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Analysis of the stabilisation mechanisms of macroeconomic models : a comparison of the Eurolink models

A. BUCHER and V. ROSSI

Internal Paper

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The Directorate-General for Economic and Financial Affairs,
Commission of the European Communities,
200, rue de la Loi
1049 Brussels, Belgium

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Contents

I. Introduction

Although there may be agreement on many of the basic theoretical schemes and stabilisation mechanisms present in the economy, the overall evaluation of the behaviour of an economic system requires quantification of the size and speed of the adjustment process. Even if a model is not more sophisticated than a simple IS/LM system, its properties may be very sensitive to a few key parameters. This is amply illustrated here by the very different properties of the Eurolink models which are all based on the same extended IS/LM framework.

The Eurolink system includes large scale quarterly macroeconomic models for four European countries; Germany, France, Italy and the UK. The full system incorporates a trade linkage module and a small scale model of the USA, but the focus here is on the four European models in isolated mode (the linkage changes only the import price and export volume determination). The versions presently used are Sysifo for Germany (University of Hamburg), Metric for France (INSEE), Prometeia for Italy (Prometeia) and the Oxford model for the UK (Oxford Economic Forecasting Ltd., Templeton College). They are all used in these centres for forecasting and simulation purposes.

The Eurolink models are particularly appropriate for comparison as they all represent about the same state of the art for macroeconomic model building. They were all developed in the 1970s when the problems of open economies, inflation and productivity slowdown among others, required a fuller treatment of the external and financial sectors and of the wage/price/competitivity linkage. The size of these models is of no particular interest for a quantification of the dominant mechanisms. The degree of disaggregation[1] may imply more non-linearities in the system

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[1] Sysifo is disaggregated into 15 branches and Metric into 8 branches. The Oxford model and Prometeia distinguish 3 branches, Oil, Manufacturing and Non-manufacturing for the former, Agriculture, Industries and Services for the latter.
The size of the models reflects the degree of disaggregation: 853 equations for Sysifo, 844 for Metric, 624 for Prometeia and 207 in the Oxford model.
More detailed information about the Eurolink model is given in both national model documentation and Eurolink survey (Commission note n° II/226/84).

but usually these have negligible effects or are even neutralised to conform to theoretical patterns (for example, Deaton and Muellbauer 1980).

Although specifications are derived from quite similar theoretical schemes, they depend also on the available econometric evidence. In cases where this evidence is weak or unstable, the approach adopted by the model builders may vary according to the overall acceptability of the model's properties. Thus these models reflect a compromise between empiricism and theoretical considerations. They provide a suitable basis for the identification and quantification of key mechanisms regulating the economies. The possibility of trade-offs between growth and inflation may be assessed.

As the models have been validated by national experts and represent structures supported by data, this study should provide information from which some assessment of the important differences between the four countries can be made.

The methodology adopted for the analysis of the model's properties is described in Section II with detailed comments on the expansion process and income distribution effects following in Sections III and IV. An evaluation of the other constraints on growth is developed in Section V.

II. Evaluating the dominant mechanisms of macroeconomic models

Various approaches can be used for the analysis of macroeconomic models. One point of view is to consider a model as a dynamic system of equations which can be decomposed into a steady-state solution and cyclical behaviour through examination of the eigenvalues (refs. Chow 1975, Bergstrom and Wymer 1976, Deleau, Malgrange and Muet 1981). This type of

analysis has only been applied to small, reduced models. While this method may be preferable, a simple calculation of the elasticities of the individual equations is more frequently reported and this may be misleading as to the dominant mechanisms of the system as a whole.

Another method often applied is based on the use of a model as a tool for policy evaluation. Properties (and acceptability) of the models are evaluated according to the responses to a number of different scenarios (ref. OECD 1983, Dramais 1983). This aids evaluation of the effectiveness of alternative policy instruments, but gives little indication of the mechanisms by which results are generated.

While these studies are useful for revealing certain aspects of a model's behaviour, they do not necessarily help in relating the model to macroeconomic theory.

The approach adopted here may be described as a block decomposition method[2]. This follows a text book treatment of macroeconomic theory which begins with a simple IS system and gradually incorporates wages, prices, external trade and the financial sector. A strict adherence to usual theoretical development cannot be respected, however, if a distinction between real sector dynamics and the determination of nominal aggregates is required. In spite of differences between models in terms of the aggregation level and specifications, the real and nominal interactions are generated by similar channels, varying only through the size of key parameters such as:

- the propensity to consume and the impact of other factors (inflation, wealth, interest rates, etc.) on consumption;
- the accelerator dynamics and the weight of other investment determinants (profit or factor cost);
- the propensity to import and the competitivity elasticities of export and import functions;
- the demand elasticity and speed of adjustment of employment;

[2]This is similar to the approach taken by LYBECK-CARLSSON (1982). Taken further, it could also be linked to proposals of CHOW (1978).

- the real wage rigidities and Phillips curve effects;
- the price response to production costs;
- the monetary channels through which changes in the real sector affect interest rates or exchange rates.

A standardised description of the models is given in the Appendix.

For a quantification of the mechanisms, a reorganisation of the models is necessary, isolating the major behavioural functions grouped in blocks as described below.The models are gradually rebuilt "block by block": in effect, we examine six gradually more complex models[3]:

block I : domestic final demand of the private sector (consumption, investment, changes in inventories, employment)
block II : the public sector (receipts and expenditures)
block III : the external sector (exports and imports)
block IV : wage determination
block V : price determination
block VI : the monetary and financial sector (demand for money, interest rates) and exchange rates.

Step 1 is equivalent to a pure, closed economy, "multiplier/accelerator" model, to which the dampening effects of taxation and imports are added in steps two and three. This gives a complete determination of GNP, income distribution being affected by the changes in taxation and employment only. Up to step 3, supply is represented by the underlying production function used in deriving the employment and investment specifications. Further, more effective, supply side feedbacks come from the endogenisation of wages and prices. At this point, the emergence of a wage-gap and the possibility of its absorption by profit adjustment can be examined. Crowding out effects in the standard models are completed with the introduction of interest rates, which does not imply a money supply constraint here. The additional introduction of exchange rates in the Italian and UK models provides a stabilisation mechanism for the balance of payments.

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[3]Technically, the exogenisation of the variables not incorporated at a particular step is done by eliminating the corresponding equations in the models.

Given the structure of these models, a demand shock is appropriate for revealing the linkages between blocks and is often quoted as a standard test of economic models. The shock chosen was to increase real public investment in infrastructure by 1 % of GDP (ex-ante) over a four year period and this shock was applied at each of the six steps.

Taking into account the different weights of real public investment in GDP, which were on average over 1981-1984:

- 2.8 % in Germany
- 2.5 % in France
- 3.2 % in Italy
- 3.2 % in UK[4],

the shock chosen implies a large maintained increase of public investment of about:

- 35 % in Germany
- 40 % in France
- 30 % in Italy
- 30 % in UK.

GDP effects are presented in Table 1, more detailed results being given later (tables in Appendix 2). On the whole, the models reproduce the usual theoretical schemes. The largest dampening effects come from the introduction of taxes and external trade. Price movements also reduce the size of the multiplier, except in the French model, where specific price effects delay the inflationary response. Some care must be taken in the interpretation of the results of the final step. In the French and German models, the exchange rate is exogenous and interest rate changes are insignificant. In the Italian and UK models, the dominant influence on the multiplier profile at step 6 is the exchange rate depreciation. The major differences, however, come from the size and speed of the responses.

[4]Public investment modified to exclude plant and machinery investment: only the total (including nationalised industry investment) is defined in the standard model. This modification implies a decrease in the import content.

