

# STRUCTURAL CONDITIONS AND MACROECONOMIC RESPONSES TO SHOCKS : A SENSITIVITY ANALYSIS FOR FOUR EUROPEAN COUNTRIES

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## INTRODUCTION

Insufficient flexibility in product and labour markets in European countries is often cited as a key factor behind their poor growth and employment performance in the **1970s** and early **1980s**<sup>1</sup>. Greater attention is now being paid to policies to promote competition and deregulation in these markets. More generally, appropriate microeconomic policies are increasingly regarded as an important precondition for better macroeconomic performance (OECD, **1987** and **1989**).

Yet it has proved difficult to assess the expected macroeconomic payoffs from microeconomic policies which seek to promote more rapid structural adjustment. First, some microstructural measures (such as deregulation or the reduction of non-tariff barriers) are, due to their very nature, difficult to quantify. Second, it is difficult to model the micro-macro links in a policy-relevant manner. Macroeconometric models rarely include structural policy instruments as explanatory variables in the key behavioural equations. Moreover, few, if any, empirical studies quantify the order of magnitude of the likely changes in behavioural parameters associated with a given reduction in barriers to competition. Third, there is uncertainty as to the effects of the removal of barriers to competition and increased flexibility on macroeconomic performance. It is commonly argued, although not unanimously accepted, that, if markets clear continuously, there is no room for active demand policies, while flexibility can also insulate the economy from the consequences of supply shocks<sup>2</sup>. Another widely debated issue relates to the extent to which potential growth could be raised by increased competition and flexibility. Little empirical evidence is available as to whether the propensity to innovate is likely to be greater in competitive but uncertain markets than in an imperfectly competitive world (Geroski, **1988**). There are also questions as to whether the steady-state growth of output could be affected by the magnitude of the fluctuations (as postulated by the hysteresis hypothesis).

This paper addresses only one aspect of the debate about the effects of increased competition in product and factor markets: the *macroeconomic response to shocks under different structural conditions*. It examines this issue by focusing on the response to shocks in the four largest European economies using the OECD's INTERLINK model of the world economy. A country is selected as "representative" in terms of labour and product-market flexibility. The parameter values of the key

behavioural relationships in the model encapsulating the features of the representative country are used to modify the same equations in other country models. In this way, the model simulates the responses to shocks in the major European countries that would occur *if they had the same degree of product and labour-market flexibility as the representative country.*

Hence, the paper seeks to quantify how much the European economies deviate *from a given baseline* according to alternative degrees of price and wage flexibility. The question of how the baseline itself is changed under different structural conditions is not addressed. Also, the important policy issue of what reductions in barriers to competition would be required to match the degree of flexibility prevailing in the representative country, if judged desirable, is not discussed in this paper.

The choice of the representative country is crucial for the purposes of the exercise in this paper. The United States appeared to be a natural choice for the major European countries, since much of the recent debate on flexibility hinges around comparisons between the United States as a flexible economy and Europe as an inflexible one. This is not the only possible choice: the alternatives could have been Japan or so-called "corporatist" economies such as the Nordic countries or Austria. Use of the former seemed less relevant as a benchmark for the major European countries and the latter was ruled out because small country models in INTERLINK do not have a sufficiently rich specification for fully capturing the institutional characteristics of those economies.

The ways in which measures to strengthen competition can be expected to affect aggregate pricing and wage-setting behaviour are discussed in Part I. A simple stylised macroeconomic model is used to illustrate the sources of potential uncertainty about the macroeconomic results of increased competition. In Part II, the INTERLINK wage and price equations for Germany, France, the United Kingdom and Italy are compared with those for the United States and the changes made to various parameters in these equations for simulation purposes are presented. Parts III and IV report the simulated responses of European countries to demand and supply shocks utilising the standard and modified versions of the INTERLINK model. The main lessons drawn from the paper are summarised in the Conclusions.

## I. INCREASED COMPETITION AND EFFECTS ON AGGREGATE PRICING AND WAGE-SETTING BEHAVIOUR

Increased competition can be expected to result in greater responsiveness of prices and wages to quantities in individual product and factor markets. This has repercussions at an aggregate level, mechanically, given the share of the more competitive sectors, and indirectly through demonstration effects on other sectors.

The following two sections examine first how prices and then wages might be affected by increased competition and how, in general, these changes might be reflected in econometric modelling of aggregate behaviour. The likely effects of behavioural changes on aggregate performance are analysed through a simple stylised macroeconomic model. The analysis shows that the combined outcome of the various effects can be ambiguous, so that an overall evaluation necessitates more detailed empirical investigation.

#### **A. The response of aggregate prices to increased competition in product markets**

Industries are shielded from competition in a variety of ways, through subsidies, regulation and barriers to imports. Depending on their nature, these instruments insulate production prices, sale prices, or effective factor costs from those prevailing for other industries and competitors. By reducing the importance of subsidies, regulation and import barriers, measures to increase competition make it more difficult for firms to set prices according to desired long-run profit margins. Thus, stronger competition should result in greater responsiveness of prices to demand-supply gaps in deregulated industries and, as a result, in the aggregate business sector. This presumption is confirmed by several empirical cross-industry studies showing that the flexibility of the steady-state profit margin with respect to demand pressures is directly related to the degree of competition prevailing in the market (Encaoua and Geroski, 1986). Increased competition in individual markets can be represented in standard macroeconomic price equations as an increased long-run sensitivity of prices to the demand-supply gap variable.

In addition, if import prices are among the determinants of aggregate price behaviour, increased foreign competition should also lead to an increased elasticity with respect to this variable; similarly, this should be reflected in higher sensitivity of imports to relative prices in trade equations.

The consequences of increased product-market competition on the speed of adjustment to the long-run desired profit margin itself are less clear-cut. The speed of adjustment of the current profit margin to a given target (determined *inter alia* by demand pressures and competitors' prices) depends to a large extent on the relative weights of contemporaneous and smoothed unit costs in the determination of the mark-up. It is generally argued that in the presence of transaction costs, the longer is a firm's intertemporal horizon the smoother is its pricing behaviour. If the expected life of firms is inversely proportional to the degree of competition, deregulation would then result in a faster transmission of changes in unit costs into prices. However, other hypotheses are also possible within a competitive framework: if demand is subject to uncertainty, a non-cooperative game between competitive firms could lead to tacit collusion, limiting the impact of cost changes on prices (see Encaoua and Michel, 1986, for a survey of the literature). In sum, the effect of greater

competition on price-smoothing behaviour appears to be theoretically and empirically uncertain<sup>3</sup>.

## **B. Product market flexibility and aggregate wage response**

How can increased flexibility in product markets be expected to affect nominal wage responsiveness to cyclical conditions? There are two aspects of wage behaviour that determine the degree of wage rigidity with respect to cyclical conditions. The first is the speed at which price changes are reflected in wage movements, i.e. the speed at which the Phillips curve shifts. The second is the sensitivity of wages to unemployment, i.e. the slope of the Phillips curve. If price expectations are assumed not to be systematically biased and to eventually catch up with actual price developments, the long-run rigidity of wages is entirely determined by the latter. The short-run dynamics of prices and output are affected by the length of the indexation lags. A quicker reaction of wages to price movements tends to decrease the effectiveness of demand policies and to magnify the negative consequences of adverse supply shocks, as argued by a wide body of literature. However, it is conceptually difficult to associate changes in indexation lags to specific policies for increased competition and flexibility. Indexation lags reflect the degree of money illusion as well as the terms of implicit and explicit wage contracts. While in principle the length of labour contracts could become the target of regulatory reform, experience in many countries has shown that the responsiveness of wages to inflation is relatively independent of official bargaining practices.

Rather than exploring the effects of changed sensitivity of wages to prices, this paper has consequently focused on the effects of increased sensitivity of nominal wages to unemployment. This is appealing for two reasons. First, it can be argued that market liberalisation in itself – for instance through reduction in government support for employment in ailing sectors – should make wages more responsive to unemployment. A higher probability for the employed work force to be fired in times of depressed demand or when relative factor prices change unfavourably might lead to greater wage concessions in the presence of perceived labour market slack. Through spillover effects, resistance to wage moderation in non-deregulated sectors will also be weaker, as lower wages in deregulated sectors reduce the reservation wage of workers in the rest of the economy. Second and maybe most important, it can also be argued that there exists an indirect link between product market liberalisation and labour market flexibility: some have even argued that the former is a quite powerful instrument for the improvement of the latter (Mitchell, 1985; Flanagan, 1984). Indeed, the demand for labour is a function not only of the substitutability of labour with other factors of production, but also of the demand function for the final product. If labour unions take into account the derived demand for labour in setting their wage demands (McDonald and Solow, 1981), the less price-elastic is product demand, the more rigid will be the response of wages. Thus, if

deregulation, abolition of trade barriers, or other measures lead to a decreased degree of monopoly in individual markets, wage setting is also likely to become more responsive to labour market conditions: hence increased competition in product markets may result in increased sensitivity of wages to unemployment.

