trends in the estimated coefficients on the inflation term and the unemployment rate (Each coefficient is estimated in a separate equation)				Time-trending parameter F-tests (Time trends over full estimation period)		
	Inflation		Unemployment				
	Coefficient (a31)	Standard erroi	Coefficient (a11)	Standard error	F[a]	F[b]	F[c]
United States	0.004	(0.012)	0.003	(0.004)	1.95	2.18	2.07
Japan	0.06	(0.06)	0.30'	(0.18)	1.05	1.08	1.09
Germany	-0.03	(0.038)	-0.002	(0.006)	2.19	2.25	1.22
France	-0.03	(0.02)	–0.008	(0.009)	3.25"	3.61**	1.91
United Kingdom[d]	-0.21**	(0.06)	-0.02	(0.02)	1.95	1.86	0.41
	-0.08'	(0.04)	-0.008	(0.009)	2.04	0.50	2.31
Italy	-0.07	(0.04)	-0.05	(0.03)	2.82	2.45	0.15
Canada	-0.03	(0.031	–0.01	(0.014)	1.17	1.37	2.81
Australia	0.04	(0.05)	0	(0.03)	2.14	2.48	2.31
Austria	0	(0.04)	-0.08	(0.008)	5.87	5.58	0.73
Finland	0.04	(0.03)	0.02	(0.002)	1.45	1.34	0.48
Netherlands	0.10	(0.07)	0.007	(0.006)	1.23	1.34	1.71
Spain	0.03	(0.05)	0.007	(0.011)	0.95	1.02	1.48
Switzerland	0.01	(0.03)	0	(0.008)	0.94	1.83	4.90**

* Statistically significant at the 5 per cent level.
** Statistically significant at the 1 per cent level.
a) Compares fixed parameter model to model with t.
b) Compares fixed parameter model to model with t and t^2.
c) Compares model with t to model with t and t^2.
d) The first row displays statistics for the standard U.K. wage equation; the second displays statistics for the hysteresis equation

Table A5. **Tests of *ex post* forecast errors**

	Hendry Chi[2] tests		Forecast error t-tests for the most recent observation				
	Test statistic for a 1979I/79II break	Test statistic for a 1982II/83I break	For 1979117911break		For 1982II/83I break		Test for:
			t	t probability	t	t probability	
United States	18.47	6.12	-0.62	0.46	-0.68	0.50	S2 85
Japan	45.29	6.95	0.83	0.58	0.39	0.30	S2 85
Germany	15.64	1.93	0.60	0.45	0.96	0.66	S2 85
France	13.05	0.52	-0.48	0.36	0.53	0.4	S2 84
United Kingdom[a]	225.10**	1.09	–1.52	0.86	0.69	0.51	S2 84
	75.47**	0.87	-0.69	0.50	0.04	0.03	S2 84
Italy	18.31'	0.04	-0.33	0.26	0.11	0.09	S2 83
Canada	14.20	1.84	-0.13	0.10	0.54	0.41	S1 85
Australia	19.17	4.85	0.08	0.06	-0.34	0.26	S2 85
Austria	29.42**	19.53**	1.56	0.86	2.05	0.94	S2 85
Finland	85.51**	24.86"	1.42	0.82	1.62	0.88	S1 85
Netherlands	20.05	2.06			0.85	0.59	S2 85
Spain	42.73**	14.95*			0.41	0.32	S2 84
Switzerland	8.81	0.83	-0.03	0.03	0.27	0.21	S2 84

* Fails stability test at the 5 per cent level.
** Fails stability test at the 1 per cent level.
a) The first row displays test statistics for the standard U.K. equation while the second displays test statistics for the hysteresis equation

Furthermore, in the full-period tests the parameters depend on time trends over the entire data period, whereas the post-1979 I time-trend test makes the parameters depend on time trends since 1979 II. Finally, the full-period tests are based on ordinary least squares and exclude dummy variables while the post-1979 I tests are based on two-stage least squares.