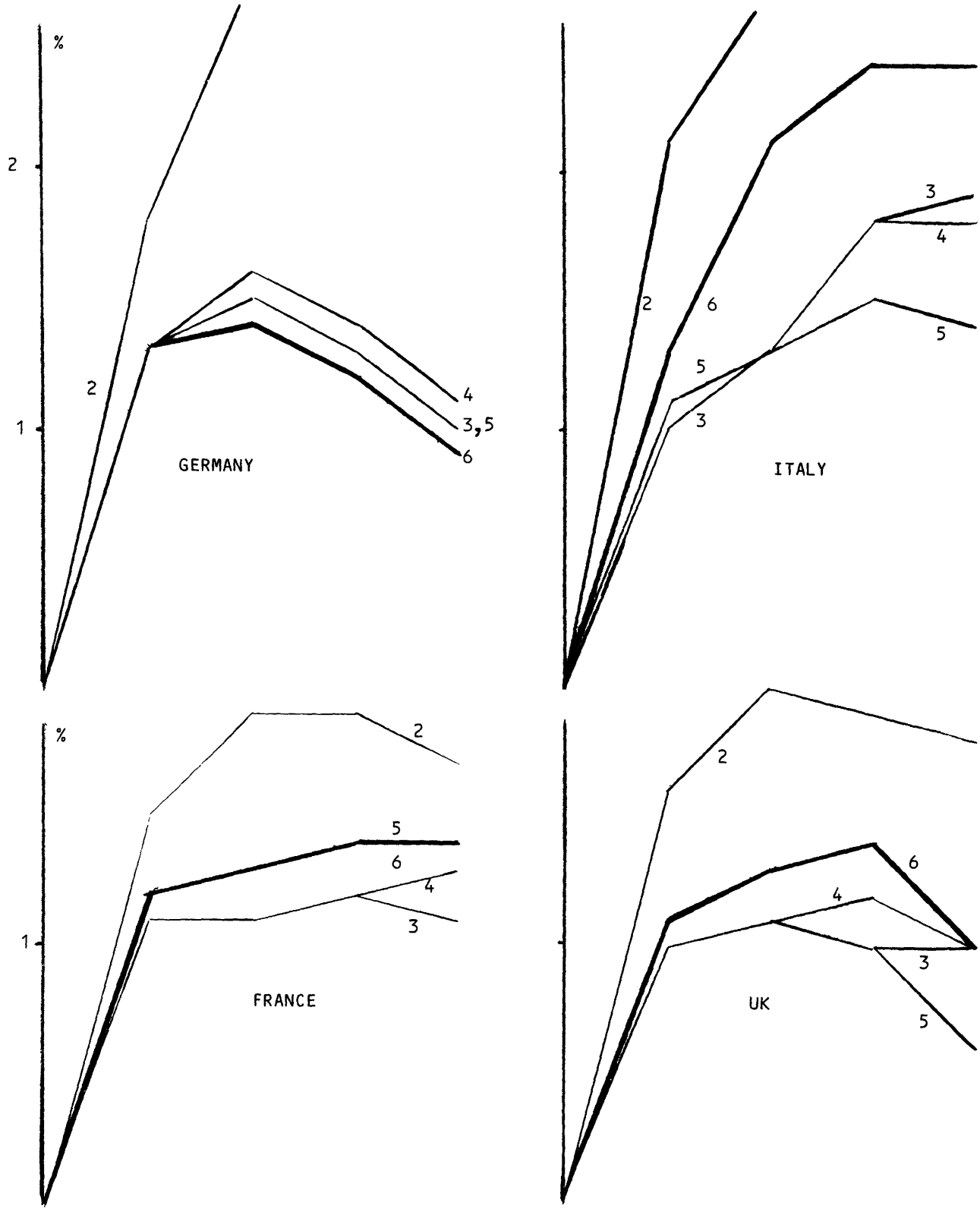

Table 1: GDP multipliers

Step 2 : domestic demand + government sector
Step 3 : 2 + external trade
Step 4 : 3 + wages
Step 5 : 4 + prices
Step 6 : 5 & financial sector = FULL MODEL

Sustained expansionary effects in the full models are observed for France and Italy (fourth year GDP multipliers 1.4 and 2.4 respectively), whereas a significant fall of the multiplier appears in the fourth year for Germany and the UK (down to 0.9 in Germany and 1.0 in the UK). For the German model, this property is clearly associated with the introduction of the external trade in contrast to the UK model where it results from the wage-price dynamics. Although strong real balance effects are also incorporated in Prometeia, they do not reverse the effects induced by the highly sensitive multiplier-accelerator mechanism. The real sector response in Metric has only weak repercussions on wages and prices.

The decomposition of the multiplier presented here reveals very different dynamic patterns between models:

- the real sector dynamic properties for the UK and French models are comparable, in contrast to the explosive responses of the German and Italian models.
- Both the German and French models exhibit a relative neutrality vis-à-vis prices, income distribution and monetary effects, compared with the UK and Italian models.

These differences require more detailed analysis to identify the behavioural hypotheses which generate the simulation properties. In particular, further decomposition of the real sector components and of the income distribution mechanisms is necessary.

III The expansionary process

According to the standard formulation of a neo keynesian model, growth is generated by the multiplier-accelerator dynamics via the induced increases in income. Differences between models may arise either from the dynamic responses of the demand components or from the size of the income changes. A decomposition of these effects is described below.

III.1 Demand component sensitivity

Tables 2 to 5 report the contributions of the GDP components to the total multiplier.

The similarity between the UK model and Metric is clearly indicated in steps 1 and 2, where the weak response of consumption leads to an early stabilisation of the multiplier. From an examination of the elasticities of the demand functions (see Table A1, appendix 1), the weak response of consumption for the UK can be attributed to the correspondingly weak marginal propensity to consume (0.63 after four years). However, for Metric (with a four year propensity to consume of 0.85), the explanation must be found in the income effects. Consumption for Italy, with a similar propensity to consume as Metric, shows stronger growth because of larger gains in disposable income. For Germany, large income effects partially compensate a moderate propensity to consume (0.76 after four years).

Little of the variation in the real sector responses can be attributed to the investment accelerator (see table A2 in Appendix 1), except for the somewhat weak elasticity for the Italian model (0.7 after four years), which is offset by the strong consumption response in the complete model. The exceptional response of investment in Sysifo comes from the strong profit effect. Although a relatively large profit effect for Germany is confirmed by other studies[5], its size in Sysifo is such as to induce an explosive investment response (figures for which are therefore not available at step one).

The introduction of external trade at step 3 illustrates the impact of supply and demand on exports and imports. According to the simple keynesian model for an open economy, the propensity to import substantially lowers the multiplier, but in addition to this demand effect, supply side constraints also limit exports in all cases and affect imports in Metric and Sysifo. Calculation of the propensity to import, assuming a constant structure of GDP (see Table A3 in Appendix 1), indicates that the highest propensity is for Prometeia and the weakest for Sysifo (1.28 and 0.82 respectively after four years). However, the

[5]In particular, see Kremp, le Dem, Oudiz (1983)

results of the models are highly sensitive to the changes in the structure of GDP. The high propensity for Prometeia is not obvious from the result because of the zero import content of public expenditure and the low content for consumption. As in the Italian case, imports in the German and UK models respond more to changes in private investment than to changes in other components of GDP. This is the source of the high import increases observed (augmented in Sysifo by the capacity constraint). The shortage in domestic supply also explains the high impact on imports in the French case.

As seen from both the results here and from the elasticities of export functions presented in Table A.4 (appendix 1), the supply side effects on exports are not negligible. These effects are particularly strong in Metric and Prometeia, but gradually disappear with the increasing capacity related to investment. This mitigating factor is not present in Sysifo, where potential output is exogenous and therefore exports continue to decrease. Supply effects in the UK model have only a slight negative impact.

Taking into account the different sensitivity of demand components, the demand shock will induce shifts in the structure of GDP. External trade is a major determinant of this shift: high propensities to import, augmented by the limitations on exports, lead to a deterioration of the trade balance. Impact effects are quite similar between countries, with losses of about 0.5 %[6] of nominal GDP. Given the elasticities to domestic demand incorporated in the external trade functions, France and Italy seem particularly vulnerable compared to the UK. However, the current account loss for France is only 0.2 %[6] of nominal GDP in the fourth year because of the weak expansion and demand component sensitivity. Overall, Sysifo generates an increasing current account deficit through capacity constraints; a loss of 0.8 %[6] of nominal GDP is observed in the fourth year.

A shift in favour of investment is also induced: this can be partly attributed to the multiplier-accelerator mechanism, but also depends on the extent to which growth is repercussed on households' disposable income. This effect has now to be investigated.