### C. The effects of wage and price flexibility: a simple model

The effects of wage and price flexibility depend on the relative magnitude of key parameters. This can be illustrated by a simple macroeconomic model (incorporating no interest rate or wealth effects) formed by the equations discussed above: an aggregate price/supply equation, a cost identity, a wage formation equation and an aggregate demand equation. All the variables are expressed in natural logarithms:

$$p = c + \beta y + \eta(p^* - p) \quad \text{aggregate price equation} \quad [11]$$

$$c = \phi(w + w^t) + (1 - \phi)p^* \quad \text{cost function} \quad [2]$$

$$w = \alpha y + p \quad \text{Phillips curve} \quad [3]$$

$$y = d - p + \varepsilon(p^* - p) \quad \text{aggregate demand} \quad [4]$$

where  $y$  represents the deviation of real output from its long-run value,  $w$  is the wage rate<sup>4</sup>,  $w^t$  is the rate of non-wage labour costs,  $p$  is the domestic output price,  $p^*$  is the foreign price (appearing both as an argument of the cost function and as a determinant of the mark-up on costs and of the share of domestic output in total demand) and  $d$  is a nominal demand-push variable.

The key parameters for evaluating the effects of increased flexibility in wage and price setting are all expected to be positive. A high value of  $\alpha$  indicates a strong response of nominal wages to unemployment; similarly, a high value of  $\beta$  reflects a quick adjustment of prices to demand-supply gaps; a high  $\eta$  indicates a strong sensitivity of domestic prices to foreign competition, and finally a high  $\varepsilon$  represents a strong sensitivity of net exports to relative prices.

This system can be solved for  $y$  and  $p$  as functions of the shock variables  $d$  (domestic demand shock),  $w^t$  (domestic supply shock) and  $p^*$  (external supply shock):

$$p = \frac{\beta + \phi\alpha}{\mu} d + \frac{\varepsilon(\beta + \phi\alpha) + (1 - \phi + \eta)}{\mu} p^* + \frac{\phi}{\mu} w^t \quad [5]$$

and

$$y = \frac{1 - \phi + \eta}{\mu} [d - p^*] - \frac{\phi(1 + \varepsilon)}{\mu} w^t \quad [6]$$

where  $\mu = (1 - \phi + \eta) + (1 + \varepsilon)(\phi\alpha + \beta)$

Three polar cases are generated by this model. When  $\alpha = \beta = 0$  (the "pure Keynesian" case), prices are entirely unresponsive to demand conditions; and an

increase in aggregate demand results in a one-to-one increase in real output. Conversely, if  $\alpha$  and  $\beta$  are very large (the "classical" case), a demand shock will result in a large price reaction, with little output change. Finally, a very large response to foreign prices (high  $\eta$  and  $\varepsilon$ ) leads to the "small open economy" case: the price level is determined internationally, with domestic demand being satisfied domestically up to the point where costs do not exceed price.

For finite changes in the parameters  $\alpha$ ,  $\beta$ ,  $\varepsilon$  and  $\eta$ , one can compute the effects on the price and output multipliers of different demand and supply shocks (a minus sign indicates a reduction of the value of the multiplier):

Parameter affected:	Supply shock				Demand shock							
	External( $p^*$ )		Domestic( $w^t$ )		$(d)$							
	$\alpha$	$\beta$	$\eta$	$\varepsilon$	$\alpha$	$\beta$	$\eta$	$\varepsilon$	$\alpha$	$\beta$	$\eta$	$\varepsilon$
Effect on multiplier of:												
P	-	-	+	+	-	-	-	-	+	+	-	-
Y	-	-	+	-	-	-	-	+	-	-	+	-

The sign pattern of the response of the multipliers gives interesting insights. Output and price responses are nearly symmetric in the case of a demand shock: an increase in  $\alpha$  and  $\beta$  – the parameters indicating the influence of competition in labour and domestic product markets – is stabilising for output (in the sense of reducing the value of the multiplier *ceteris paribus*), but it leads to greater price fluctuations. The opposite is true for  $\eta$ , the responsiveness to external price competition, which has a dampening effect on prices and increases the output response. Increased responsiveness of imports to relative prices ( $\varepsilon$ ) has a somewhat different effect as it decreases the variance of both prices and output.

The origin – domestic or external – of a supply shock is an important source of difference for the response of the economy. When the shock originates internally, increased flexibility has an unambiguously stabilising effect on prices; all the flexibility parameters also contribute to a lower variance of output, with the exception of  $\varepsilon$  (since a higher value of this parameter implies a greater foreign "spill-over" of domestic output). If the shock is of external origin, however, a higher sensitivity of output prices to foreign competitors' prices – an increased  $\eta$  – becomes "destabilising" for both output and prices, while an increase in the other structural parameters  $\alpha$  and  $\beta$  remains stabilising. This result is not too puzzling: if the supply shock is an increase in foreign prices, price rigidity with respect to foreign prices implies a greater cushioning from the shock via lower domestic inflation *ceteris paribus* and, consequently, a reduced output loss. If exchange rates move to offset deviations

from purchasing power parities, changes in  $\varepsilon$  and  $\eta$  do not affect the responsiveness of the system to shocks.

## II. USING INTERLINK FOR A SENSITIVITY ANALYSIS: CHOICES AND PROBLEMS

As the illustrative model above has shown, the result of increased flexibility of all the parameters cannot be evaluated *a priori* in all cases, but must be analysed through numerical simulations based on an empirical macro model. For this purpose, the OECD's INTERLINK model was used<sup>5</sup>. Although it is not explicitly designed to analyse questions relating to structural adjustment – in particular problems related to changes in relative prices among economic sectors – the model contains a number of parameters that could in principle be affected by microeconomic measures to increase competition. This part begins by discussing the relevant parameters in the key equations and the modifications made to them; then, methodological problems linked to the various possible simulation strategies are reviewed.

### A. Changes in parameters

The general strategy of the simulations has been to modify the equations for the four major European countries to increase the responsiveness of wages and prices to quantities. It was decided to change key parameters so as to align their values with those incorporated in the United States model of INTERLINK. This choice was motivated by two considerations. First, as discussed below, the United States in general exhibits a higher estimated flexibility in prices and labour markets than European countries. As this feature has often been cited as an explanation for the differing macroeconomic behaviour on the two sides of the Atlantic, the choice is naturally appealing. Second, the use of the U.S. parameter estimates provides the advantage of a uniform reference point for the four European countries as the number of possible combinations of changed structural parameters is very large.

#### 1. The product market

The price block in INTERLINK for the seven major OECD countries revolves essentially around two leading prices: import prices and the price of business output. The latter is, in turn, mainly determined by the price of gross output of the non-energy business sector (denoted PQBNE), the focus of this discussion. The **growth rate** of PQBNE is homogeneous in unit costs – the combination of a smoothed component (CNORM) and of an instantaneous one (COST) – while its



level is homogeneous in a tradeable sector-weighted average of COST and competing non-energy import prices (PMQNE). The equation also captures the effects on the mark-up of excess demand, measured as the ratio of actual to potential output (IFU).

The basic specification is as follows (see Stiehler, 1987):

$$\begin{aligned} \Delta \ln (PQBNE) = & a_0 + a_1 \Delta \ln CNORM + [1 - a_1] \Delta \ln COST \\ & + a_2 IFU + a_3 W_1 \cdot \ln [PMQNE(-1) / PQBNE(-1)] \\ & + a_4 (1 - W_1) \cdot \ln [COST(-1) / PQBNE(-1)] \end{aligned}$$

where  $W_1$  represents the weight of tradeable non-energy goods and services.

The long-run sensitivity of prices to excess demand and to foreign competition is determined by the coefficients  $a_2$ ,  $a_3$ ,  $a_4$  the elasticities with respect to IFU and PMQNE are, respectively,  $a_2 / [a_3 W_1 + a_4 (1 - W_1)]$  and  $a_3 W_1 / [a_3 W_1 + a_4 (1 - W_1)]$ . By construction, the long-run elasticity of PQBNE with respect to unit costs is the complement to one of the import price elasticity.

The estimated parameter values of the current version of INTERLINK show a more competitive output price behaviour for the United States than those exhibited by the Japanese, German, French and, particularly, Italian equations (Table 1). The elasticities for these countries with respect to the demand/supply gap and to foreign prices are lower across-the-board. The comparison for the United Kingdom is more ambiguous: the elasticity with respect to IFU is somewhat lower, but that with respect to import prices is higher. Only full model-simulation properties can show if the U.K. output price behaviour is as sensitive to market conditions as that of the United States.

