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THE PHILLIPS CURVE SLOPE AND THE COST OF DISINFLATION IN THE 1980s

An institutional account of differences among OECD countries

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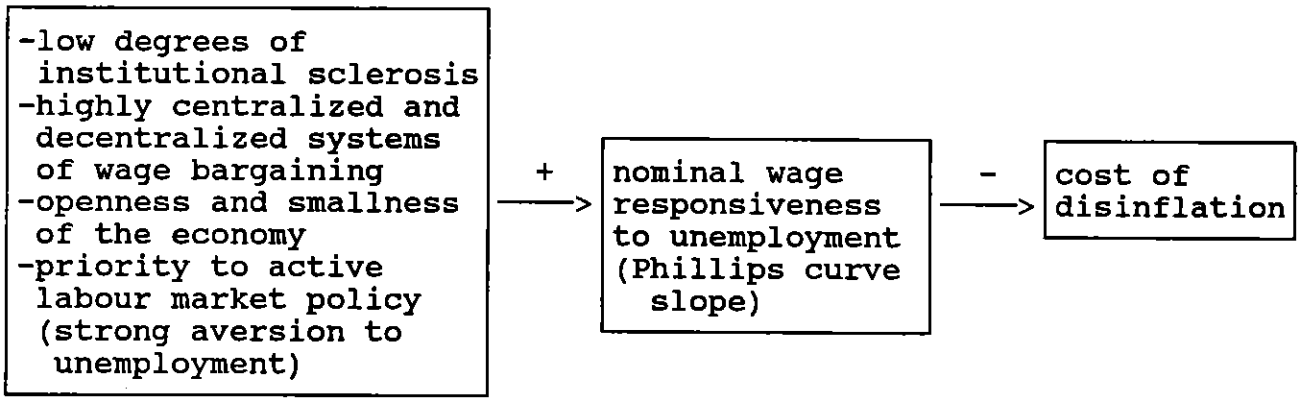
ABSTRACT

In almost all OECD countries inflation declined substantially during the first part of the 1980s. It is quite remarkable, however, to find out that some countries reached that result at no or very little cost (in terms of lost output and increased unemployment), while in other countries the cost was very high. This paper shows that cost differences among countries strongly depend on differences in the process of wage formation in general, and nominal wage responsiveness to unemployment (i.e. the Phillips curve slope) in particular.

A second part of the paper goes into the question why the Phillips curve slope is so different among countries. In this respect, the paper reflects a strong belief in the major role of structural and institutional characteristics. Theoretical explanation and empirical evidence are shown to exist with respect to the following relations:



1. INTRODUCTION

Economic development in the 1980s showed substantial and worldwide disinflation. From a peak of 13% in 1980, the rate of inflation within the OECD economies declined to an average of 2.6% in 1986 and 3.5% in 1987-88. Almost all OECD countries shared this evolution. However, fundamental differences exist among countries with respect to the costs incurred (in terms of lost output and increased unemployment) to realize inflation reduction.

Section 2 focuses on these differences. It presents some basic theory explaining why disinflation may or may not be painful. It is shown that the cost of disinflation strongly depends on the characteristics of wage formation. Empirical evidence is found that countries that show high nominal wage responsiveness to unemployment (i.e. a high Phillips curve slope), have experienced a better macroeconomic performance in the 1980s. Further, some weak evidence is obtained suggesting that vulnerability to hysteresis had an unfavourable influence on economic results.

Section 3 answers the question why nominal wage responsiveness to unemployment differs among countries. We show that structures and institutions are at the basis of these differences. We go into institutional sclerosis, the smallness and openness of the economy, the aversion of people and governments to unemployment and the degree of centralization of wage bargaining.

2. WAGE FORMATION AND THE COST OF DISINFLATION

2.a. Theoretical conditions for low cost disinflation

The costs incurred to achieve inflation reduction in the first part of the 1980s diverged widely among countries (cf. section 2b). This paper asks the question how these differences can be explained. Figures 1a-d, concentrating on wage formation,

illuminate some basic ideas.

Point a represents the combination of nominal wage inflation (w) and unemployment (U) of an arbitrary country in 1980: inflation is high ($w=w_1$), unemployment is relatively low. Point b represents a similar combination in 1986, at the end of the disinflationary process ($w=w_2$).

A comparison of the figures 1a-d makes clear that the cost of disinflation depends on two fundamental determinants: the slope and shift of the Phillips curve. Countries that lack both a flexible response of wages to unemployment (a steep Phillips curve) and a strong downward shift of the Phillips curve, are likely to show the highest cost to bring inflation down from w_1 to w_2 (fig. 1a). The number of additional unemployment years that a country must bear, is expected to decline to the extent that the response of wages to unemployment is more flexible (fig. 1b) or the downward shift of the Phillips curve stronger (fig. 1c). Fig. 1d reflects the best situation obtainable.

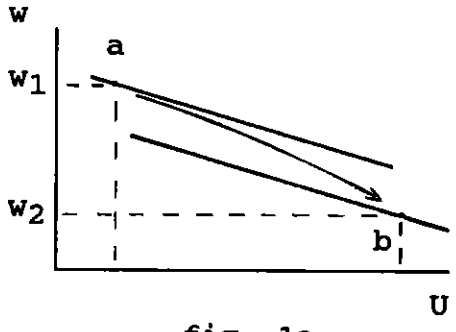


fig. 1a

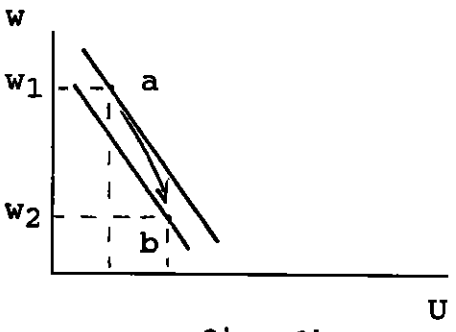


fig. 1b

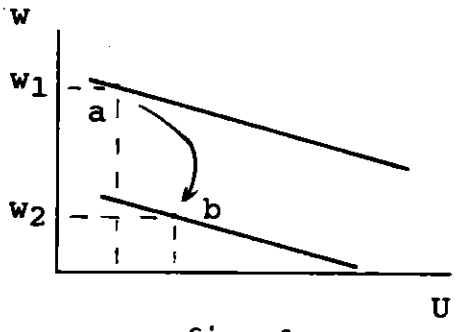


fig. 1c

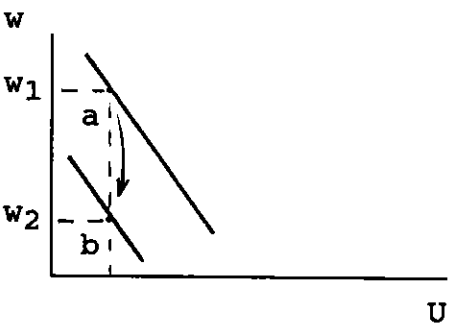


fig. 1d

The remaining part of this section goes into the empirical relevance of these theoretical conclusions. In section 2b we estimate Phillips curves (nominal wage equations) for 15 countries and derive indicators of their slope and shift. Further (section 2c), it is shown that these indicators contribute to explaining differences in the OECD countries' macroeconomic performance in the 1980s.