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[6]Step 3 (Table 11, Section V.2)

Table 2 - Effect of an increase in real public investment of 1 % of GDP for **GERMANY**

Taking into account: / effect on:		(1)* = Domestic demand -consumption -inventories -investment -employment	(2) = (1) + Government Sector -taxes -transfers	(3) = (2) + External Trade -imports -exports	(4) = (3) + Wage rate	(5) = (4) + Prices	(6) = (5) (full model) + Monetary Sector -interest rates -money demand -exchange rate (UK-Italy only)
GDP	1st year	-	1.8	1.3	1.3	1.3	1.3
	2nd year	-	3.2	1.5	1.6	1.5	1.4
	3rd year	-	4.7	1.3	1.4	1.3	1.2
	4th year	-	6.5	1.0	1.1	1.0	0.9
Households consumption	1st year	-	0.2	0.2	0.2	0.2	0.2
	2nd year	-	0.7	0.5	0.8	0.6	0.6
	3rd year	-	1.2	0.5	1.2	0.9	0.9
	4th year	-	1.7	0.4	1.4	1.1	1.0
Private investment	1st year	-	2.8	2.6	2.6	2.6	2.6
	2nd year	-	8.3	5.5	5.5	5.6	5.5
	3rd year	-	14.1	4.8	4.4	5.0	4.6
	4th year	-	21.4	3.0	0.8	2.4	2.0
Imports	1st year	-	-	1.5	1.6	1.6	1.6
	2nd year	-	-	2.4	2.5	2.5	2.5
	3rd year	-	-	1.8	2.1	2.2	2.1
	4th year	-	-	0.8	0.8	1.1	1.1
Exports	1st year	-	-	-0.2	-0.2	-0.2	-0.2
	2nd year	-	-	-0.7	-0.7	-0.8	-0.8
	3rd year	-	-	-1.3	-1.4	-1.7	-1.6
	4th year	-	-	-1.5	-1.5	-2.0	-2.0

*Convergence is not achievable at this step without exogenising the rate of capacity utilisation. Results for step 1 in Appendix A2 include this adjustment.

Table 3 - Effect of an increase in real public investment of 1 % of GDP for **FRANCE**

Taking into account: / effect on:		(1) = Domestic demand -consumption -inventories -investment -employment	(2) = (1) + Government Sector -taxes -transfers	(3) = (2) + External Trade -imports -exports	(4) = (3) + Wage rate	(5) = (4) + Prices	(6) = (5) (full model) + Monetary Sector -interest rates -money demand -exchange rate (UK-Italy only)
GDP	1st year	1.6	1.5	1.1	1.1	1.2	1.2
	2nd year	2.4	1.9	1.1	1.1	1.3	1.3
	3rd year	2.8	1.9	1.2	1.2	1.4	1.4
	4th year	2.5	1.7	1.1	1.3	1.4	1.4
Consumption	1st year	0.2	0.2	0.1	0.1	0.1	0.1
	2nd year	0.6	0.4	0.2	0.3	0.3	0.3
	3rd year	1.0	0.6	0.3	0.4	0.4	0.4
	4th year	1.1	0.6	0.4	0.5	0.5	0.5
Investment	1st year	3.1	2.8	2.0	2.0	2.2	2.2
	2nd year	4.2	2.8	1.3	1.3	2.0	2.0
	3rd year	3.9	2.6	1.5	1.6	2.6	2.6
	4th year	2.7	1.5	0.9	1.1	2.2	2.1
Imports	1st year	-	-	1.7	1.7	1.8	1.8
	2nd year	-	-	1.4	1.5	1.6	1.6
	3rd year	-	-	1.1	1.2	1.4	1.3
	4th year	-	-	1.1	1.2	1.2	1.2
Exports	1st year	-	-	-0.3	-0.3	-0.3	-0.3
	2nd year	-	-	-0.2	-0.2	-0.2	-0.2
	3rd year	-	-	-0.1	-0.1	-0.3	-0.2
	4th year	-	-	0.0	-0.1	-0.3	-0.3

Table 4 - Effect of an increase in real public investment of 1 % of GDP for **ITALY**

Taking into account: / effect on:		(1) = Domestic demand -consumption -inventories -investment -employment	(2) + (1) + Government Sector -taxes -transfers	(3) = (2) + External Trade -imports -exports	(4) = (3) + Wage rate	(5) = (4) + Prices	(6) = (5) (full model) + Monetary Sector -interest rates -money demand -exchange rate (UK-Italy only)
GDP	1st year	2.4	2.1	1.0	1.0	1.1	1.3
	2nd year	4.2	2.7	1.3	1.3	1.4	2.1
	3rd year	6.2	3.1	1.8	1.8	1.5	2.4
	4th year	7.5	2.9	1.9	1.8	1.4	2.4
Consumption	1st year	1.1	0.8	0.5	0.4	0.4	0.5
	2nd year	2.9	1.3	0.7	0.7	0.4	0.7
	3rd year	4.8	1.8	1.1	1.0	0.5	0.9
	4th year	6.5	1.8	1.2	1.1	0.4	0.9
Investment	1st year	2.7	2.4	0.8	0.8	1.0	1.2
	2nd year	6.7	4.4	1.8	1.8	2.1	2.8
	3rd year	11.3	5.1	2.8	2.4	2.5	3.1
	4th year	12.9	4.3	2.6	2.1	1.8	2.0
Imports	1st year	-	-	0.0	0.0	0.6	0.9
	2nd year	-	-	0.5	0.5	0.8	1.3
	3rd year	-	-	1.3	1.2	1.2	1.2
	4th year	-	-	1.5	1.3	0.9	1.0
Exports	1st year	-	-	-2.0	-2.0	-1.5	-1.1
	2nd year	-	-	-1.7	-1.7	-0.9	0.9
	3rd year	-	-	-0.5	-0.4	-0.2	1.7
	4th year	-	-	-0.1	-0.1	0.0	2.6

Table 5 - Effect of an increase in real public investment of 1 % of GDP for **UK**

Taking into account: / effect on:		(1) = Domestic demand -consumption -inventories -investment -employment	(2) = (1) + Government Sector -taxes -transfers	(3) = (2) + External Trade -imports -exports	(4) = (3) + Wage rate	(5) = (4) + Prices	(6) = (5) (full model) + Monetary Sector -interest rates -money demand -exchange rate (UK-Italy only)
GDP	1st year	1.7	1.6	1.0	1.0	1.0	1.1
	2nd year	2.4	2.0	1.1	1.1	1.1	1.3
	3rd year	2.6	1.9	1.0	1.2	1.0	1.4
	4th year	2.6	1.8	1.0	1.0	0.6	1.0
Consumption	1st year	0.5	0.4	0.3	0.3	0.3	0.1
	2nd year	1.2	0.7	0.5	0.6	0.6	0.4
	3rd year	1.7	0.9	0.5	1.3	1.0	0.9
	4th year	1.9	0.9	0.6	1.3	0.8	0.6
Investment	1st year	2.3	2.2	1.4	1.4	1.4	1.5
	2nd year	3.8	3.2	1.8	1.9	1.8	2.1
	3rd year	4.0	2.9	1.5	1.8	1.5	2.0
	4th year	3.4	2.1	1.2	1.3	0.8	1.2
Imports	1st year	-	-	1.3	1.3	1.3	1.0
	2nd year	-	-	1.6	1.8	1.8	1.3
	3rd year	-	-	1.5	2.3	2.1	1.6
	4th year	-	-	1.3	2.3	1.9	1.4
Exports	1st year	-	-	0.0	0.0	0.0	0.2
	2nd year	-	-	-0.1	-0.1	-0.1	0.4
	3rd year	-	-	-0.1	-0.4	-0.4	0.2
	4th year	-	-	-0.1	-0.6	-0.8	-0.1

III.2 Generation of income through labour market adjustment

In the simplest form of the IS-LM model, households and companies are consolidated. This may be justified in the long term if no shift in the GDP share of households occurs, that is if, through either wage or other income distribution channels, gains in GDP are distributed to households. It is, however, a strong assumption and a distinction between households and companies is required for examination of the issue. According to standard keynesian schemes, the linkage between GDP and households' income should be achieved through employment adjustment which is related to output changes, theoretical consistency implying a long run elasticity of one.

In fact, a unitary elasticity of employment to output is not found in all the models. Sysifo is very close (elasticity of one in the manufacturing sector, 0.8 in the building sector) and in the UK model the elasticities are also high, 0.8 for manufacturing, 0.6 for non-manufacturing. Although in Metric the elasticitity for manufacturing is one, the elasticities for the other sectors are low (for example, the lowest is the building sector[7]: 0.4). The particularly low elasticities observed in Prometeia (less than 0.5 in all cases) are justified by the Cassa Intergrazzione Guadani scheme, implying the possibility of larger adjustment in hours of work.