Table 1. Sensitivity of business output price to demand pressure and import prices and the price elasticity of imports'

	Semi-elasticity of business output price with respect to demand supply gap <sup>2</sup>	Elasticity of business output price with respect to import price <sup>2</sup>	Relative price elasticity of manufactured imports
United States	2.28	0.46	-0.80
Japan	1.13	0.27	-1.48
Germany	0.69	0.11	-0.75
France	1.40	0.14	-0.70
United Kingdom	1.97	0.62	-0.69
Italy	0.38	0.26	-0.60
Canada	1.75	0.45	-1.12

In the simulations discussed below, the estimates of the  $a_1$ ,  $a_3$  and  $a_4$  parameters for the U.S. model were substituted for those in the output price equations of the four major European countries.

Modifications were also made to the elasticity of manufactured imports with respect to relative prices. Here again, the U.S. price elasticity of import demand for manufactured goods seems to be higher than in the four major European countries (though to a lesser extent than for the parameters discussed before), and its value was also entered into the European manufactured goods import equations<sup>6</sup>.

Although logically symmetrical to the increased responsiveness of price to quantity disequilibrium, it is worth noting that the sensitivity of output to changes in prices was not modified, in view of the difficulties in identifying the requisite parameter changes.

## 2. *The labour market*

The comparison of real wage flexibility among countries on the basis of the estimated Phillips curves in INTERLINK presents some difficulties. While wages are fully indexed to consumer prices in the long run in all countries, the influence of the unemployment rate (denoted UNR) is linear for the U.S., Canadian and French models, and is non-linear for the German model (entering as  $\log UNR$ ), as well as for the Italian and Japanese ones (entering as  $1/UNR$ ). For the U.K. model, the unemployment rate enters linearly, but, in accordance with the hysteresis hypothesis, the equation is driven by the absolute difference between the current unemployment and a moving average of past unemployment. In addition, a cyclical labour productivity term is included in the U.S., German and Japanese equations.

In the employment equations, the adjustment lags to the desired level of employment are very short for the United States, but they are very long for Germany and Japan: median lags are respectively 0, 6 and 10 semesters (Table 2). In the German case, real wages are highly sensitive to cyclical productivity changes – induced by employment rigidity – so that real wages adjust downwards during a recession even if they do not react strongly to unemployment. Such a mechanism can be viewed as another channel of wage flexibility that allows output and hence employment shocks to be absorbed by wage movements. Indeed, measures of long-run real wage flexibility adjusted for the impact of productivity changes, computed on the basis of these wage equations, suggest that German real wages are every bit as flexible with respect to demand pressures as U.S. real wages<sup>7</sup>. Because of this, the German wage equation was not modified in the simulations. On the other hand, real wages do seem to be less rigid in the United States than in France, Italy, and the United Kingdom, and for these countries, the unemployment rate coefficient value was modified\* so as to get a long-run real wage flexibility as close as possible to the United States value, as reported in Table 2.

	INTERLINK wage sensitivity to unemployment rate <sup>2</sup>	Changes to the unemployment coefficient for simulations <sup>3</sup>	Wage sensitivity to labour productivity growth	Median adjustment of employment (in semesters) <sup>4</sup>
United States	-0.605 (UNR)	no change	0.274	0
Japan	0.071 (1/UNR)	no change	0.605	10
Germany	-0.389 (1n UNR)	no change	0.613	6
France	-0.293 (UNR)	-0.605	-	4
United Kingdom	-0.436 (UNR- $\alpha \sum_i \beta_i \text{UNR}_{-i}$ )	-0.605 ( $\alpha=0$ )	-	1
Italy	0.197 (1/UNR)	0.441	-	1
Canada	-0.506 (UNR)	no change	-	0

## B. Nature of the exercise

Several options are available to explore the consequences of the modifications to the wage and price equations just outlined. One strategy might involve the analysis of the transition path from a less to a more competitive economy. In this case, the "shock" is represented by the change in the critical parameters, and the simulation consists in solving the model for a given set of more or less arbitrary new add-factors. However, such an exercise would critically depend on a number of arbitrary factors. First, the short-term response of the economy depends on the starting point of the simulation period: for instance, if the economy is made more price-responsive at the peak of a cycle, the initial impact of the parameter shock will be inflationary and will have an unfavourable impact in the short run on growth; the opposite could happen if one started from a cyclical trough. Second, the speed of adjustment of the modified economy to its steady-state hinges on the reaction of real interest rates. The latter are largely determined by assumptions about the stance of monetary policies. Finally, generating a new long-run solution is a very controversial exercise, as uniqueness of the steady-state of large macro-models is not always guaranteed.

Hence, rather than exploring in detail the transition path to the long-run features of a new baseline, this paper focuses on the responses to shocks of different economies characterised by alternative degrees of flexibility. This was done by utilising the same baseline as was adopted for the unchanged model<sup>5</sup>, after computing

add-factors consistent with observed data and the new parameters, and refitting the constants of the modified equations. This latter procedure neutralises the effects of parameter changes on the implicit natural rate of unemployment<sup>10</sup> and equilibrium profit margin.

### III. SIMULATION RESULTS: AGGREGATE DEMAND SHOCKS

Several simulations of supply and demand shocks were carried out on the basis of the parameter changes discussed in Part II. The reference period is 1980-1989<sup>11</sup>; model solutions were computed in both single-country mode and in linked mode to take account of external feedbacks. The assumptions regarding fiscal and monetary policies are discussed below; simulations were also run under both fixed and flexible exchange rates. In the latter case, exchange rates in INTERLINK are modelled so as to maintain an approximate purchasing power parity among countries, with due regard to the influences of interest rate differentials and the cumulated stock of net foreign assets (Holtham, 1984). This Part reviews the results of expansionary demand shock simulations, in a country in isolation and for Europe as a whole in linked mode.

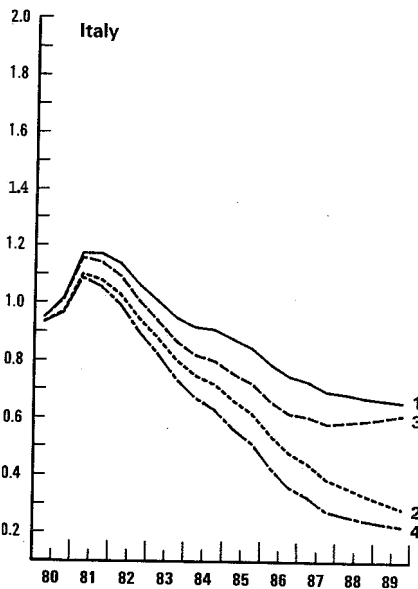
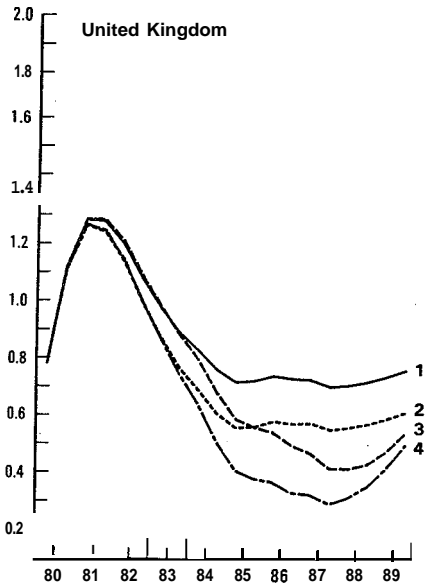
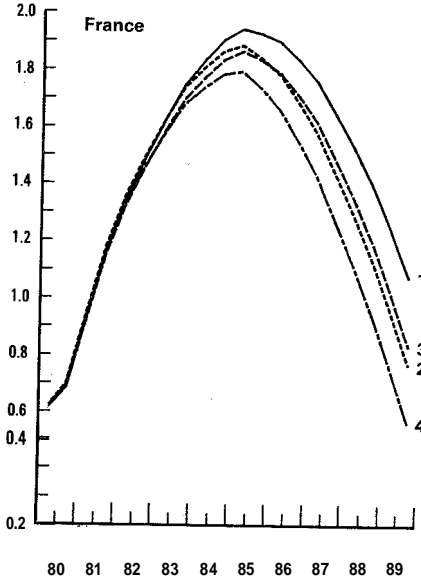
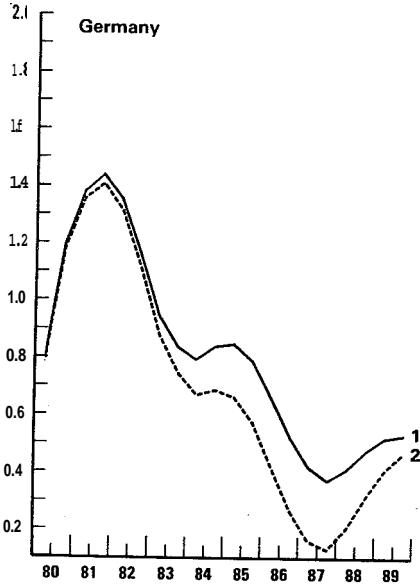
#### A. Expansionary demand shock in single-country mode

The expansionary demand shock was defined as an *ex ante* permanent increase in non-wage government consumption equal to 1 per cent of baseline real GDP, with accommodating monetary policy and fixed nominal exchange rates. The assumption of an unchanged nominal short-term interest rate prevents the interest rate crowding-out that would otherwise offset the effects of the fiscal stimulus. Alternative simulations (not reported here) show that the results of the exercise are not substantially modified with a non-accommodating monetary policy or with floating exchange rates.