2.b. Derivation of nominal wage equations for 15 OECD countries

Equation (1) represents the general formulation of the estimated Phillips curve. This is in line with earlier empirical work by e.g. Coe (1985), Gordon (1987) or Van Poeck (1989).

$$w = a_0 + pcom - a_2(U - \beta UN) + a_3 q + a_4 D \qquad (1)$$

with w : nominal wage growth (growth rate of nominal compensation per employee in the whole economy)
pcom: a consumer price inflation component
U : unemployment rate
UN : proxy for the natural rate of unemployment (U^*)
q : percentage change of labour productivity
D : country-specific dummy-variable
$a_i > 0$ for $0 < i \leq 3$
$\beta > 0$

The coefficient a_2 reflects nominal wage responsiveness to unemployment (i.e. the Phillips curve slope); the other explanatory variables (pcom, UN, q and D) and their coefficients are responsible for shifts of the Phillips curve.

As far as the price component is concerned, we impose that prices are fully reflected into wages: pcom gets a coefficient 1. We do not, however, want to impose the same particular 'structure' on all countries: differences are allowed with respect to the speed of adjustment. Two specifications were provided (2a-b). Countries

for which pcom1 performs better as an explanatory variable and for which a_1 tends to 1, show the fastest adjustment.

$$pcom1 = a_1 p + (1-a_1)p_{-1} \quad (2a)$$

$$pcom2 = a_1' p_{-1} + (1-a_1')p_{-2} \quad (2b)$$

Ideally, the wage equation should be estimated with excess unemployment ($U-U^*$) as explanatory variable. However, the natural rate of unemployment (U^*) is unknown and some proxy (UN) will have to be created. We opt for some combination of lagged unemployment. Again, countries can differ in 'structure': three alternative specifications for UN, possibly lagged, were allowed (cf. equations 3a-c).

$$UN1 = U_{-1} \quad (3a)$$

$$UN2 = .5(U_{-1} + U_{-2}) \quad (3b)$$

$$UN3 = .33(U_{-1} + U_{-2} + U_{-3}) \quad (3c)$$

As a consequence of this approximation, the restriction on the coefficients of U and U^* can no longer be imposed. Equation (1) reflects the assumption $U^* = \alpha + \beta UN$, which allows an interesting derivation. As UN is a function of lagged unemployment, the estimated β becomes an indicator of a country's vulnerability to hysteresis. If β tends one, a strong relation is established between natural and lagged unemployment. If, on the contrary, β tends to zero, absence of vulnerability is suggested[1].

Table 1 presents the estimation results for 15 countries. The estimation method was OLSQ for equations in which neither current price inflation, nor current productivity growth occur. Otherwise

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[1] A similar exercise, but more limited with respect to the number of countries and the specification of UN, is done by Graafland (1988).

the instrumental variables method was used. For all countries the estimation period was 1967-86 or 1968-86. The numbers between brackets are absolute t-values. Data sources are described in appendix 1. With respect to the results we want to make the following remarks.

First, some readers may wonder why we still feel the need to estimate wage equations. Many authors already did this job; Andersen (1989) presents an (incomplete) survey of results[2]. We had three particular reasons: (1) we wanted wage equations for a relatively large number of countries, with a dependent variable not just based on manufacturing, but covering the whole economy; (2) we explicitly wanted to test for hysteresis effects; and (3) in our opinion more flexibility had to be allowed in the specification of the wage equation for different countries. One cannot, on the one hand, study the role of countries' structural and institutional characteristics, and, on the other hand, limit in advance the possibilities for differences to show up (e.g. by imposing an identical price adjustment structure).

Second, the estimation results are generally good in terms of standard statistical measures. The coefficients on the price component and on unemployment always have the correct sign and are highly significant in almost all equations. Remarkable are the big differences that are found among countries with regard to the responsiveness of nominal wages to unemployment: the estimated coefficient a_2 varies from 0.62 in the UK to 6.69 in Sweden. The coefficient on the price component shows much smaller variance. The division of countries according to the speed of adjustment of wages to prices is not unexpected: none of the six countries for which pcom2 gave better estimation results, show strong wage indexation mechanisms in the period studied (cf. Bruno & Sachs'

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[2] The correlation coefficients between our estimated coefficient on unemployment (a_2) and the estimates of Coe (1985) and Van Poeck (1989) amount to, respectively, 0.89 and 0.86. A correlation of 0.55 is obtained with the average of the estimates of 10 studies summarized by Andersen (1989).

degree of indexation indicator). With the exception of Japan, Switzerland and to a lesser extent Finland, all countries for which pcom1 gave better results, show strong wage indexation.

Third, the estimation results for the β-coefficient suggest that most countries in our sample are vulnerable to hysteresis. Table 2 summarizes these results. Further in this table, $(1-\beta)a_2$ reflects the (negative) long-run effect of a rise in unemployment on wages. The remarkable difference with respect to hysteresis, stressed in the literature[3], between major European countries and the US is confirmed in our results. France, the UK, Italy, Austria and Norway are found highly vulnerable to hysteresis (although important differences exist in strength and speed of effects). Japan also shows a high β. However, in that country important long run effects of unemployment on wages remain. Canada, the US, Sweden and Finland, on the contrary, show both low vulnerability ($\beta<0.5$) and substantial long run unemployment effects on wages. Germany, Belgium, Denmark, the Netherlands and Switzerland take a position in the middle, though in the latter country β is imprecisely estimated and important long-run effects of unemployment on wages remain.

Fourth, nominal wages are found to adjust to productivity in nine countries[4]. In only four countries, however, is the wage response to productivity statistically significant (at the 5% level). In France an unexpected negative (lagged) response was obtained.

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[3] cf. Blanchard & Summers (1986), Coe (1988) and Graafland (1988).

[4] A coefficient zero was imposed on the productivity variable if the corresponding t-value was found to be lower than one.