In simulations, these long run properties are not obvious, because of the importance of adjustment speeds. The UK and German models not only have relatively high long run elasticities for employment, but also have high speeds of adjustment (between 3 and 5 quarters). For Metric and Prometeia, the combination of low long term elasticities and long adjustment lags leads to very weak employment responses. For example, the unitary elasticity in the manufacturing sector in Metric is obscured in the simulations presented here by a slow adjustment over two and a half years.

The employment response accelerates the transmission of the expansionary shock in Germany and the UK and curbs the dynamics in France and Italy. Clearly, in the full models, income changes will also be affected by the real wage outcome.

[7]This obviously has strong implications for the employment effects of the policy applied here.

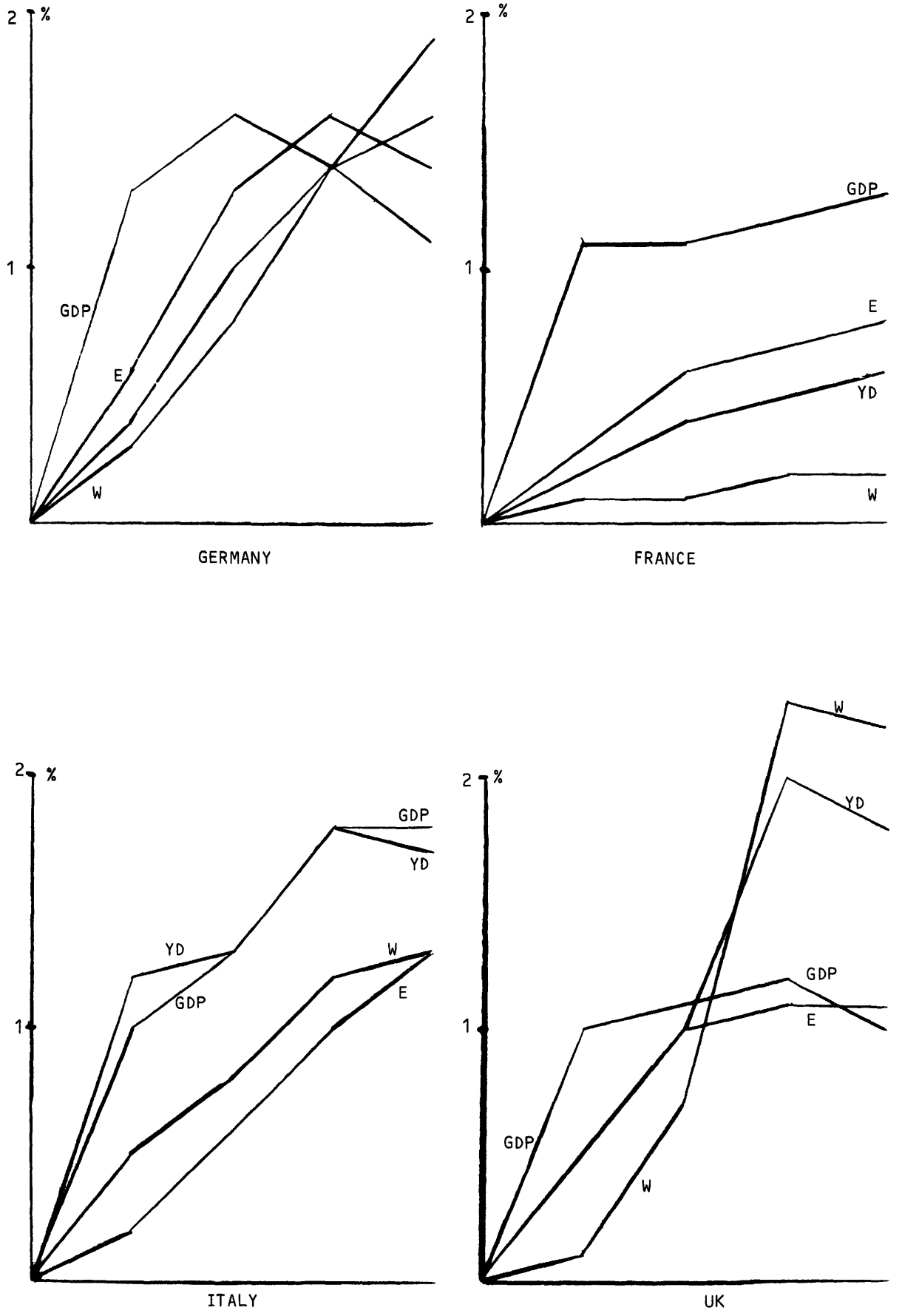

Table 6: Labour market adjustment at step 4 (real sector + wages)
Multipliers for: YD disposable income
W average earnings
E employment

Wage determination, endogenised at step 4, allows the labour market to respond to disequilibrium, incorporating both labour demand and supply effects[8]. The Phillips' curve is one ad hoc formulation which provides this link. All the models contain this type of effect, although they do not use the same measurement of disequilibrium[9]. Except for Metric, wage determination is extended to take explicitly into account other elements of the bargaining process and the institutional framework, with productivity playing a major role in the real wage outcome.

We evaluated, using only the wage block of the Eurolink models, the increase in the wage rate induced by a maintained shock of:

		D	F	I	UK
+ 10% in private employment	Year 1	1.5	0.5	2.8	4.4
	Year 2	5.8	1.7	5.2	3.1
	Year 3	10.5	2.6	4.1	10.9
	Year 4	14.4	3.4	2.8	14.8
+ 10 % in productivity	Year 1	1.0	-	2.8	0.0
	Year 2	4.0	-	6.5	3.2
	Year 3	7.5	-	6.3	11.1
	Year 4	8.4	-	5.5	12.0

According to these results, Germany and the UK exhibit the highest wage sensitivity, both to productivity and unemployment. Italy is an intermediate case, where the effects are about half of those obtained for the former two countries. The specificity of Italy lies in the higher weight of productivity compared to employment and in the dampened response leading to a wage stabilisation, whereas, in the other models, a more standard theoretical Phillips' curve is observed. For France, a weak employment effect coupled with the absence of productivity feedbacks implies strong wage inertia.

[8]Also in the French and UK models, specific labour supply effects are explicitly modelled by the inclusion of the "discouraged worker" phenomenon

[9]This makes it difficult to evaluate the non-linearities of this effect, as will be seen later.

These properties can be compared with those found in other studies (Artus, 1983; Cellier, Le Berre, Miqueu, 1984; Le Dem, Kremp, Oudiz, 1983). For France and Germany, other evidence tends to support the results presented here, in particular the strong productivity and unemployment effects in Germany and the weak Phillips curve response in France. It is more difficult to compare results for Italy and the UK, particularly because wage policies have influenced the wage determination. Nevertheless, the linkage between wages and productivity in Italy has been confirmed by other studies. For the UK, a simple direct link between wages and unemployment is not well supported, although distribution effects appear to play a role. The incorporation of these effects in the Oxford model leads to a more complex equation, which necessitated some manipulations in order to extract the Phillips curve and productivity effects, reported above. Although these results cannot therefore be considered precise, the strong effect of output on wages is nevertheless obvious.

Leaving aside the problem of nominal or real wage rigidities and the role of wages in the trade-off between inflation and growth, we focus at this point on the weight of real wage gains in the expansion.

Combined with the labour demand response, the strong Phillips curve effects in the German and the UK models induce a shift in income in favour of households during the expansionary process. The multiplier of the real wage income of households is about three times higher than the multiplier of GDP. This is attenuated by the non-wage income response. In the Italian case, in the absence of financial effects, no long term shift may be observed, growth being equally distributed between employment and wages through productivity gains, and with less distortion in non-wage income. In Metric, the weak response of employment leads to insignificant real wage gains. A strong shift occurs: a growth of about 1.5 in GDP is achieved after four years, with a growth in real disposable income of households of only 0.5.

The introduction of real wage changes in step 4 should positively contribute to the expansionary process, through increasing households' disposable income. Even without the price response, two dampening mechanisms may nevertheless be present at this step. The first one is the

induced change in value added shares which may affect real sector growth through profit effects in the investment function (this is quite clearly present for Germany and Italy) or through sensitivity of consumption to non-wage income[10]. The other dampening mechanism lies in the substitution effects on employment. All the models except the UK incorporate relative fact cost as a determinant of employment in the manufacturing sector, but this has only a weak medium-term effect. The elasticities used in the models reflect the problems surrounding econometric evidence on substitution effects; using quarterly data, evidence is even more dubious. Over a four year period, the effects are hardly significant.