Compared to the simulation with the unchanged model, *increased price flexibility* results in weaker real output gains from a demand stimulus (Chart 1A). *Increased real wage sensitivity* to the unemployment rate yields broadly the same results. When combined, the effects of increased flexibility of both wages and prices are roughly additive. The cumulated losses in real output with respect to the unchanged model (i.e. the cumulated difference between the output gains with respect to the baseline for the unchanged model and those for the modified model incorporating wage and price flexibility) are reported in Table 3. The losses are relatively

CHART 1A  
**POSITIVE DEMAND SHOCK**  
 Single-country mode, fixed exchange rates and nominal interest rates

Real GDP response as % of baseline



Model versions  
 1. Unchanged parameters.  
 2. Increased output price sensitivity to demand-supplygap and import prices. Increased relative-price elasticity of demand for

imports.  
 3. Increased wage sensitivity to unemployment rate  
 4. Full-flexibility (versions 2 + 3).

Table 3. Expansionary fiscal shock :  
cumulated output losses from increased flexibility<sup>1</sup>

Year	Germany	France	United Kingdom	Italy
1	-0.01	0.00	0.00	-0.04
5	-0.31	-0.20	-0.48	-0.78
7	-0.80	-0.67	-1.24	-1.54
10	-1.37	-2.12	-2.47	-3.02

1. Cumulated absolute difference between simulated real GDPs with unchanged model and with model with increased flexibility, as a percentage of base-year real GDP.

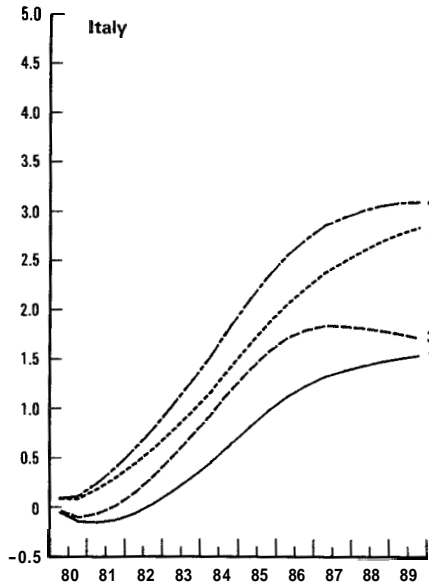
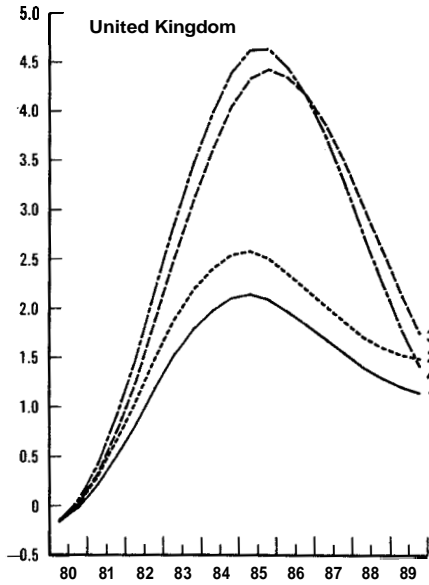
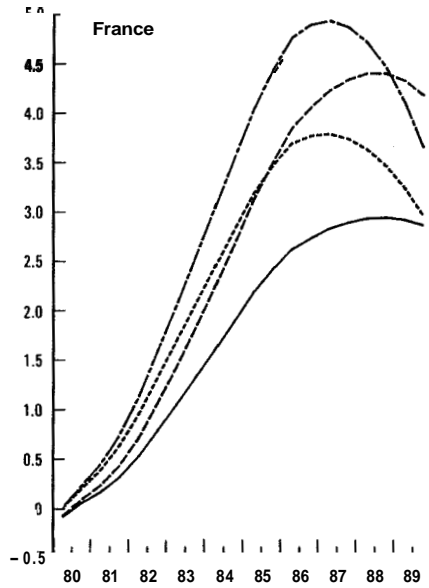
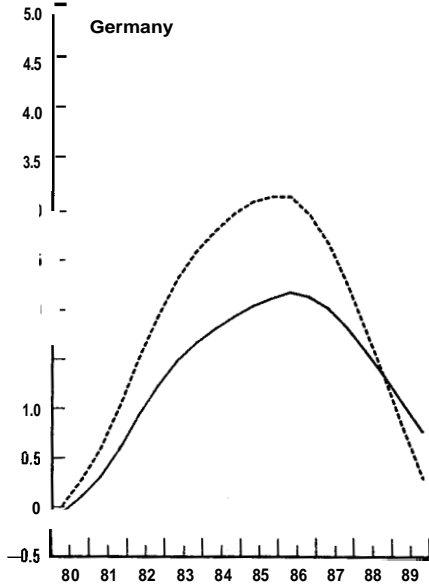
small in Germany (1.4 per cent of baseline output), which is not surprising given that only the degree of price flexibility is varied in the German simulation. At the other extreme, the losses are very large in Italy (3 per cent), suggesting that the degree of price and wage flexibility for that country is the farthest away from the U.S. reference.

The behaviour of output is strictly linked to the price response to the demand shock. The aggregate demand stimulus is more inflationary in every country when flexibility of prices and/or wages is increased (Chart 1B). The positive differential between the *level* of the consumption deflator, with and without combined flexibility, increases at least until the sixth year of the simulation period (for Italy, the price differential continues to rise slightly). The higher cumulated price increases of the "flexible" model are a consequence of the increased sensitivity of prices to the rate of capacity utilisation and of wages to the rate of unemployment, despite the greater restraining influence of import prices on domestic prices. As a result of the decline in competitiveness, the external contribution to growth deteriorates. Moreover, despite lower real interest rates, private consumption is depressed by the acceleration in inflation, because of negative implicit wealth effects.

The response of the unemployment rate broadly follows the pattern of real GDP, with the fall in unemployment generally being less than in the case of the unchanged model (Chart 1C). However, there is an important difference between the effects of each individual element of flexibility. Following a demand stimulus, the fall in the unemployment rate is steeper when prices alone are made more flexible, compared with when wages only are made more responsive to unemployment<sup>12</sup>; a relatively small difference is registered for France, the United Kingdom and Italy between the flexible-prices case and the standard model, despite a lower output gain. For Germany, the unemployment rate becomes even lower at the end of the period when prices are flexible compared with the simulated path with unchanged parameters.

CHART 1B  
**POSITIVE DEMAND SHOCK**  
 Single-country mode, fixed exchange rates and nominal interest rates