Table 1 Estimation results for the nominal wage equation

Estimated equations for countries in which pcom1 performs better

Country	Estimated coefficients						Indicator of U^*			
	a_0	a_1	a_2	β	a_3	a_4		$\bar{R}^2$	DW	SER
Belgium[a] (68-86)	4.67 (3.27)	0.74 (4.84)	0.90 (3.95)	0.71 (3.21)	0.75 (5.50)	-	$UN3_{-3}$	.94	-	1.06
Denmark (68-86)	5.31 (7.41)	0.56 (3.54)	0.97 (5.35)	0.57 (2.95)	-	-	$UN3_{-4}$	.78	1.74	1.51
Finland (67-86)	9.50 (9.06)	0.51 (2.93)	2.62 (6.84)	0.48 (5.33)	-	-	UN3	.86	1.67	1.86
France[b] (68-86)	9.27 (7.23)	0.75 (4.97)	1.49 (4.10)	0.86 (2.99)	-0.44 (1.69)	1.50 (2.11)	$UN2_{-6}$	.93	2.07	0.92
Italy (67-86)	5.90 (1.41)	0.63 (2.78)	2.55 (2.75)	0.94 (3.09)	0.57 (2.03)	-	$UN2_{-3}$	.83	2.17	2.18
Japan (68-86)	4.54 (1.16)	0.68 (4.81)	4.61 (2.18)	0.79 (2.69)	0.57 (1.86)	4.22 (1.53)	$UN2_{-6}$	.93	1.46	1.75
Netherl. (67-86)	2.85 (1.34)	0.71 (2.53)	0.72 (3.57)	0.60 (2.51)	0.63 (1.34)	2.36 (2.29)	UN3	.89	2.15	1.61
Switzerl. (67-86)	2.73 (5.37)	0.65 (2.56)	2.95 (1.87)	0.60 (1.63)	-	4.76 (4.85)	$UN1_{-1}$	.85	1.86	1.36
UK (67-86)	3.42 (2.91)	0.90 (4.71)	0.62 (1.56)	1.17 (2.43)	-	4.78 (2.78)	$UN2_{-3}$	.81	2.08	2.56

(a) corrected for autocorrelation AR1: with rho Belgium 0.57 (2.59)
(b) q_{-1} instead of q

The dummy-variables included are:

France	: 1968, 1982 = 1	UK	: 1967-69 = -1/3
Japan	: 1973-74 = 1		1970 = +1
Netherl.	: 1970-73 = 1		1976-77 = -1/2
Switzerl.	: 1970-72 = 1		1978-79 = +1/2

Table 1 Estimation results for the nominal wage equation (continued)

Estimated equations for countries in which pcom2 performs better

Country	Estimated coefficients						indicator of U*			
	a_0	a_1'	a_2	β	a_3	a_4		$\bar{R}^2$	DW	SER
Austria[ab] (68-86)	1.72 (0.96)	1.13 (3.19)	2.44 (4.09)	1.08 (3.33)	0.68 (2.28)	-4.48 (2.73)	$UN3_{-2}$	.80	-	1.92
Canada[b] (68-86)	7.93 (4.82)	1.34 (5.82)	1.31 (3.77)	0.31 (1.59)	0.55 (2.00)	-3.58 (2.92)	UN2	.79	1.93	1.59
Germany[a] (68-86)	7.14 (6.38)	0.62 (2.17)	1.81 (5.43)	0.53 (3.75)	-	5.60 (4.03)	UN3	.87	-	1.30
Norway[ab] (68-86)	2.50 (0.69)	0.92 (8.82)	3.57 (4.51)	1.02 (1.85)	0.21 (1.08)	7.07 (6.70)	$UN2_{-3}$	.83	-	1.38
Sweden[b] (68-86)	9.35 (3.84)	0.73 (3.72)	6.69 (5.79)	0.37 (2.15)	0.47 (1.54)	-4.28 (2.01)	UN3	.62	1.81	2.01
US (68-86)	8.72 (9.17)	0.64 (6.57)	1.48 (8.80)	0.18 (1.59)	-	-	UN2	.72	1.43	0.87

(a) corrected for autocorrelation AR1: with rho Austria -0.51 (1.94), Norway 0.46 (1.61), Germany 0.46 (2.29)
(b) q_{-1} instead of q

The dummy-variables included are:

Austria	:	1981-82 = 1	Germany	:	1970 = 1
Norway	:	1975 = 1	Canada	:	1978-79 = 1
		1979 = -1	Sweden	:	1979 = 1

Table 2 Vulnerability to hysteresis (15 OECD countries)

Country	β (t-value)	$(1-a_2)\beta$	Country	β (t-value)	$(1-a_2)\beta$
Austria	1.08 (3.33)	-0.20	Japan	0.79 (2.69)	0.97
Belgium	0.71 (3.21)	0.26	Netherl.	0.60 (2.51)	0.29
Canada	0.31 (1.59)	0.90	Norway	1.02 (1.85)	-0.07
Denmark	0.57 (2.95)	0.42	Sweden	0.37 (2.15)	4.21
Finland	0.48 (5.33)	1.36	Switzerl.	0.60 (1.63)	1.18
France	0.86 (2.99)	0.21	UK	1.17 (2.43)	-0.11
Germany	0.53 (3.75)	0.85	US	0.18 (1.59)	1.21
Italy	0.94 (3.09)	0.15			

2.c. Responsiveness of nominal wages to unemployment, vulnerability to hysteresis and the cost of disinflation

As figures 1a-d made clear, macroeconomic performance in a disinflationary environment should be better in countries with a high slope and a strong downward shift of the Phillips curve. Tables 3 and 4 present empirical evidence on these theoretical findings.

In table 3 the macroeconomic performance, reflected by six indicators, of three groups of five countries in the period 1980-86 is compared. The criterion behind the classification of countries is nominal wage responsiveness to unemployment (i.e. the Phillips curve slope, or the estimated coefficient a_2). Nominal wages were found to be the most responsive to unemployment in Sweden, Japan, Norway, Switzerland and Finland. They were found to be the least responsive in the Uk, the Netherlands, Belgium, Denmark and Canada (cf. table 1).

The performance indicators are: (a) realized disinflation, expressed as a percentage of the inflation level in 1980 (DIS), (b) the change in the adjusted misery index (ΔAMI), (c) the change in the performance index (Calmfors & Driffill) (ΔPI), (d) cumulative unemployment above the 1980-level of unemployment (CUMU), (e) average employment creation (EMPL) and (f) cumulative output loss below the 1970-79-trend (CUMOL). In algebraic terms:

$$\text{(a)}\quad DIS = 100*(p_{80} - p_{86})/p_{80}$$

$$\text{(b)}\quad \Delta AMI = (U_{86} - U_{80}) + \delta(p_{86} - p_{80}), \qquad \text{with} \quad \delta = \bar{p}_{80}/p_{80}$$

$$\text{(c)}\quad \Delta PI = (U_{86} - U_{80}) + (cad_{86} - cad_{80})$$

$$\text{(d)}\quad CUMU = \sum_{81}^{86} (U_t - U_{80})$$

$$(e) \quad EMPL = (1/7) \sum_{80}^{86} empl_t$$

$$(f) \quad CUMOL = \sum_{80}^{86} (Q^*_t - Q_t)/Q^*_t$$

We express the realized disinflation (DIS), not as an absolute number, but as a percentage of the initial level in order to avoid the bias that may result from the fact that it is probably easier to reduce inflation by one percentage point when one starts from e.g. 15% than when one starts from e.g. 5%.