To summarize this section, the leading transmission mechanisms of the expansionary process are the following:

- Germany: demand expansion leads to increases in both investment and employment. The latter, together with the wage effects, then lead to increases in consumption. Dampening effects begin to appear through imports and exports because of the constraints imposed by the exogenous capacity term.

- France: the gradual growth is the result of the sluggish employment response which restrains both the multiplier-accelerator mechanism and the Phillips curve effect.

- Italy: the low elasticities of domestic demand components and employment, together with the high sensitivity of external trade to the domestic market, suggest a weak response to a demand shock. The expansionary process is dominated by the income distribution mechanisms.

- UK: consumption response is related to substantial changes in employment and particularly wages. Investment also shows a strong dynamic response, but linked to this is the large increase in imports.

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[10]The non-wage income effect explains the slight decrease of the GDP multiplier in Italy when wages are introduced. The decrease in the UK comes from a totally different channel, related to external trade functions where competitivity is measured by relative wage costs.

IV Neutrality of the distribution of income

The importance of the distribution of income in determining the growth in consumption and investment has already been emphasized. It also has direct implications for the linkage between growth and inflation. Two steps are involved in determining the outcome: the first is the primary split of GDP into wages and profits, the secondary step being a redistribution of the first split according to taxation, transfers, dividends and interest payments. In order to complete the primary distribution, the price response (representing profit adjustment of firms) must be evaluated in addition to the labour market responses discussed above. As seen in section III, these labour market responses lead to a shift in favour of households in the UK and Germany, are neutral in Italy and favourable to companies in France. The possibility that price responses and sectoral transfers alter these conclusions will be examined below.

IV.1 Primary distribution: wage-price nexus

Following the recursive structure of neokeynesian models, prices are assumed to be determined by a mark-up on unit production costs, allowing profit adjustment to occur. This is the most important supply-side feature found in these models. The strict assumption of a constant mark-up should lead to a neutral primary distribution of income implying:

$$\dot{P} = \dot{W} + \dot{N} - \dot{Q}$$

where P = value-added prices

W = nominal wage

N = employment

Q = value-added (volume)

The inflationary response actually observed is never as high as that required by this relationship. This is a well-known property of macroeconomic models which is founded on both econometric evidence and theoretical schemes. These schemes, which are reproduced in the Eurolink models, can be summarized as follows:

- variable mark-up: competitivity gains (Metric) and demand pressures (Prometeia and Sysifo) may lead to increased profit margins. Only weak changes appear in the results here;

- measurement of unit labour cost: firms may react differently to wage increases than to productivity gains (Nordhaus, 1972). Except for Metric, all the models assume that only long-term productivity gains are repercussed on prices. This explains why Metric exhibits a deflationary response when the inflationary process is already underway in the other models.

- price stucture: divergences may occur because of decomposition to identify producers' prices, demand deflators, etc. In a recursive structure (Metric, Prometeia, Sysifo) which links these prices, additional lags within the price block may delay the reactions. For some prices, specific effects may be incorporated (such as the interest rate in the retail price index for the UK, firms' financial cost in the production price in Metric). Import prices may be sensitive to domestic conditions (except for Prometeia) and export prices are influenced by competitors' prices.

The specificities of the price block together with the employment responses make it difficult to predict the implications for the income distribution, as is illustrated by the different solutions of the four Eurolink models (tables 7 and 8). In all cases, the impact effect is a shift of value-added in favour of the gross operating surplus. This is related to the productivity cycle which dominates the adverse effect of nominal wages responding more quickly than prices. In Sysifo and the Oxford model, cyclical changes in productivity are entirely absorbed into profits. There is a delayed response of prices to productivity gains in Metric and in Prometeia (prices respond more quickly to wage changes). In the longer term, the clear distinction between Germany/UK and France/Italy emerges. For the first two countries, the shift in value-added shares is reversed in the third year the outcome being determined by the real wage growth and productivity loss. Eventually, stabilisation is implied by the moderation of wage claims with the productivity slowdown,

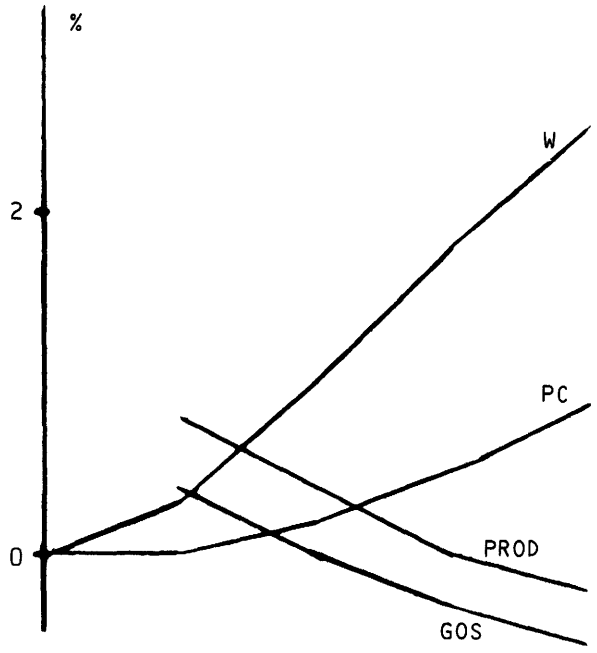
further price adjustments and the slow (German model) or incomplete (UK) indexation of wages. In Metric and Prometeia, the wage/price response ensures stability of the income distribution. In Prometeia, this is the result of the effect of productivity on both wages and prices. In Metric, it is the basis of the price equations. A return to the base shares of value-added is achieved in the Italian case, and may be maintained as a deceleration in wage and price growth is occuring. The very slow employment response in Metric implies that the wage drift in favour of companies can be maintained through price adjustment.

The inflationary response, although not guaranteeing income distribution neutrality, is increasing in Sysifo and the Oxford model in accordance with the existence of a Phillips' curve type trade-off between employment and inflation. Such a trade-off is not apparent in the other two models with prices stabilising in Prometeia and labour market inertia being observed in the French case.

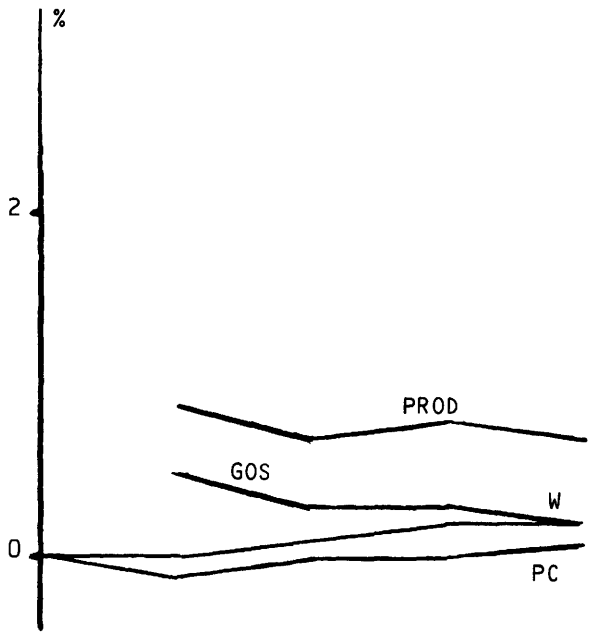
Table 8: percentage points difference in the gross operating surplus[11] share of value added results for steps 4 (wages), 5 (prices) and 6 (full model)

	Step	Year 1	Year 2	Year 3	Year 4
	4	0.3	0.0	-0.5	-0.7
D	5	0.4	0.0	-0.3	-0.5
	6	0.4	0.1	-0.3	-0.4
	4	0.5	0.3	0.4	0.3
F	5	0.5	0.3	0.3	0.2
	6	0.5	0.3	0.3	0.2
	4	0.4	0.3	0.2	0.0
I	5	0.5	0.3	0.2	0.0
	6	0.5	0.4	0.2	-0.2
	4	0.3	-0.1	-0.7	-0.8
UK	5	0.3	0.0	-0.4	-0.4
	6	0.4	0.2	-0.3	-0.4