Consumption deflator response as % of baseline



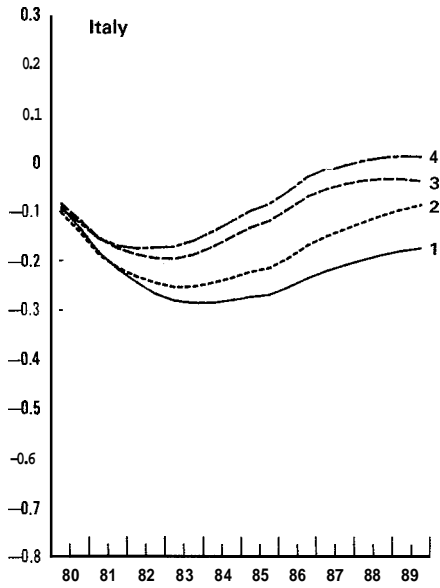
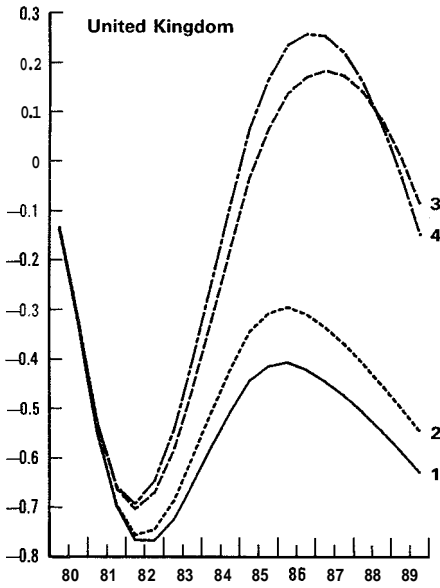
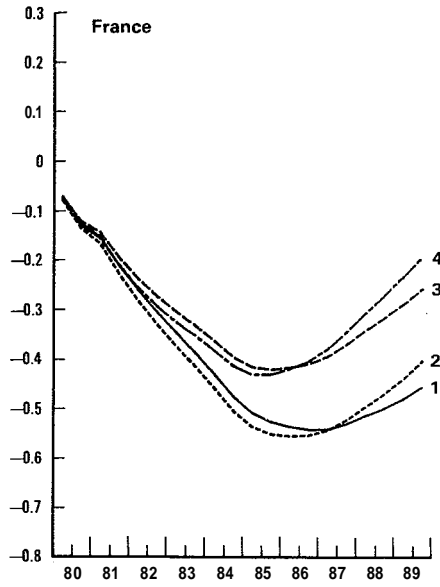
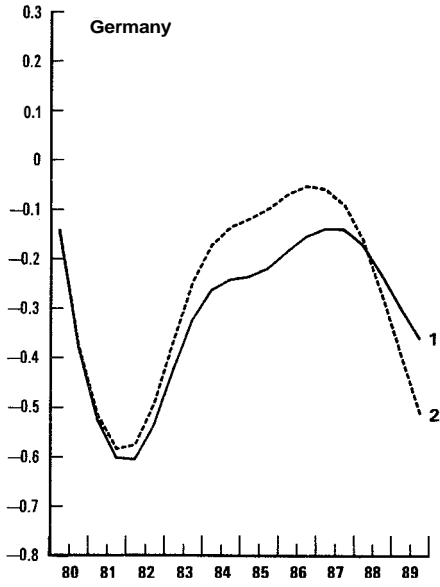
Model versions

- 1. Unchanged parameters.
- 2. Increased output price sensitivity to demand-supplygap and import prices. Increased relative-price elasticity of demand for

- 3. Increased wage sensitivity to unemployment rate
- 4. Full-flexibility (versions 2 + 3).

CHART 1C  
**POSITIVE DEMAND SHOCK**  
 Single-country mode, fixed exchange rates and nominal interest rates

Unemployment responses as % point difference from baseline



Model versions

- 1. Unchanged parameters.
- 2. Increased output price sensitivity to demand-supply gap and import prices. Increased relative-price elasticity of demand for

- imports.
- 3. Increased wage sensitivity to unemployment rate
- 4. Full-flexibility (versions 2 + 3).



## B. The effects of a concerted European demand stimulus

The effects of a concerted European demand stimulus were simulated under the assumption of unchanged nominal exchange rates. The fiscal multipliers of output (Chart 2A) and prices (Chart 2B) are, not surprisingly, larger in linked mode than in unlinked mode; but the differences between the results of the unchanged model and those of its modified version are similar to those discussed above in single-country mode. When the four major European economies are made simultaneously more competitive, the output response is weaker and the price response stronger. But the effectiveness of a concerted fiscal shock for any one given country could vary, depending on the relative speed of deregulation of partner countries: a country would be more penalised in terms of output if it had deregulated alone, although the difference is only slight when compared to the case where there is a concerted deregulation. Conversely, if a country does not deregulate while the others do, the gain to the free-rider country is greater than in the other cases. In the particular case of France, the gains from free-rider behaviour come largely from the consequences of German deregulation, given the importance of the output losses due to increased imports and the weight of the German market in French trade.

In sum, when price and wage movements play a more active role in clearing product and labour markets, a positive aggregate demand shock is more inflationary and produces an output gain generally smaller than that generated by a less price-responsive economy. This apparently uncomfortable message can also be read in a different, more encouraging way: for the corollary is that restrictive fiscal policies could be less costly in terms of output losses and more disinflationary than in the case of a less flexible economy<sup>13</sup>.

## IV. SIMULATION RESULTS: SUPPLY SHOCKS

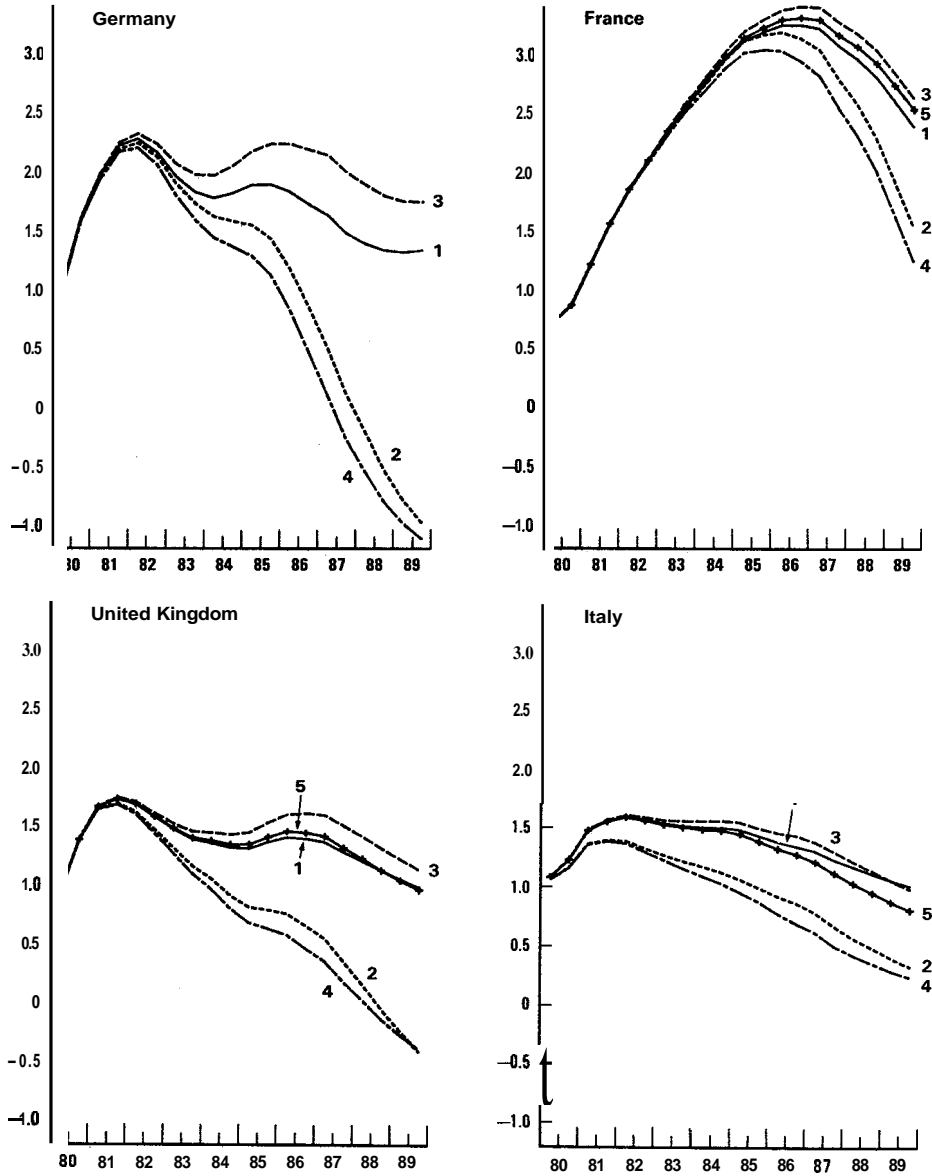
As discussed in Part I, the effect of increased flexibility on the response to supply shocks can be expected to differ according to the origin of the shock. Consequently, two types of supply shocks were simulated, one having a domestic origin and the other an external one: an increase of non-wage labour costs equivalent to 1 per cent of nominal GDP carried out in single-country mode and a sustained 20 per cent increase in the price of imported energy undertaken in linked mode. Both sets of simulations assume unchanged real government expenditures; in the case of the external shock, fixed nominal interest rates and fixed money supply were simulated in turn.

CHART 2A

## CONCERTED EUROPEAN POSITIVE DEMAND SHOCK

Linked mode, fixed exchange rates and nominal interest rates

Real GDP response as % of baseline



Model versions

1. Unchanged parameters.
2. Price and wage equations parameters are changed simultaneously for France, the United Kingdom and Italy (model version 4 in Charts 1). Only price equation parameters are changed for Germany (model version 2 in Charts 1).