In order to compare the performance of countries, economists (cf. Bruno & Sachs, Calmfors & Driffill) often make use of the change in the misery index (i.e. the sum of the rates of unemployment and inflation). However, the same idea that disinflation is easier starting from a high level of inflation, implies that data on misery index reduction should be viewed with caution. We present the change in the adjusted misery index (ΔAMI) as a possible alternative. For each country the change in the unemployment rate is added to the change in the inflation rate multiplied by a country-specific weight (δ). This weight is calculated as the ratio in 1980 between the average inflation rate over all countries ($\bar{p}_{80}$) and the inflation rate of the country concerned. The disinflation of countries with a high inflation rate in 1980 is consequently given a lower weight.

The change in the performance index (ΔPI) adds the changes in the unemployment rate and the current account deficit, expressed as a percentage of GNP (cad). The idea behind the use of this performance index is that it may be misleading to consider only the evolution of inflation and unemployment without a further look at government policy. One may think of the US as a typical example of how to obtain relatively good unemployment and inflation results at the cost of a strongly deteriorating current account. The performance index tries to capture these costs.

The cumulative output loss (CUMOL) measures the development of an output gap in the 1980s. It is calculated as the cumulative percentage gap between the actual (Q) and the "potential" real GNP (Q^*). With respect to the determination of the latter, the average growth rate of real GNP in 1970-79 is taken to be an acceptable proxy for the potential growth rate. Further, to simplify comparison, there was assumed to be no output gap in 1979.

As far as the indicators CUMU and EMPL are concerned, we believe no further comment is necessary. In (e) empl stands for the yearly growth rate of total employment.

What conclusions can be drawn from table 3? First, despite the fact that most OECD countries faced highly similar shocks (disinflationary policy) in the first part of the 1980s, their macroeconomic performance diverged widely. Divergence is particularly high as far as cumulative unemployment and cumulative output loss are concerned. Second, we believe table 3 confirms the theoretically expected negative relationship between the Phillips curve slope and economic performance in a disinflationary environment. Admittedly, a better economic evolution in the highest slope countries, as a group, cannot be called totally unexpected: in comparison, they show the weakest disinflation (cf. DIS). However, the extent to which these countries outperform the others (with respect to all indicators) is most remarkable. Further evidence for our hypothesis comes from the fact that the low slope countries, as a group, typically show the worst results.

Despite these unambiguous results, table 3 must be viewed with caution. Consider e.g. the position of Finland and Italy. Though these countries have quite similar Phillips curve slopes, they belong to different groups. The reason is that groups are created to contain only 5 members, while Italy has the sixth highest Phillips curve slope.

Table 3 Nominal wage responsiveness to unemployment and macroeconomic performance (1980-86)

Phillips curve slope	Indicators of macroeconomic performance					
	DIS	ΔAMI	ΔPI	CUMU	EMPL	CUMOL
High						
Sweden	68.6	-7.0	-3.5	5.3	0.53	26.1
Japan	95.0	-9.8	-4.6	3.3	0.94	38.4
Norway	33.9	-3.5	8.6	5.7	1.36	37.4
Switzerland	82.5	-8.7	-5.1	2.8	0.55	-12.8
Finland	75.0	-7.6	-0.9	3.4	1.07	9.6
Average	71.0	-7.3	-1.1	4.1	0.89	19.7
Intermediate						
Italy	72.2	-4.8	5.0	11.9	0.66	37.4
Austria	73.4	-6.5	-0.8	10.6	0.14	62.7
Germany	103.6	-7.0	-1.5	24.1	-0.14	54.9
France	80.2	-4.9	3.0	16.3	-0.23	55.7
US	85.9	-9.8	3.2	5.4	1.49	36.4
Average	83.1	-6.6	1.8	13.7	0.38	49.4
Low						
Canada	58.8	-4.4	3.8	16.7	1.51	65.9
Denmark	70.7	-7.1	2.7	14.3	0.79	28.0
Belgium	80.3	-5.4	-3.3	24.4	-0.38	54.1
Netherlands	98.5	-4.1	3.7	41.5	-0.26	77.8
UK	81.1	-3.4	6.9	28.8	-0.31	46.1
Average	77.9	-4.9	2.8	25.1	0.27	54.4
General Average	77.3	-6.3	1.1	14.3	0.51	41.2
Stand. dev.	16.3	-2.1	4.1	10.9	0.66	22.2

Sources: calculations based on OECD, Economic Outlook

Table 4 is (among other things) a response to this criticism. It presents simple regression results, attempting to explain the performance differences illuminated in table 3. The Phillips curve slope (a_2), vulnerability to hysteresis (β) and the realized disinflation (DIS) are included as explanatory variables. About

the expected favourable influence of a high Phillips curve slope, nothing more needs to be said. Vulnerability to hysteresis is one element underlying an upward shift of the Phillips curve (when actual unemployment rises). As a consequence, it is expected to deteriorate macroeconomic performance (increase the cost of disinflation). Finally, with regard to realized disinflation as an explanatory variable, conventional theory predicts it should have no effect on performance in the longer run (1980-86?). On the other hand, as suggested by table 3 (and traditional Phillips curve theory), stronger disinflation might well induce worse results.

The following conclusions can be drawn from the estimation results. First, and most important, high nominal wage responsiveness to unemployment had a favourable influence on macroeconomic performance in the first part of the 1980s. A high Phillips curve slope was found to reduce the change in the adjusted misery index, the change in the performance index, cumulative unemployment and cumulative output loss. Moreover, it had a favourable influence on employment creation. Second, we found weak evidence supporting the hypothesis that vulnerability to hysteresis had a bad effect on performance. The sign of the estimated coefficients is correct in all equations, but the t-values are not always convincing. Finally, the results concerning the effects of the strength of realized disinflation are less unambiguous. At first sight, they are not consistent with any expectation: e.g. the negative coefficients obtained in both the third and fifth (or sixth) equation are contradictory.

Two important remarks remain. First, in this section we studied the period 1980-86, in which average OECD inflation fell from a peak of 13% to a minimum of 2.6%. However, not all countries showed this particular pattern. In a lot of countries inflation peaked in 1981 or reached a minimum in 1987. Consequently, there's a good case for a more flexible approach. In appendix 2 we repeat the exercise of table 4, allowing the period studied to differ

from country to country. Although the quality of the estimated equations is a less good, the results fully confirm our findings in table 4.