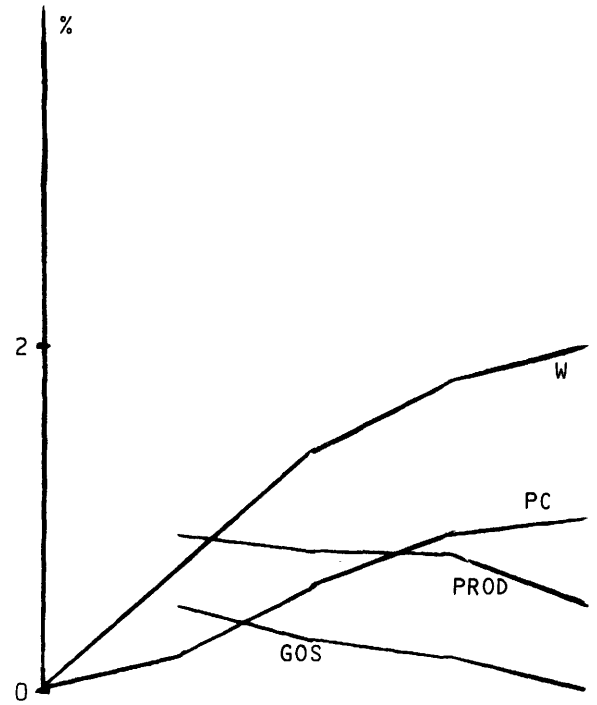
[11] includes self-employment incomes
average shares 1980-1983 are D: 23.7 %; F: 24.6 %; I: 26 %; UK: 26%.



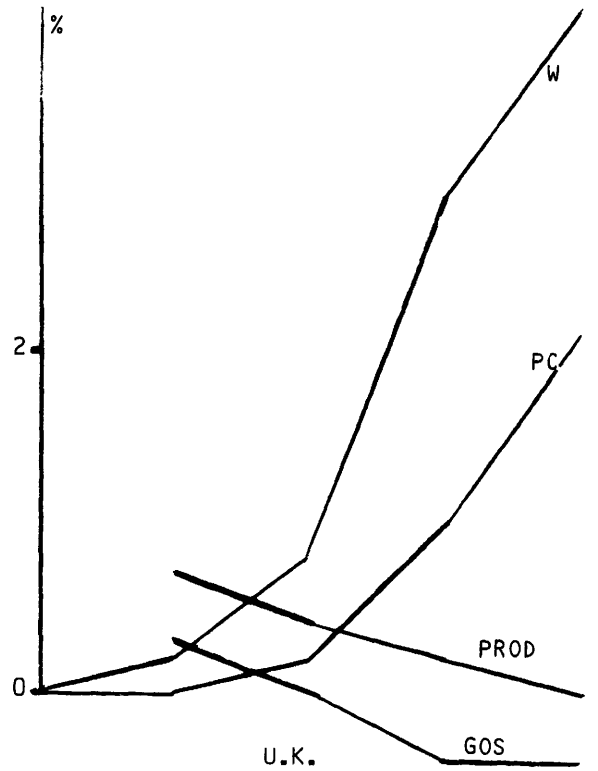
GERMANY



FRANCE



ITALY



U.K.

Table 7: Wage/price nexus and primary distribution
at step 5 (real sector + wages + prices)
Multipliers for: W average earnings
PC consumer prices
PROD total productivity per head
GOS percentage point difference in gross operating surplus/nominal GDP ratio

IV.2 Redistribution: sectoral transfers

Although theoretically no important issues are involved in the redistribution of the primary income split, empirically this is a major source of differences between countries reflecting the various institutional arrangements, size of the public sector and the weight of self-employed. The treatment of the redistribution within a typical macroeconomic model nevertheless poses some problems because of the simplifications needed to keep this part of the model reasonable in terms of its size and complexity.

The assumption that many of the components of the redistribution are simply proportional to some nominal aggregate can be justified by institutional rigidities and the inherent properties of taxation systems, etc. The use of this assumption at the level of aggregation required in the models can be considered a good approximation if the redistribution of income is rather stable. However, some changes in the redistribution are not excluded because the models incorporate specific effects:

- government transfers to households may be adjusted either on wages (Metric, Prometeia and Sysifo) or prices (UK), taxes on total income, but indexation may not be complete.
- employers' social security contributions are related to the wage bill and therefore influence the wage-price nexus through unit labour costs.
- non-wage income depends on the weight of self-employed, gross operating surplus, interest rates etc. If the weight of self-employed or dividend payments is high, this implies a stronger linkage between households' non-wage income and gross operating surplus.
- other components of the redistribution (eg subsidies) may be exogenous (fixed in real or nominal terms).

The models are sensitive to redistribution mainly because of its influence on consumption through households' disposable income. The outcome of companies and government has implications for the financial sectors but in most models this linkage is not complete either because of the consolidation of companies and financial institutions or because of simplification of the monetary sector. Although profit effects may be introduced, proxies related to the primary distribution are generally used. Company and government saving can be considered as residuals in the

models, therefore only household disposable income results need further comment.

The differences between countries in the structure of disposable income, as illustrated in Table 9, suggest a source of variance in the distribution outcome. The weights of self employed and, correlated to this, the non-wage income in France and Italy, may contribute to a greater stability in households' disposable income and therefore consumption share. The redistributive role of the government is illustrated by the transfers and taxes. Government is a net contributor to households' disposable income in France and Italy. In the UK and Germany, the governments' role is closer to that of a pure redistributor. Some differences may, however, be related to the channels of distribution (e.g. private pension plans).

Table 9: distribution of income and weight of self-employment, average over 1980-1983

	proportion of self-employed in total employment %	weights in disposable income of: wages	non-wage component	net transfers	direct taxes
D	13.5	71.8	27.4	13.8	12.1
F	16.8	53.3	30.4	24.9	8.6
I	28.4	51.6	39.9	24.0	14.9
UK	9.0	72.4	24.1	24.3	20.9

A summary of the simulation induced shifts in the income distribution is presented in Table 10. The properties described above may not be obvious in the results because of the interaction of various factors. The important role of the weight of the wage component is revealed as supporting a grouping of countries according to the split between wage and non-wage income. However, the mechanisms through which this occurs are not the same.

For France and Italy, very similar responses in wage and non-wage income are observed. In Italy, this is the result of the combination of the neutral primary distribution together with the close linkage between non-wage income and gross operating surplus via self-employment incomes.

Table 10: changes in the distribution of income, fourth year result for steps 4 (wages), 5 (wages and prices) and 6 (full model)

	fourth year of step	percentage points difference in the weights of: wages	non-wage	transfers	taxes
D	4	1.1	-0.2	-0.6	0.2
	5	1.1	-0.2	-0.7	0.2
	6	1.0	-0.1	-0.7	0.2
F	4	0.1	0.1	-0.2	0.0
	5	0.2	0.0	-0.2	0.0
	6	0.2	0.0	-0.2	0.0
I	4	0.3	0.5	-0.6	0.1
	5	0.3	0.4	-0.6	0.2
	6	0.5	0.6	-0.8	0.3
UK	4	0.9	-0.2	-0.4	0.4
	5	0.8	0.0	-0.4	0.4
	6	1.1	0.1	-0.6	0.5

This self-employment income effect is too weak to compensate the low response of wage income in the French case and is related to the sectoral distribution of the expansionary impulse. While the outcomes for the UK and Germany are dominated by the wage component profiles, the non-wage income behaviour restrains the shift in favour of households occuring at the primary distribution step. In the UK model, the link of non-wage income to gross operating surplus through dividend payments causes this restraint whereas in the German model the non-wage income is rather insensitive (except to interest payments).

V. Constraints to growth

According to the usual debate on the effectiveness of expansionary policy, the positive effects of the real sector dynamics (accelerator/multiplier responsiveness etc.) and income generation process are restrained by the inflationary and financial sector feedbacks. These negative feedbacks are important only in the medium-term because of the size and speed of the adjustment processes.The emergence of a current account deficit also poses a problem for the sustainability of the policy.

Other problems with the acceptability of this policy may arise (such as the increase in the public deficit, the depreciation of the exchange rate and the reaction of international capital markets) and some of the issues raised are difficult to treat within stylised macroeconomic models.

The constraints to growth which emerge in these models are discussed below. The inflationary and financial effects, representing domestic constraints, are evaluated first and conclusions are then extended to the case of the open economy.