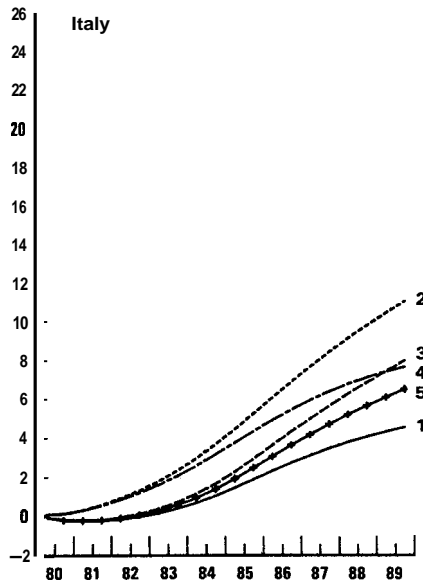
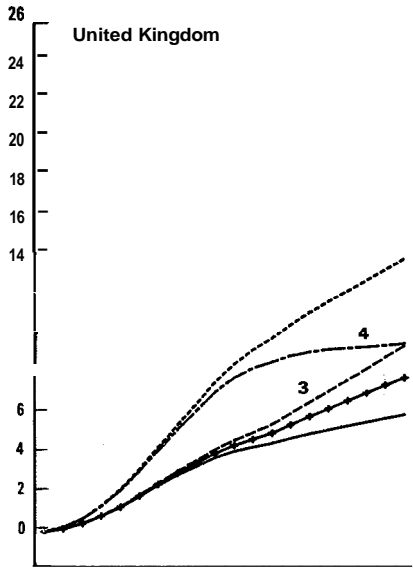
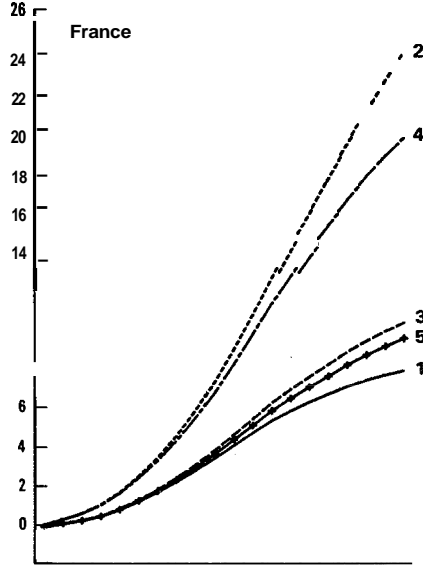
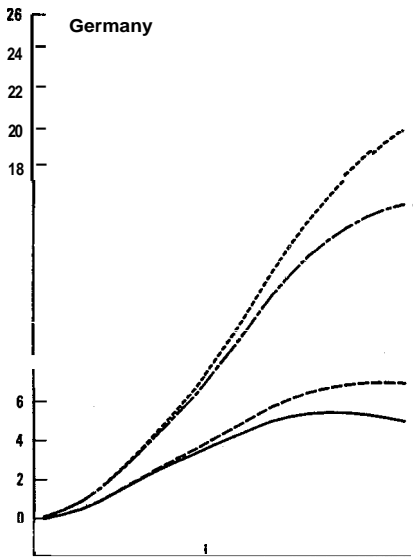
3. Previous version except for the concerned country which is assumed not to deregulate.
4. The concerned country deregulates alone.
5. Only Germany deregulates.

CHART 2B

# CONCERTED EUROPEAN POSITIVE DEMAND SHOCK

Linked mode, fixed exchange rates and nominal interest rates

Consumption deflator responses as % of baseline



Model versions

- 1. Unchanged parameters.
- 2. Price and wage equations parameters are changed simultaneously for France, the United Kingdom and Italy (model version 4 in Charts 1). Only price equation parameters are changed for Germany (model version 2 in Charts 1).

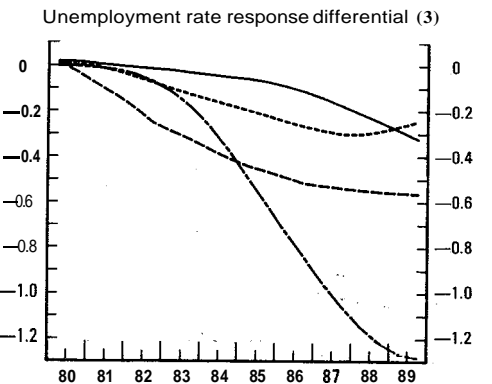
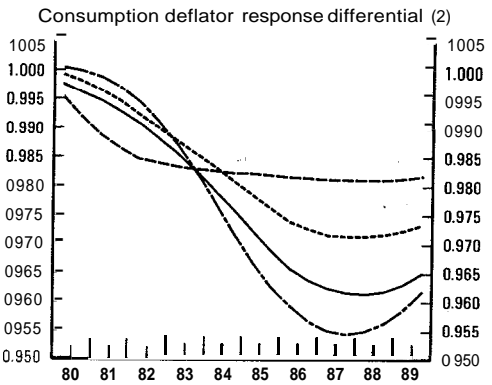
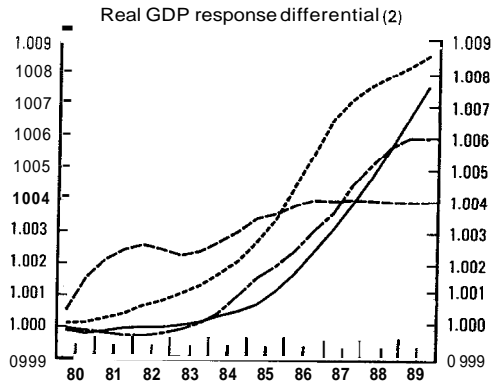
- 3. Previous version except for the concerned country which is assumed not to deregulate.
- 4. The concerned country deregulates alone.
- 5. Only Germany deregulates.

CHART 3

**DOMESTIC SUPPLY SHOCK (1)**

Single country mode, fixed exchange rates and nominal interest rates

— France  
 - - - Germany  
 - - - Italy  
 - - - United Kingdom



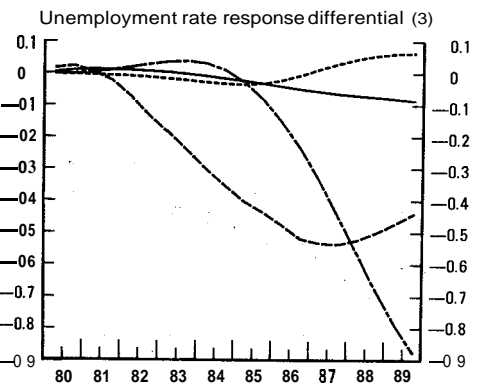
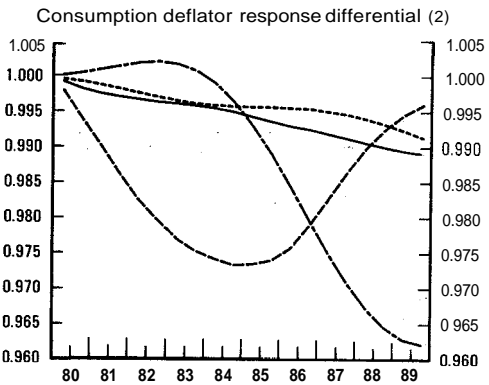
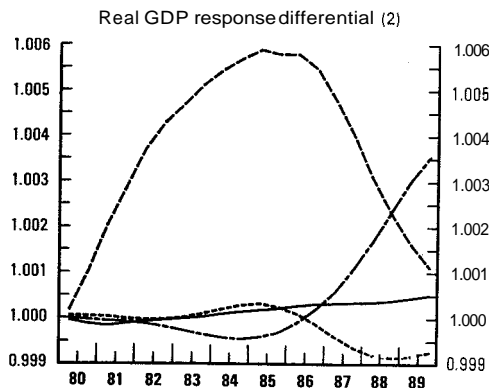
1. Non-wage labour cost shock as described in the text.
2. Ratio of flexible to unchanged model results.
3. Absolute difference between flexible and unchanged model results.

CHART 4

**EXTERNAL SUPPLY SHOCK (1)**

Linked mode, fixed exchange rates and nominal interest rates

— France  
 ..... Germany  
 - - - Italy  
 - - - United Kingdom



1. Baseline level of energy price increased by 20 per cent.
2. Ratio of flexible to unchanged model results.
3. Absolute difference between flexible and unchanged model results.

### A. A domestic supply shock

The effects of the domestic labour cost supply shock on real **GDP**, unemployment and prices under unlinked simulations are displayed in Chart 3. Only results with fixed exchange rates are shown; simulations not reported here yielded similar results with floating exchange rates. The real GDP and consumption deflator lines represent the ratio of the results of the flexible model to those of the unchanged one, while the unemployment rate is the absolute difference between the two simulations. The results for the unmodified model and the model incorporating full product and factor market flexibility are clear-cut. Increased wage and price flexibility have a positive effect on output, limiting the losses due to the negative domestic shock, albeit with some variation across countries. The positive effect is dominant from the start for Italy and for Germany (where, by construction, the only source of increased flexibility comes from the product market), but builds up only gradually for the United Kingdom and France.