Second, we only considered one indicator (β) of the Phillips curve shift. Clearly, in a more general approach, other potentially important elements (as e.g. wage indexation or the credibility of the authorities) will also have to be incorporated into the analysis.

Table 4 Regression analysis of differences in macroeconomic performance (15 OECD countries, 1980-86)

Dependent variables	Explanatory variables estimated coefficients					
	constant	$\log(a_2)$	$\log(\beta)$	DIS	$\bar{R}^2$	SER
Δ AMI	-4.52 (5.96)	-1.28 (1.88)	1.94 (2.11)	-	0.31	1.76
Δ PI(a)	-0.16 (0.06)	-2.49 (1.62)	4.19 (1.15)	-	0.14	3.97
Δ PI(a)	13.1 (2.46)	-3.51 (2.72)	2.44 (0.82)	-0.15 (2.76)	0.44	3.18
CUMU	12.0 (1.25)	-11.9 (4.24)	4.33 (1.19)	0.15 (1.32)	0.62	6.94
EMPL	1.59 (2.58)	0.27 (1.50)	-0.74 (3.16)	-0.02 (2.81)	0.57	0.44
EMPL(b)	1.50 (3.55)	0.53 (3.70)	-0.92 (5.46)	-0.02 (4.26)	0.80	0.31
CUMOL	49.6 (1.60)	-15.6 (1.73)	5.25 (0.44)	0.05 (0.13)	0.04	22.4
CUMOL	51.1 (6.97)	-16.1 (2.00)	-	-	0.18	20.8

(a) estimated with β instead of $\log(\beta)$
(b) including a dummy variable, taking the value 1 for Sweden, with an estimated coefficient -1.40 (3.63)

3. STRUCTURES, INSTITUTIONS AND THE SLOPE OF THE PHILLIPS CURVE

Section 2 presented strong evidence on the existence of an inverse relationship between the cost of disinflation and the slope of the Phillips curve (responsiveness of nominal wages to unemployment). This section asks the question why nominal wage responsiveness differs so strongly among countries. We study the theoretical and empirical relevance of four structural and institutional characteristics: a. institutional sclerosis, b. centralization of wage formation, c. smallness and openness of the economy and d. aversion of people and governments to unemployment (as reflected by the importance of active - relative to passive - labour marktet policy). Sections 3a-d go into theory; section 3e presents empirical results.

3.a. Institutional sclerosis and the responsiveness of nominal wages to unemployment

The concept 'institutional sclerosis' and its consequences for economic growth and the flexibility of wages and prices were introcuced by M. Olson (1979, 1982). Though Olson's name is mainly linked to the explanation of comparative growth rates, this paper concerns his ideas on the flexibility of wages and prices. Fundamental in that context is the following hypothesis. Countries that show the highest degree of institutional sclerosis, i.e., the strongest accumulation of powerful common-interest organizations (e.g. big business, trade unions), will (other things equal) also show the weakest responsiveness of wages to unemployment. The reason can be found in these organizations' decision-making process, which occurs either through complex multi-lateral bargains (often requiring consensus) or by time-consuming constitutional procedures (via lobby influence on government).

The complexity of the problems dealt with, the intermediate work of committees and subcommittees, as well as crowded agendas, all contribute to delays. The status quo has priority until the time for a new bargain has come. The resolution of interest conflicts (how to share the cost of unfavourable shocks e.g. on the labour market), becomes very difficult. Therefore, Olson concludes, organizations and collusions for collective action are encouraged to seek simple formulas that can apportion costs, first, between their own and other organizations, and, second, within their own organization. The fixing of prices or wages (rather than the quantity that is sold) and seniority rules are examples of such formulas.

An important question remains. Why do some countries show a higher degree of institutional sclerosis than other countries? Olson is quite clear on this point and explains as follows.

The activity of an interest group consists of providing a public good. Its services, if provided to anyone, go to everyone in the group. Individual members who contribute nothing to the strength of the group get just as much as those who make big efforts. As a logical consequence, everyone will "let the others do the job" and the development of an interest group of some size will be very difficult and take a lot of time[5]. Large and stable interest groups can, according to Olson, only develop and survive if they can provide a private good (selective incentive) as a by-product to their active members exclusively[6]. In this way individuals are bribed to support group action. However, these selective incentives are very hard to obtain. Favourable conditions and lucky situations are required. Consequently (and summarizing),

1. Over time, stable societies will accumulate more common-

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[5] Small groups will develop much more easily: social control and pressure is possible and allows to 'catch' free riders.

[6] Another possibility is the use of coercive power or public regulation to support the development of organizations.

interest organizations and show more rigid wages and prices (as additional groups enjoy favourable conditions).

2. In a comparative perspective, countries (like Germany and Japan) that have had totalitarian government, occupying armies, civil wars or other major disruptions that destroy common-interest organizations, are expected (other things equal) to show less institutional sclerosis and a higher degree of flexibility in society and in the adjustment of wages and prices. On the contrary, countries, such as Great Britain and Sweden, that have had stable freedom of organization and security from invasion or other disruptions, will (other things equal) tend to develop more and stronger interest groups, rigidity and institutional sclerosis in society[7].

K. Choi (1983) developed an index of institutional sclerosis (IS), completely in line with Olson's ideas. Table 5 contains the results. This index is a positive function of the institutional age of a nation (i.e. the length of the period since the consolidation of modernizing leadership[8]) and a negative function of both the sum of years with disruption since consolidation and the strength of casual disruption. The consolidation of modernizing leadership is considered to be a proxy for the onset of common-interest group accumulation. In e.g. the UK this is 1649, in the US 1776, in Belgium 1795 and in Sweden 1809. As far as major disruptions are concerned, the UK and Sweden didn't have any, the US had their civil war, while Belgium was occupied during two world wars.

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[7] The fact that Sweden is mentioned as an example of a potentially rigid society may be unexpected (cf. our estimated wage equations). Our next section will solve this paradox: major interest organizations in Sweden are highly encompassing.

[8] "Consolidation is marked by three characteristics: the assertion of the determination to modernize; an effective and decisive break with the institutions of an agrarian way of life; and the creation of a national state with an effective government and a reasonably stable consensus on political means and ends by inhabitants." (Choi, p. 60)

Summarizing the data in table 5, the highest degree of institutional sclerosis is found in the UK, the US, Canada, the Netherlands and Switzerland. Japan, Austria, Finland, France and Germany show the lowest IS-value[9].