D. Data definition and sources

For all countries except Japan, Australia, Austria and Switzerland, the wage variable is the private sector national accounts wage bill per dependent employee in the private sector. For Japan it is the index of wages and salaries, including bonus payments, for all industries, based on a survey of companies employing more than 30 workers. For Australia it is total compensation per employee in the non-agricultural sector, including private pension contributions and non-monetary income. For Austria it is the total national accounts wage bill per dependent employee. For Switzerland, it is the national accounts private sector wage bill divided by total employment. The unemployment variable is the civilian unemployment rate (in percentage points). The price variable is the national accounts-based private consumption deflator. For the United States, Japan and Germany, productivity is real business sector GDP divided by business sector employment. For Finland, Spain and Switzerland, productivity is total real GDP divided by total employment.

BIBLIOGRAPHY

Andersen, P.S. (1984), "Real wages, inflation and unemployment", BIS Working Papers, No. 9 (July).

Blanchard, O.J. and L.H. Summers (1986), 'Hysteresis and the European unemployment problem", ***NBER Working Paper*** No. 1950 (June).

Centre d'Etudes des Revenus et des Coûts (1982), 'Note sur l'indemnisation du chômage en France et à l'btranger" (June).

Chow, G.C. (1960), "Tests of equality between sets of coefficients in two linear regressions", ***Econometrica,*** Vol. 28.3 (July), pp. 591-605.

Coe, D.T. (1985), "Nominal wages, the NAIRU and wage flexibility", OECD ***Economic Studies*** No. ***5*** (Autumn), pp. 87-126.

La Commission des Communautbs Européennes (1986). "Coût budgbtaire du chômage et rôle des budgets dans la lutte contre le chômage" (March).

Dilnot, A.W. and C.N. Morris (1983). "Private costs and benefits of unemployment: measuring replacement rates", ***Oxford Economic Papers,*** Supplement (November), pp. 321-340.

Friedman, M. (1968), "The role of monetary policy", ***American Economic Review*** (March), pp. 1-17.

Hendry, D.F. (1979), "Predictive failure and econometric modelling in macroeconomics: the transactions demand for money", in P. Ormerod (ed.), ***Economic Modelling,*** London, Heinemann.

Johnston, J. (1984), ***Econometric Methods*** (3rd ed.), New York, McGraw Hill.

Klau, F. and A. Mittelstadt (1986). "Labour market flexibility", OECD ***Economic Studies*** No. ***6*** (Spring), pp. 7-45.

Knoester, A and van der Windt (1985). "Real wages and taxation in ten OECD countries", Erasmus University, Rotterdam Institute for Economic Research Discussion Paper Series No. 8501 g/m.

Lucas, R.E. (1976), "Econometric policy evaluation: a critique", in K. Brunner and A. Meltzer (eds.), ***The Phillips*** curve ***and labour markets,*** Carnegie-Rochester Conference Series on Public Policy, Vol. 1, Amsterdam, North Holland, pp. 19-46.

Netherlands Central Bank (1980), ***Quarterly Statistics,*** Nos. 2 and 3.

Newell, A. and J.S.V. Symons (1985). "Wages and employment in the OECD countries", Centre for Labour Economics Discussion Paper No. 219 (May).

OECD (1979), ***Unemployment compensation and related employment policy measures.***

OECD (1980-1986, various issues), ***Country Surveys*** for individual countries.

OECD (1982), ***Challenge of unemployment: A report to labour ministers.***

OECD (1984, 1985, 1986), ***Employment Outlook.***

OECD (1985), ***Costs and benefits of protection.***

Phelps, E. (1967), "Phillips curves, expectations of inflation and optimal unemployment over time", ***Economica*** (August), pp. 254-281.

Phelps, E. (1972), ***Inflation policy and unemployment theory,*** London, Macmillan.

Rowlatt, P.A. (1986), "A model of wage bargaining", U.K. Treasury Working Paper No. 44 (August).

Sims, C.A. (1982), "Policy analysis with econometric models", ***Brookings Papers*** on ***Economic Activity,*** No. 1, pp. 107-152.

Swedish Employer's Confederation (1986). ***International survey 1974-84: wages and total labour costs for workers*** (November).

U.S. Bureau of Labor Statistics (various issues), ***Current wage developments.***

Vroman, W. (1981), "State replacement rates in 1980", ***Unemployment compensation studies and research,*** National Commission on Unemployment Compensation, Washington D.C.