As in the case of a demand shock, the behaviour of unemployment under the unchanged and changed models follows rather closely the behaviour of output. Additional simulations (not reported here) also showed that increased labour market flexibility was the single most important source of moderation of the rise in unemployment in response to the domestic shocks, through its favourable effects on relative factor prices.

### B. An across-the-board energy shock

While the message of the simulations for shocks of domestic origin is unambiguous, in contrast, the consequences of an increase in the imported energy price, when the four major European economies are made simultaneously more competitive, do depend on the exchange-rate regime and the interest-rate policy assumed. Cumulated output losses or savings from increased flexibility, with fixed and flexible exchange rates and alternative monetary policies, are reported in Table 4.

The effects of the energy shock when both exchange rates and nominal interest rates are maintained fixed in nominal terms are shown in Chart 4. The behaviour of output and price differs markedly among countries. In the case of the United Kingdom, there is little difference between the response of the unchanged and flexible models for the first five years, as the effects of increased price sensitivity to world inflation and to the market slack virtually cancel each other out. In the later part of the simulation with the modified model, the price response becomes more favourable and translates into a better output performance. The opposite pattern is observed in the case of Germany and Italy, where an initially favourable differential of output responses is reversed in the out years. In the latter country, this effect is attributable to the fact that the inflation response is reversed, probably given the immediately very favourable response of unemployment, leading to a progressive relative **loss** of competitiveness and to a reduction of consumption *via* wealth effects,

Table 4. Adverse external supply shock :  
cumulated output savings from increased flexibility<sup>1</sup>

		Germany			France		
Exchangerate :	Monetary policy :	Fixed FixedIR	Floating FixedIR	Floating FixedMS	Fixed FixedIR	Floating FixedIR	Floating FixedMS
Year							
1		0.01	0.01	0.03	-0.01	-0.01	0.03
5		0.06	0.34	1.05	-0.03	0.06	1.52
7		0.07	1.00	2.29	0.07	0.45	3.78
10		-0.28	1.34	4.30	0.35	0.68	8.62
		United Kingdom			Italy		
Exchangerate :	Monetary policy :	Fixed FixedIR	Floating FixedIR	Floating FixedMS	Fixed FixedIR	Floating FixedIR	Floating FixedMS
Year							
1		-0.00	0.00	0.35	0.07	0.06	0.09
5		-0.17	0.46	0.74	3.27	3.83	2.70
7		-0.12	0.70	2.21	6.83	9.53	9.44
10		1.04	-0.63	6.46	7.95	12.09	16.88

that more than compensates for the reduced real interest rates. In the case of Germany, on the other hand, the deterioration of the relative output performance in the flexible case is attributable to the stronger deterioration of price competitiveness *vis-à-vis* its European partners, given their larger gains in flexibility<sup>14</sup>. It is only for France that the path of both the output and price response differentials gives an unequivocal answer, greater flexibility reducing the variance of these two variables.

Introducing flexible exchange rates tends to neutralise the consequences of relative price changes on the trade balance. The behaviour of the real interest rate, which depends ultimately on the assumed stance of monetary policy, is then crucial for the output response. For France and Italy, floating exchange rates do not alter substantially the results just discussed (Chart 5). The responses of both the United Kingdom and Germany are however dramatically affected by this change. In the case of Germany, the floating exchange-rate regime leads to a better output performance for a much longer period of time, as inflation is significantly lower compared with the baseline results. In the last three years of the simulation, however, the inflation performance starts to be reversed and, as a consequence, the output gains become weaker. Overall, the results for both output and prices are better than under

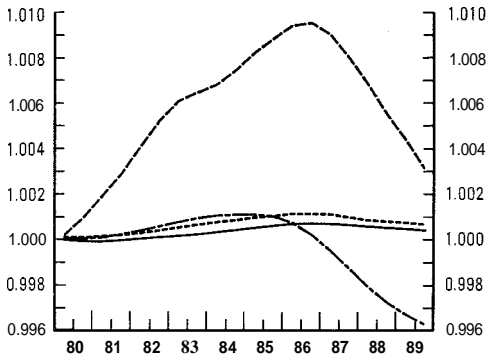
CHART 5

**EXTERNAL SUPPLY SHOCK (1)**

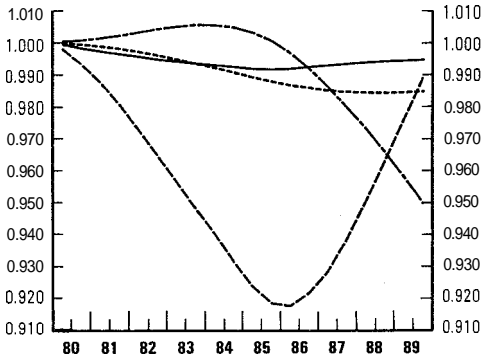
Linked mode, floating exchange rates and fixed nominal interest rates

— France  
 - - - Germany  
 - - - Italy  
 - - - United Kingdom

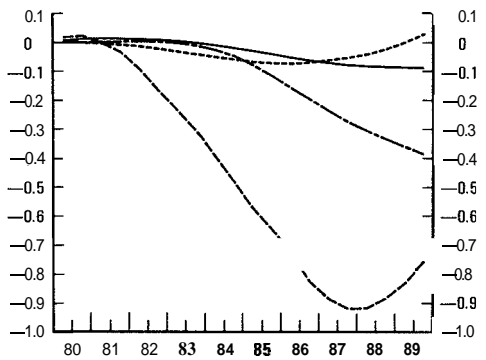
Real GDP response differential (2)



Consumption deflator response differential (2)



Unemployment rate response differential (3)



1. Baseline level of energy price increased by 20 per cent.
2. Ratio of flexible to unchanged model results.
3. Absolute difference between flexible and unchanged model results.

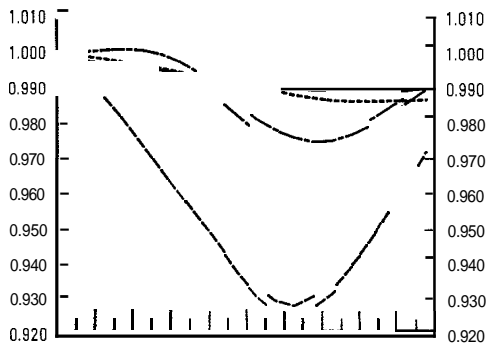
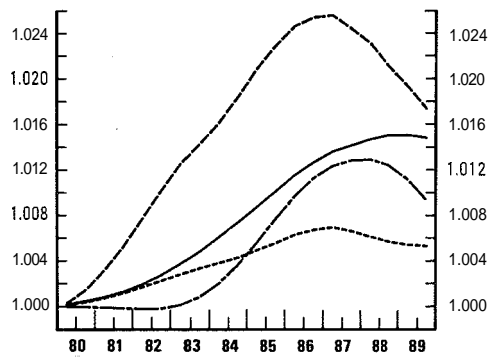
CHART 6

**EXTERNAL SUPPLY SHOCK (1)**

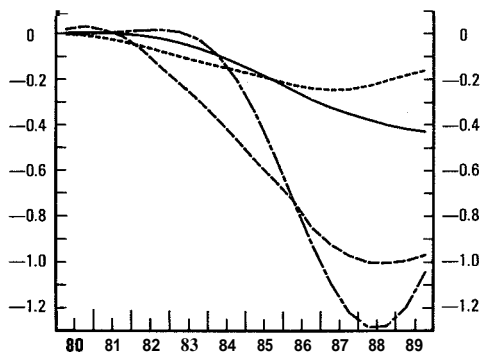
Linked mode, floating exchange rates and fixed money supply

— France  
 - - - Germany  
 - - - Italy  
 - - - United Kingdom

Real GDP response differential (2)



Unemployment rate response differential (3)



1. Baseline level of energy price increased by 20 per cent.
2. Ratio of flexible to unchanged model results.
3. Absolute difference between flexible and unchanged model results.

fixed exchange rates. In the case of the United Kingdom, on the other hand, the less inflationary response in the competitive case leads to a fall in domestic demand *via* the strong increase in real interest rates from the fifth year. Therefore, the response of a more flexible economy to an external supply shock cannot be judged without consideration of the monetary policies adopted. When the money supply is maintained fixed, the response of real interest rates is roughly neutralised. The only remaining channel of the less inflationary response in a more flexible economy is *via* favourable wealth effects on consumption. The consequence for the U.K. simulation with fixed money supply is clear-cut: the removal of the deflationary effect of higher interest rates permits a **positive** output response, reversing the previous results (Chart 6).