3.b. Centralization of wage bargaining and nominal wage responsiveness[10]

Centralization of wage bargaining concerns two important criteria. One is the level at which the main negotiations between labour and capital occur. This can be the national economy, the industry or the individual firm. Another criterion concerns the extent of internal coordination within labour and capital organizations. The coordination between different national unions (e.g. blue-collar and white-collar unions) and the power of the central organization over lower - industry or firm - levels, are relevant aspects in this respect.

Highly centralized systems (e.g. in the Nordic countries) show national wage agreements between powerful, highly encompassing union confederations and employer associations. There is no or very little lower level autonomy. In decentralized systems (e.g. the US and Canada), on the contrary, wage bargaining occurs at the firm level without intervention from central organizations. Finally, in intermediate systems (e.g. Belgium, the Netherlands) wage bargaining mainly takes place at industry level.

Our hypothesis is that both highly centralized and highly

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[9] We are fully aware that Choi's indicator isn't perfect. We do make use of it, however, for two reasons. First, it strongly reflects Olson's ideas; second, a perfect alternative does not exist.

[10] The importance of centralization of wage bargaining was first stressed by Calmfors & Driffill (1988). Their ideas were our inspiration.

decentralized systems of wage formation contribute to wage flexibility, while intermediate systems are expected to show more rigidity.

An explanation of this non-monotonic relation between the degree of labour market centralization and nominal wage flexibility is most clear in an environment of disinflationary policy (on which we focus). Disinflationary policy should result in falling nominal demand (PQ) or demand growth (p+q). The consequences of such policy for output (q) strongly depend on the downward flexibility of prices (and wages). The more flexible these are, the smaller the output loss will be. In this respect, however, we have all reasons to expect a lack of flexibility.

Inherent in disinflation is a typical prisoner's dilemma. Disinflation would be relatively painless if all economic agents were willing to accept a reduction of their prices' or wages' rate of growth at the time of the demand restriction. The problem is, however, that agents who do not cooperate, while others do, are rewarded: their relative and real incomes rise. Players who cooperate while others don't, are punished. Consequently, unless some mechanism exists that forces agents to cooperate, rational behaviour generates wage and price rigidity and substantial output losses. We believe highly centralized and decentralized systems of wage formation provide such mechanisms to solve the prisoner's dilemma.

In a highly centralized labour market with national wage bargaining a general agreement can indeed be reached in which every union accepts (must accept) wage restriction, while employers accept to reduce the rate of price increase. No one will feel relatively worse off, while output costs can roughly be avoided. The main objectives of the union, real income and employment, can both be safeguarded.

This result is clearly superior to the alternative in which the

central union refuses to moderate wages. As prices remain rigid too, output and employment must fall. There will be no compensating real income gains. On the contrary, many trade union members lose their jobs, while those trade union members who are so lucky as to remain employed, will share the increased cost of unemployment benefits.

A completely different mechanism exists in highly decentralized labour markets. Competitiveness and market constraints force every individual decision maker (i.e. union and employer at the firm level) to moderate nominal wages and prices in an environment of declining markets. For the union or firm that does not want to play the market game, real income gains may be substantial in the short run (as all other economic agents do reduce pay or price demands). In the longer run however, this alternative implies the failure of that firm.

The case of labour markets with wage bargaining at the intermediate level presents no mechanism to avoid the prisoners' dilemma or to induce labour and employer organisations to contribute to the common interest. On the contrary, a comparison of the costs and benefits of alternative actions with respect to real income and employment effects, will undoubtedly make the industry union opt for non-cooperation (i.e. rigid nominal wages).

Cooperative behaviour of e.g. the steel union leads to the worst outcome for the steel workers if other unions (e.g. the textile or transport unions) resist moderation. In this case, workers in the steel industry will bear a real income loss without any expected compensation in terms of employment. Real income will fall because of the downward pressure on the steel workers' wages without a proportionate pressure on other wages (and the general price index). Employment will probably fall too. In this respect, two counteracting forces are at work. On the one hand, restriction of nominal demand without proportionate restriction of the general price index, reduces real effective demand in the economy.

All sectors, including steel, will consequently experience declining demand for their products. On the other hand, employment in the steel industry is expected to rise due to its increased competitiveness. The latter effect, however, may be very small because of the limited substitutability between goods of e.g. the steel and textile sectors[11].

The alternative of resisting wage moderation may be more rewarding for a trade union at industry level. Real income might rise (if other unions present themselves as inflation fighters), while additional employment losses due to declined competitiveness promise to be small (again because of the limited substitutability mentioned). The fact that no loss of competitiveness results with respect to other firms within the industry, will undoubtedly reduce employer resistance to union policy. The cost of labour conflict might be much higher than the cost of accepting union wishes.

Moreover, the fact that benefits to additional unemployed workers are paid by all the employed in the economy, and not just by the workers of the non-cooperating industries, presents a further reason for non-cooperation and wage rigidity.

Summarizing, two conclusions can be drawn. First, as section 2 also made clear, nominal wage moderation is the key to avoiding employment and output costs of disinflationary policy (falling nominal demand). Second, highly centralized and decentralized systems of wage bargaining are conducive to this nominal wage moderation.

Table 5 contains a ranking of countries according to the degree of labour market centralization. It is based on Calmfors & Driffill.

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[11] Even if employment gains were substantial, one should not expect the steel workers (who have to accept a personal real income loss) to be highly interested in those gains.

Index numbers rise as the degree of centralization declines: Austria is the most centralized economy, Canada has the most decentralized labour market.

3.c. Openness and smallness of the economy

Section 3.b. took a rather closed economy point of view. International interdependence, however, has important implications for our analysis.

For a highly decentralized labour market nothing really changes: the market constraint may even get stronger.

As far as the position of a central national union is concerned, it is important to mention the significant influence in an open economy of foreign prices on the domestic price evolution. National wage moderation as response to demand restraint on the international level, may consequently result in a real income loss for workers as the foreign component of the consumer price index does not undergo proportionate downward pressure. The cost of moderation is higher than in a closed economy. We believe, however, that this will not fundamentally change the policy of a central union. Reduction of wage claims presents undeniable long run benefits too as e.g. the gain of market shares of the national industries on the world market, due to increased competitiveness of the domestic economy. This creates the opportunity of long run real wage gains.

Moreover, as long as no real possibilities exist to shift the cost of national union policy to the international level[12], the position of a central union in an international setting remains

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[12] Assume e.g. the payment of benefits for Danish unemployed workers by all workers and firms of the "United States of Europe".

fundamentally different from the position of an industry union in a closed national economy.

Trade unions at an intermediate national level, however, become small in an international perspective. They no longer control the whole sector and are consequently forced to more flexible behaviour in case of (international) demand restraint. Their position tends to the position of a union at firm level in a closed economy. Smallness of the economy reinforces this tendency. However, fundamental differences remain, due to e.g. the existence of an important non-tradables industry.