V.1 Domestic constraints

Neokeynesian models are based on a recursive structure. Demand is always satisfied in the short run although some temporary restraint may be imposed by capacity limitations (the particular case of Sysifo, where these restrictions are maintained, has already been mentioned in section III.1). Wages react to disequilibrium generated on the labour market and the price behaviour drives the dynamic response of the supply side, affecting the economy only in the medium term. The supply curve of the model may be identified with a reduced form of the labour demand, wage and price functions, leading to a positive correlation between prices and output. Otherwise a negative correlation appears from the demand side due to competitivity, real balance and substitution effects. The juxtaposition of these functions leads to the dampening effect of inflation on growth.

The elasticity of the supply curve, as evaluated in Section IV.1, was revealed to be low in the French (weak labour market response) and German (slow price adjustment) models and high in the UK (strong wage sensitivity) and Italian (rapid price adjustment) ones. The price sensitivity of demand components is reported in tables A1 to A4 in Appendix 1. Real balance effects are significant only in the UK model, they are absent in Sysifo and Prometeia and only temporary in Metric (inflation then inducing a shift to purchases of durable goods). For the UK, a downturn in the growth of consumption is observed only with the introduction of prices (step 5) and therefore the real balance effect.

The results for the distribution of income also have repercussions on the real sector through the profit effect in the investment function (present in all models except the UK). This effect is strongest in the German model and can be seen by the fall in investment when wages and prices are introduced (Table 2). In Metric, with weak price decreases, only the sensitivity of housing investment to these decreases is observed. In the absence of the financial sector, the stabilisation of the GDP multiplier at step 5 for Italy must be attributed to the real wealth effect in the consumption function. Also the systematic turnaround in the growth of profit in the fourth year in Italy affects the profile of investment.

With the endogenisation of the monetary sector, inflation has repercussions through interest rates. Although some adjustment in long term rates occurs, real interest rates fall with inflation. In the French case, therefore, the interest changes are negligible while the long term rates in Germany, Italy and the UK increase by 0.5, 1.0 and 0.3 percentage points respectively by the fourth year. With an accommodating monetary policy, this small modification in interest rates provides the major financial feedback, except in Prometeia where increases in asset holdings are closely linked to the wealth effect in the consumption function.

According to the usual IS/LM framework, a bond financed deficit/non-accommodating monetary policy stance would suggest larger increases in interest rates. In the UK model, a non-accommodating monetary policy works in this way with the inversion of the money demand equation to determine the short-term interest rate modifications. In the other models, this is not a standard procedure. Reaction of interest rates to external disequilibria may be considered more usual but do not appear for Metric and Sysifo because of the absence of the exchange rate equations. The interest rate changes for Italy already take into account the external trade situation. According to some investigations of the effect of increased bond financing of a deficit in Metric, this may induce increased demand by companies for bank credit, and therefore some increases in interest rates. However, with the increase in profit generated by the expansionary policy, firms' borrowing requirements are already reduced, implying an improvement in credit availability.

Interest rate increases have conflicting effects, the usual crowding out effects on the IS function being modified by interest payments between sectors. In Prometeia, there is a systematic transfer from the government to households leading to an increase in consumption at the expense of the government deficit. In the absence of specific feedbacks from the size of the government deficit, the expansionary effect through the growth in consumption dominates. The outcome of the interest transfers between sectors in Metric and Sysifo is less clear cut because of the weak linkages between interest rates. If the authorities operate only on the money market rate, this has few repercussions in these two models. In Metric, the sensitivity of interest payments to interest rate structure has implications for the inflationary response through the adjustment of prices according to firms' financial cost. Interest rates also have a specific influence on prices in the UK model through the retail price index (cost of housing). This inflationary effect is in opposition to the indirect deflationary effect of interest rate increases through induced exchange rate appreciation. The relative interest rate sensitivity of exchange rates and money demand is obviously crucial in determining the overall result of a non-accommodating monetary policy.

V.2 Open Economies and external constraints

The introduction of external trade, as examined in section III, has been identified as a major source of dampening effects on GDP growth. This is linked to the propensity to import given the restrictions imposed on exports by the fixed world demand. The adverse effect of inflation on competitivity may further dampen GDP growth and lead to a greater deterioration of the current account. Exchange rate depreciation may boost GDP growth and stabilise the current account, but inflation then accelerates (this is seen in the UK and Italian models).

Even with the introduction of wages and prices, and therefore competitivity modifications, the external trade response is still dominated by the shift between the domestic demand components. In Italy, the large first year increase in imports when prices are introduced must be attributed more to the high import content of investment than to competitivity. In the UK, the wage increase occuring at step 4 leads not only

(5)

Table 11: Effect on current balance* of an increase in real public investment of 1 % of GDP

Taking into account	(1) = + Domestic demand -consumption -inventories -investment -employment	2 = (1) + Government Sector -taxes -transfers	(3) = (2) + External Trade -imports -exports	(4) = (3) + Wage rate	(5) = (4) + Prices	(6) = (5) (full model) + Monetary Sector -interest rates -money demand -exchange rate (UK-Italy only)
Germany : 1st year			-0.5	-0.5	-0.5	-0.5
2nd year			-1.0	-1.0	-1.0	-1.0
3rd year			-1.0	-1.1	-1.0	-1.0
4th year			-0.8	-0.8	-0.8	-0.8
France : 1st year			-0.4	-0.4	-0.4	-0.4
2nd year			-0.3	-0.3	-0.4	-0.4
3rd year			-0.3	-0.3	-0.3	-0.3
4th year			-0.2	-0.3	-0.3	-0.3
Italy : 1st year			-0.5	-0.5	-0.6	-0.7
2nd year			-0.6	-0.6	-0.6	-0.6
3rd year			-0.6	-0.5	-0.5	-0.4
4th year			-0.6	-0.5	-0.4	-0.2
UK : 1st year			-0.4	-0.4	-0.4	-0.4
2nd year			-0.5	-0.5	-0.5	-0.3
3rd year			-0.4	-0.6	-0.5	-0.4
4th year			-0.4	-0.8	-0.6	-0.3

*percentage point difference in current balance/nominal GDP ratio

to growth in consumption but also to a loss in competitivity and these two effects combined generate the higher import leakage. Competitivity effects are most noticeable in the export profiles and with the introduction of exchange rates in Italy and the UK. As exports are more sensitive than imports to competitivity in Metric and Prometeia, a larger dampening effect should be expected. However, this is not observed because of the specific price behaviour.

The combination of price and volume changes determines the outcome for the current balance (Table 11). According to the usual reasons for the appearance of a J-curve, the asymmetry in the response of the export and import prices together with the lags in volume adjustment should delay the deterioration of the current balance. In fact, this is apparent only in the UK case. At step 4, with competitivity losses (linked to wage rates), a sharp deterioration in the current balance for the last two years appears (the fourth year figure is doubled compared with step 3).

In the other cases, the stabilisation of the current balance is generated by the weak export price movements. In Metric and Sysifo, this is linked to the overall weak inflationary response of the models, whereas export prices in Prometeia are based on the assumption of price taking.

With stable interest rates, it may be expected that increased domestic inflation and external deficit lead to exchange rate depreciation. This may offset, or even reverse, the competitivity loss and therefore support further growth which may in turn augment the external deficit. The additional growth, together with import price changes, will also increase the inflationary response, implying a continuous depreciation and possibly a reversal of the expansion in the long run (the "vicious circle" syndrome).

In the models with endogenous exchange rates, Prometeia and the UK model, the expansionary effects of depreciation dominate over the four year period. The greater sensitivity of the exchange rate in Prometeia enables competitivity gains to be maintained over the whole period, compared with the UK, where the gains are already disappearing after three

Table 12: Effect of an increase in real public expenditure of 1 % of GDP with superimposed devaluation of 5 %

	GDP	Imports	Exports	Consumption Price	Import price	Export price	Current* account
Germany : 1st year	1.6	1.6	0.8	0.4	1.3	1.0	-0.3
2nd year	2.3	3.5	1.0	0.8	1.6	1.8	-0.7
3rd year	2.3	4.1	0.1	1.5	2.0	2.7	-1.0
4th year	1.8	2.7	-0.8	2.4	2.5	3.5	-0.7
France : 1st year	1.4	1.8	0.2	0.1	3.0	1.5	-0.8
2nd year	2.0	1.6	1.2	0.6	3.9	2.6	-0.4
3rd year	2.2	1.9	2.2	1.1	4.3	3.4	-0.2
4th year	2.2	2.0	2.5	1.8	4.4	4.0	0.0

*percentage points difference in current account/nominal GDP ratio, other variables pecentage difference

years. For Italy, the exchange rate depreciates by 7.8 % with a corresponding 3.0 % domestic price increase (fourth year), whereas for the UK, the exchange rate depreciation of 4.2 % must be compared with the wage increase of 6.3 % (domestic price increase 4.3 %). The depreciation improves the current account situation after two years for Italy and reinforces the expansionary process through the linkage between productivity, real wage and consumption gains. Current account improvements are also observed for the UK, however the expansionary effects are weak as these are restricted to the external sector. The domestic response in the UK model is limited by the rapid inflationary impact: consumption, for example, is depressed through the real balance effect.