## CONCLUSIONS

This study has focused on the effects of changes in structural conditions, namely an increase in price and wage flexibility, on macroeconomic responses of the four major European countries to a similar set of shocks. It does not address the question of how increased competition could raise potential output and lower the steady-state level of prices. This exercise has been undertaken by aligning the behaviour of product and labour markets in Europe in the INTERLINK model to the more flexible behaviour that is thought to characterise these markets in the United States. The main lesson of these simulations is that the degree of competition in product and labour markets does have an important bearing on the functioning of the economy.

When the economy is subject to an aggregate demand shock, greater flexibility of wages and prices results in smaller variance of real output and larger variance of prices. Hence, regardless of whether insufficient wage and price flexibility *per se* is responsible for the poor European performance in the 1970s and early 1980s, it can be argued that the relatively restrictive fiscal and monetary-policy stance adopted by the major European countries since the end of the 1970s would have had a less depressive influence on growth if it had been accompanied by a vigorous reduction in barriers to competition. Increased flexibility is thus "preferable" when the intention of governments is to reduce public expenditures, since output losses are smaller and disinflation gains greater.

In the case of an adverse supply shock, the results are somewhat more mixed. Output losses will generally be lower when prices and wages are more sensitive to market conditions. These stabilising properties might seem preferable for a risk-averse policy-maker, although in the case of a favourable supply shock fewer benefits will accrue in terms of output gains. However, in the particular case of an



external shock (such as an oil price change), the behaviour of a more flexible economy is affected by opposing influences. The exchange-rate and monetary-policy stance can determine whether the overall response will be more favourable than in the case of a more rigid economy. The results presented here suggest that, for some countries, flexibility, when the four major European economies are made simultaneously more competitive, is desirable as regards output and prices only with floating exchange rates and interest-rate accommodating policy.

A second interesting feature of the simulation results concerns the respective contributions of the various areas of liberalisation. Increased Competition in product or labour markets leads to broadly the same outcome in terms of output and prices. In fact, the "advantages" from flexibility in the two markets are almost additive in the case of a demand shock. This is not necessarily the case with respect to the response of relative factor costs, and consequently of labour demand and unemployment. Compared with a more rigid economy, a demand stimulus is not significantly less favourable to employment if the degree of real-wage sensitivity to unemployment is left unchanged, while prices are made more responsive to demand-supply gaps. Conversely, a restrictive demand shock might be more costly in terms of employment losses when product markets alone are deregulated, compared with the case where competition in the labour market increases. The same conclusion can be drawn for an adverse supply shock.

Third, on the basis of the comparison of wage and price equations using the United States as a reference, a certain ranking in the degree of rigidity appears among the four European countries, with Germany being the least rigid and Italy being the most rigid. The same pattern is reflected in the simulation results. Consequently, the challenges posed by deregulation and increased competition would be different across Europe. In this respect, the macroeconomic policy stance is important. For instance, in the context of the pursuit of greater competition in the run-up to the internal market by 1992, the case for fiscal stimulus would be weaker, other things being equal, for countries that had rather rigid product and labour markets, as prices and wages would become more responsive to aggregate demand pressure. If a concerted demand expansion were attempted, the temptation to indulge in "free-rider" behaviour could then be great, as a country that does not deregulate can expect to benefit to a greater extent from other countries' expansionary demand policies. On the other hand such a country would find any disinflationary policies more painful. Some degree of co-ordination in structural and macro policies among countries may well be desirable.

## NOTES

1. Cf. Lawrence and Schultze (1987) and references therein, or Dreze and Wyplosz (1988).
2. This standard view has recently been challenged by Delong and Summers (1986, 1988).
3. A number of empirical studies have failed to find a negative correlation between the speed of price adjustment to some given target price and the degree of concentration (Domberger, 1979; Encaoua and Michel, 1986, *op. cit.*).
4. The specification of the Phillips curve in this simple model is in levels, rather than rates of change. The latter specification would make analytical results more cumbersome, while leaving the basic result unchanged. An increase in demand, for instance, would result in higher *rates of inflation*, rather than a higher *price level*, as seen above.
5. The INTERLINK model is a representation of the world economy which combines a set of small to medium-sized semi-annual macroeconomic models, one for each OECD Member country, with trade linkages between these countries and six non-OECD zones. The model and its associated data systems serve as important tools in the OECD's macroeconomic work, notably in the construction of short and medium-term projections and the analysis of macroeconomic policies. The broad coverage of the OECD country models largely reflects the basic requirements for the national accounts breakdown of real and nominal GNP, factor demands, inflation, financial conditions and the public and private sector appropriation accounts, associated with the structure of projections for the OECD *Economic Outlook*. The larger country models include a more detailed treatment of expenditure components, price deflators and also the government sector. The models for the seven major economies, also production function and supply-based elements in the determination of output, prices and factor demands. Richardson (1988) summarises the main features of the OECD INTERLINK model. A detailed guide to the most recent developments in the overall structure and simulation properties of INTERLINK is given by Richardson (1987a, 1987b). Llewellyn *et al.* (1985) discuss the general background, role and functions of INTERLINK in OECD work.
6. Only relatively marginal effects on the aggregate behaviour of the model can be expected from this change, as the original parameters are fairly close to each other. The elasticities of other imports of goods and services were not modified, given the greater difficulties in obtaining reliable comparisons across countries; in any case it is likely that manufactured goods would show the largest response to abolition of trade barriers.
7. Indicators of long-run real wage rigidity adjusted for the impact of productivity changes are computed following the method presented in Coe and Gagliardi (1985). Results are very similar for Germany and the United States. A recent study by Bell (1986) comes to a similar conclusion.
8. When the influence of the UNR term is not linear, in order to get an equivalent coefficient in terms of linear UNR impact, the basic UNR coefficient must be multiplied by  $-1/UNR^2$  for a  $1/UNR$  specification, and by  $1/UNR$  for a log UNR specification. UNR is some reference unemployment rate, such as its mean value over a certain period.
9. This strategy raises the question of the baseline dependency of simulations and the definition of shocks. It is likely that some of the structural features of an economy would be modified if it became more price-sensitive. Identical shocks may not have the same consequences under different starting

conditions. For instance, the share of the public sector could be expected to differ in a more competitive economy. However, the demand shocks, defined as an increase of public expenditure by a given percentage of real GDP, are homogeneous, as various tests show that the simulation results were not significantly baseline dependent. It is worth mentioning that, consequently, in this case, the importance of increased flexibility can be compared across countries. On the other hand, certain kinds of supply shocks appear to be more baseline dependent. In the case of an oil shock, even when the energy price increase is uniform across countries, its impact effects depend on the importance of net imports of energy and the structure of the fiscal system. In the case of a non-wage labour cost shock, even when the increase is in terms of nominal GDP and uniform across countries, its effects depend on the share of non-wage costs in total costs.

10. Real wage behaviour in INTERLINK can be characterised roughly as follows:

$$rw = q - a(UNR - UNR^*) = (q + aUNR^*) - aUNR$$

with  $rw$ , the growth rate of real wages,  $q$  trend labour productivity growth,  $UNR^*$  the natural unemployment rate.  $q + aUNR^*$  corresponds to the constant term,  $C$ , of the usual Phillips curves, so that  $UNR^*$  is given by  $(C - q)/a$ .

11. The data for the simulation period correspond to the data bank for the *OECD Economic Outlook 42*.
12. The reason why for all countries, the unemployment response is very similar in the flexible-prices case to that in the unchanged model, despite lower output gains, is the following: the stronger reaction of prices to the demand-supply gap leads to a higher user cost of capital, via the increase in the investment deflator. As wage behaviour remains unchanged, the demand for labour is stimulated, due to a substitution effect following the reduction in the relative price of labour.
13. Under identical assumptions (fixed exchange rates and fixed nominal interest rates), a restrictive fiscal shock is symmetrical to an expansionary shock output losses and gains in disinflation are respectively smaller and larger in a flexible economy than in a more rigid one. Simulations (not reported here) show that keeping money supply unchanged, thus allowing interest rates to decrease, would be more stabilising in the face of a restrictive fiscal shock than the combination of a flexible economy and fixed nominal interest rates. In other words, policies to encourage greater flexibility could not be viewed as a perfect substitute for stabilising monetary policy in such a context. However, combined with fixed money supply, increased competition is again more stabilising and helps fiscal policy to reach its target with less cost. As already indicated in Section III. A, this outcome is not jeopardised even if the exchange rate is allowed to appreciate, as only the positive effect of disinflation on trade performance is neutralised not its effects on private consumption.
14. Simulations in unlinked mode confirm the favourable effect of increased price flexibility on the responses of the German economy.

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