The theoretical conclusion of this section should be clear. Openness and smallness of the economy induce greater flexibility of wages. The empirical relevance of this conclusion is tested in section 3.e. As an indicator of smallness and openness, we created, for each country, OS:

$$OS = \text{Openness} * \text{Smallness} \qquad (4)$$

with Openness : exports/GNP
Smallness : GNP(US)/GNP

The share of exports in GNP is taken as a proxy of openness. A country's smallness is reflected by the ratio between the US GNP and that country's GNP. Table 5 contains the calculation results for OS. Norway, Finland, Denmark, Belgium and Austria come out as typical examples of small and open economies (high OS). As expected, the US, Japan, Germany and France are found to exert most influence in the world economy (low OS).

3.d. Aversion to unemployment, active labour market policy and nominal wage flexibility

This section considers the flexibility of wages as the result of

the aversion of people and governments to changes (especially rises) in unemployment. A high preference for employment stability should result in wage flexibility.

With respect to empirical work, the question must be asked how aversion to unemployment can be measured. We put forward the hypothesis that unemployment aversion is reflected in government labour market policy. Governments (and people) are considered highly averse to unemployment when priority in labour market policy is given to 'active' measures in favour of the young and unskilled, education and training and to direct job creation subsidies (rather than to 'passive' unemployment benefits and early retirement schemes).

The data on active labour market policy (ALMP) in table 5 were calculated as the percentage of total public expenditure on labour market programmes that goes to 'active' measures[13].
As can be seen, only four countries (Sweden, Norway, Switzerland and Germany) allocate more than 40% to 'active' measures. At the other end of the range we find Denmark, France, Belgium and Canada with less than 26%. These four countries are considered least averse to unemployment and, according to this indicator, expected to show the most rigid wages.

3.e. Empirical explanation of the Phillips curve slope

This final section presents some estimation results, explaining the differences among OECD countries as far as nominal wage

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[13] Other indicators that reflect e.g. public expenditure on active labour market policy as a percentage of GNP or total public expenditure, are considered inferior. These indicators are 'biased' since high unemployment countries almost automatically spend more on labour market policy. Moreover, these are absolute indicators, not reflecting relative importance.

Table 5 Relevant institutional and structural characteristics of 15 OECD countries

Country	IS	CI	OS	ALMP
Austria	36.0	1	16.8	0.28
Belgium	61.2	8	17.4	0.25
Canada	65.3	15	2.9	0.25
Denmark	57.6	4	17.4	0.23
Finland	40.3	5	19.6	0.32
France	43.6	9	1.1	0.24
Germany	46.1	6	1.1	0.42
Italy	43.6	11	1.6	0.36
Japan	20.8	12	0.4	0.29
Netherlands	63.2	7	11.3	0.27
Norway	56.9	2	24.7	0.54
Sweden	59.9	3	8.0	0.70
Switzerland	63.2	13	11.8	0.43
UK	90.1	10	1.6	0.35
US	78.9	14	0.1	0.29

Sources: Institutional sclerosis (IS): K. Choi (1983)
Centralization index (CI): Calmfors & Driffill (1988)
Smallness and Openness (OS): calculation based on equation (4) and OECD, National Accounts 1974-86 (data for 1980)
Active labour market policy (ALMP): calculation based on OECD, Employment Outlook, Sept. 1988, (data for 1987)

responsiveness to unemployment (NWRU) is concerned. Equation (5) presents the general form of the estimated equations.

$$NWRU = d_0 - d_1 IS - d_2 CI + d_3 CI^2 + d_4 OS + d_5 ALMP \qquad (5)$$

$$\text{with } d_i > 0$$

The dependent variable is the estimated coefficient a_2 (cf. table 1); the explanatory variables have been presented in previous sections and table 5. In order to test the relevance of a non-monotonic relation between labour market centralization and the

responsiveness of nominal wages, the squared centralization index (CI^2) has also been included as an explanatory variable. It is expected to get a positive sign.

Table 6 Regression analysis of differences in nominal wage responsiveness to unemployment (equation 5)

equation	(1)	(2)	(3)	(4)
Explanatory variables	Estimated coefficients			
constant	2.12 (2.55)	1.17 (1.13)	1.58 (1.83)	1.50 (1.87)
IS	-0.033 (3.24)	-0.036 (3.60)	-0.036 (4.34)	-0.035 (4.56)
CI	-0.230 (2.29)	-0.235 (1.78)	-0.216 (1.99)	-0.221 (2.16)
CI^2	0.020 (2.88)	0.020 (2.94)	0.019 (3.39)	0.019 (3.61)
OS		0.031 (1.44)	0.028 (1.58)	0.028 (1.68)
ALMP	7.11 (4.68)	8.23 (5.03)	6.60 (4.40)	6.78 (4.91)
Dsj				2.57 (2.65)
$\bar{R}^2$ SER	0.643 0.990	0.637 0.997	0.856 0.357	0.931 0.434

Notes: equation (3) excudes Sweden and Japan
$\bar{R}^2$ and SER are based on unweighted residuals

The estimation method was weighted least squares; for each country the inverse of the variance of its estimated coefficient a_2 was used as weight. The numbers between brackets are absolute t-values.

Summarizing our results, we believe they provide strong evidence on the theory presented in previous sections. All relevant estimated coefficients get the correct sign. Most of them are found to be highly significant. It cannot be denied, however, that our model has some difficulties explaining the Phillips curve slope for Sweden and Japan. Excluding these countries from the sample, as equation (3) does, allows us to realize a strong rise in the $\bar{R}^2$ to no less than 0.86. Equation (4), which includes a dummy variable Dsj, taking the value 1 for Sweden and Japan and 0 for the other countries, summarizes.

All in all, our main conclusion is quite clear: the Phillips curve slope (nominal wage responsiveness to unemployment) is strongly determined by structural and institutional characteristics. It reflects the favourable influence of low degrees of institutional sclerosis, highly centralized and decentralized systems of wage bargaining, smallness and openness of the economy and strong aversion to unemployment (i.e. priority to active labour market policy)[14]. Section 2 made clear that this also contributes to low cost disinflation.

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[14] Earlier research on the effects of institutions on wage formation mainly concentrated on the concept of corporatism. The hypothesis was accepted that wage responsiveness to unemployment rises with the degree of corporatism in the economy (Bean, Layard & Nickell (1986) and Newell & Symons (1987)). Calmfors & Driffill (1988), however, expressed their doubts about the monotonic relation that was put forward. Some further regression results we obtained, can only strengthen these doubts. Completely in line with our findings on centralization, a U-shaped (instead of monotonic) relation came out (see appendix 3).

REFERENCES

ANDERSEN, P., (1989), "Inflation and output: a review of the wage price mechanism", BIS Economic Papers, January, nr. 24

BEAN, C., LAYARD, R. & S. NICKELL (1986), "The rise in unemployment: a multi-country study", Economica, 53, Supplement, pp. 1-22

BLANCHARD, O. & L. SUMMERS, (1986), "Hysteresis and the European unemployment problem", in S. FISCHER (ed.), NBER Macroeconomics Annual 1986, Cambridge (Mass.), MIT Press

BRUNO, M. & J. SACHS, (1985), Economics of worldwide stagflation, Oxford, Basil Blackwell

CALMFORS, L. & J. DRIFFILL, (1988), "Bargaining structure, corporatism and macroeconomic performance", Economic Policy, April, pp. 13-61

CHOI, K., (1983), "A statistical test of Olson's Model", in D. MUELLER (ed.), The Political Economy of Growth, New Haven, Yale University Press, pp. 57-78

COE, D., (1985), "Nominal wages, the NAIRU and wage flexibility", OECD Economic Studies, Autumn, nr. 5

COE, D., (1988), "Hysteresis effects in aggregate wage equations" ,in CROSS, R. (ed.), Unemployment, Hysteresis & The Natural Rate Hypothesis, Oxford, Basil Blackwell, pp. 284-305

GORDON, R., (1987b), "Wage gaps vs. output gaps: is there a common story for all Europe?", NBER Working Paper, nr. 2454

GRAAFLAND, J.J., (1988), "Can hysteresis explain different labour market operations between Europe and the United States?", Discussion Paper, Institute for Economic Research, Erasmus University Rotterdam, nr. 8807/G, May

NEWELL, A. & J. SYMONS, (1987), "Corporatism, laissez-faire and the rise in unemployment", European Economic Review, 31, pp. 567-614

OECD, (1988), Economic Outlook, December

OECD, (1988), Employment Outlook, September

OECD, (1988), National Accounts 1974-86 (detailed tables)

OLSON, M., (1979), "An evolutionary approach to inflation and stagflation", in J. GAPINSKY & C. ROCKWOOD (eds.), Essays in Post-Keynesian Inflation, Cambridge, Massachusetts, Ballinger Publishing Company, pp. 137-59

OLSON, M., (1982), The Rise and Decline of Nations, New Haven, Yale University Press

VAN POECK, A., (1989), "Wage formation, labor market characteristics and the EMS", SESO Rapport, Studiecentrum voor Economisch en Sociaal Onderzoek, February, nr. 89/235

APPENDIX 1 DATA SOURCES

* wage inflation (w): growth rate of nominal compensation per employee in the whole economy: computed from:
  - OECD, National Accounts (detailed tables): compensation of employees paid by resident producers
  - OECD, National Accounts (detailed tables): employment of employees (if not available: --> wage and salary earners: OECD, Labour Force Statistics)
* consumer price inflation (p): OECD, Economic Outlook
* unemployment rate (U): OECD, Economic Outlook
  For the calculation of our proxy of the natural rate of unemployment (UN) in the early 1960s, we also relied on COMMISSION OF THE EUROPEAN COMMUNITIES, European Economy, Statistical Annex
* productivity growth (q): computed as output growth minus growth of total employment. Source: OECD, Economic Outlook
* import price growth (included as instrumental variable in the estimation of equation 1): IMF, International Financial Statistics, unit value of imports

APPENDIX 2 Regression analysis of differences in macroeconomic performance (15 OECD countries, 1980/1-1986/7)

Dependent variables	Explanatory variables estimated coefficients					
	constant	$\log(a_2)$	$\log(\beta)$	DIS	$\bar{R}^2$	SER
ΔAMI	-5.57 (7.12)	-0.79 (1.12)	1.80 (1.89)	-	0.18	1.82
ΔPI[a]	10.5 (1.54)	-0.93 (1.46)	3.73 (1.06)	-0.11 (1.68)	0.19	3.81
CUMU	12.6 (1.51)	-8.91 (4.05)	3.94 (1.37)	0.08 (0.86)	0.58	5.47
EMPL[b]	1.65 (2.62)	0.52 (2.75)	-0.77 (3.38)	-0.02 (3.06)	0.62	0.41
CUMOL	26.4 (1.03)	-8.14 (1.21)	11.8 (1.34)	0.35 (1.18)	0.15	16.9

(a) estimated with a_2 instead of $\log(a_2)$ and β instead of $\log(\beta)$
(b) including a dummy variable, taking the value 1 for Sweden, with an estimated coefficient -1.31 (2.47)

In this appendix the macroeconomic performance of 15 countries is studied in variable periods (depending on the years in which inflation in the country concerned reached its maximum and minimum). There is one restriction: the alternative years considered for maximum inflation are 1980 and 1981; they are 1986 and 1987 for minimum inflation. In detail, the following 'most relevant' periods were studied: 1980-86 for Denmark, the US, France and the UK; 1980-87 for Italy, Japan and Sweden; 1981-86 for Belgium, Finland, Switzerland, Germany, Norway and Canada; 1981-87 for the Netherlands and Austria.
Evidently, studying 1981-87 for e.g. Austria implies that CUMU is calculated as the cumulative unemployment (in 1982-87) above the level in 1981. Further, CUMOL concerns cumulative output loss in the period 1981-87, with the output gap assumed to be zero in 1980, etc.

APPENDIX 3 Corporatism and the slope of the Phillips curve

We reestimated the equations presented in table 6 including a corporatism (COR) and squared corporatism (COR^2) index as explanatory variables (replacing CI and CI^2). The COR-index is taken from Bruno & Sachs (1985). The most (least) 'corporatist' economy receives the lowest (highest) COR-value. As shown by the following results, the hypothesis that wage responsiveness to unemployment rises monotonically with the degree of corporatism (i.e. a negative coefficient on COR and no role for COR^2) is clearly rejected. On the other hand, a U-shaped relation between corporatism and wage responsiveness is accepted by the data: extremes show more flexible wages.

$$\underset{\quad}{NWRU} = \underset{(0.04)}{0.03} - \underset{(4.19)}{0.032IS} + \underset{(4.02)}{0.097COR} + \underset{(1.26)}{0.018OS} + \underset{(4.99)}{7.92ALMP} + \underset{(2.15)}{2.36\ Dsj}$$

$\bar{R}^2$ 0.91 SER 0.50

$$\underset{\quad}{NWRU} = \underset{(1.2)}{0.60} - \underset{(7.21)}{0.035IS} - \underset{(2.43)}{0.167COR} + \underset{(3.94)}{0.017COR^2} + \underset{(4.23)}{0.05OS} + \underset{(7.75)}{7.62ALMP} + \underset{(4.02)}{2.75Dsj}$$

$\bar{R}^2$ 0.93 SER 0.42

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