Without a fully integrated exchange rate determination in Sysifo and Metric, an imposed depreciation can only evaluate the consequences of competitivity gains and inflationary response (Table 12). Results of applying a 5 % depreciation in Metric and Sysifo suggest that the positive aspects also dominate these models over the four year period tested, with modest reversals of the current account losses in Germany and a complete disappearance of these losses in France. For Germany, as all price responses are rather weak (import and domestic price increases are only about 2.5 % after four years), the initial export gains are followed by the usual dominant investment and employment growth and, linked to these, increases in imports. The competitivity gains are eroded more quickly in the French case: the fourth year must be considered a turning point for the positive effects as the influence of the inflationary response begins to be felt (Debonneuil-Sterdyniak 1982). The overall GDP growth for the four year period is nevertheless quite similar for Germany and France, but for the latter the leading factors are only investment and exports.

If bond-financing of the government deficit leads to interest rate increases, this may cause initial exchange rate appreciation. Depending on the relative sensitivity of exports and imports to prices (J curve effects), a current account improvement may be observed and the possibility of a "virtuous circle" arises. Otherwise, the exchange rate reaction may be reversed by current account deterioration and the inflationary effects of the expansionary policy. This last scenario is observed for the UK model when monetary policy is defined as non-accommodating (Table 13).

Table 13 Effect of an increase in real public expenditure of 1 % of GDP with non-accommodating monetary policy (M3 constant)

		GDP	consumer price	exchange rate	current account*	interest rate*
	1st year	0.9	0.2	0.5	-0.3	1.6
UK:	2nd year	0.7	0.7	0.4	-0.3	2.9
	3rd year	0.6	2.3	-0.5	-0.4	3.4
	4th year	0.3	4.1	-1.4	-0.4	3.4

* percentage points difference in interest rate and in current account/ nominal GDP ratio, other variables percentage difference

Even if interest rate increases could lead to exchange rate appreciation in the Italian case, this would not improve the current account as Italy is assumed here to be a price-taker in world markets. On the contrary, in Sysifo, the assumptions that exports are only weakly sensitive to changes in competitivity and that the domestic economy is relatively insensitive to interest rates suggests that an exchange rate appreciation through interest rate increases may improve the current account with little repercussions on the domestic economy. Price sensitivity of exports coupled with the inflationary effects of interest rate increases shows that there may exist a trade-off between growth and the current account in France.

VI Conclusion

In spite of its rigid causality structure, a neokeynesian model can be adapted to describe economic systems with varying properties. With quantification of the mechanisms, dominant linkages can be identified. This reveals the implicit trade-offs within the system, such as that between growth/external balance/inflation.

Compared with theoretical debates based on long term solutions of models incorporating extreme or partial adjustment schemes, an exercise with econometric models helps in evaluating the implications of various combinations of adjustment speeds. Adjustment may not be complete even in the medium term: here, after four years, full adjustment is not observed. Also the types of trade-off found depend on the relative adjustment speeds. Metric illustrates the simple case where emergence of trade-offs is delayed by the overall inertia of the system. This is modified in Prometeia by the short term response of wages to productivity which initiates the inflationary process. In Sysifo and the UK model, the rapid employment response reverses this dynamics. However, the feed-backs from the productivity slowdown contribute to the stabilisation of the growth and inflation generated. Other evidence (Dunn, Jenkinson, Michael and Midgley, 1984) suggests that the turning point for the UK is after about four years. This would occur later in Germany according to the slow price response of Sysifo. The stabilisation mechanisms revealed here can be summarised as follows:

Germany: Sysifo generates a trade-off between growth and external balance. The inflation response is weak and also demand is inelastic with particularly weak competitivity effects in external trade. This implies that sustainability of growth relies on growth in world demand and that the external trade deficit cannot be eliminated by exchange rate depreciation. For the domestic economy, the distributional outcome may dampen growth through the profit/investment linkage.

France: In Metric, this demand shock, given the inherent employment/wage/price stability, also suggests a trade-off between growth and external balance. If inflation is induced through exchange rate depreciation, an inflation/growth trade-off may emerge in the medium-term because of the strong competitivity effects. Employment and wage responses always remain stable.

Italy: From Prometeia, the neutrality of the distribution of income both from the wage/price response and from the weight of the non-wage income ensures the sustainability of domestic growth.

This is achieved with a high inflation rate which has repercussions on the external balance. The latter is already deteriorating due to the high propensity to import. Over the period considered here, this deterioration can be attenuated by over-compensating exchange rate depreciation.

UK: Even for the closed economy case, it is clear from the UK model that a trade-off between inflation and growth would emerge given the response of wages to increases in output. This trade-off is offset by factors such as the real balance effect through which inflation dampens growth. In the open economy, the large competitivity losses are translated into an external trade deficit which is only slightly reduced by exchange rate depreciation because the inflationary effects are rapidly transmitted.

Clearly it cannot be claimed that a model perfectly represents the real world and shortcomings are manifold. Some dubious elements have already been exposed in these models (for example, the explosive investment reaction coupled with exogenous capacity constraints in the Sysifo model) even without considering problems of forward-looking expectations, structural difficulties, capital market reactions, etc. However, in spite of justified criticisms, the robustness and flexibility of the established macroeconomic model framework is remarkable and the need for a complete reworking of this framework is not apparent. On the whole, the Eurolink models reproduce basic differences between the European economies. Problems are related not so much to the mechanisms themselves as to the stability of the mechanisms over time. The need for quantification exists and the examination of the models presented here illustrates something of the information which can be gained by use of econometric models.

Appendix 1: Standardised description of models

For these exercises, the latest available Troll versions of the national models have been used. The simulation periods were 1981 to 1984 for the UK and Germany, and 1982 to 1985 for France and Italy. Some checks on the baseline dependency suggest that the start dates hardly change the properties for the simulations presented here. Some modifications in the models were introduced as detailed below:

- Germany: Eurolink version of Sysifo with the reintroduction of investment goods price and profit effects in the investment equations, the exogenisation of housing investment, and the specification of the negotiated wage rate equations;

- UK: Troll version of the Oxford model transferred in July 1984, with own modification to allow a low import content public investment policy to be defined (comparable with those for Germany, France and Italy);

- France and Italy: latest versions available in August 1984 of Metric and Prometeia[12].

Although their degree of disaggregation varies, it is nevertheless possible to give a standardised description of the models and to quantify the responses of the demand components. The disaggregation has no impact on the overall causality structure but may influence the derived demand component elasticities. To provide clear exposition, only the important effects are noted. The description below is organised to follow the structure of the block by block analysis.

Block 1: Demand Block:

Consumption: C = C (YD)

Specificities by countries:

- Germany : - different propensities to consume according to source of income;
  - wealth and interest rates are determinants of some items of consumption;
  - only the relative price structure of consumption goods is taken into account.

- France : - different propensities to consume according to wage and non-wage income;
  - both relative price effects and real balance effects are represented
  - unemployment and liquidity effects are also included.

- Italy : - wealth effects are represented by the stock of financial assets.

- UK : - real balance, interest rates and unemployment effects are introduced.

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[12]The linkage version of Prometeia is from April 1984. Main new features in August 1984 are: profit effect in investment function, endogenous exchange rate.

Investment: I = I (Y, FC)

Specificities by countries:

- Germany : - The investment in plant and machinery is based on a putty-clay hypothesis. These relative factor costs are introduced, but the relationships between the user cost and the interest rate is not endogenised. As described above, the effects of investment goods prices and profits have been reintroduced.

- France : - the investment functions are similar to those of Sysifo, with a full endogenisation of user cost and inluding a profit effect.

- Italy : - factor cost is represented by the real interest rate. In this latest version, profit effects have been introduced as well.

- UK : - the nominal long run interest rate is used as a proxy for the user cost of capital.

Employment: N = N (Y)

Specificities by countries:

- Germany : - for the manufacturing sectors, employment is associated with investment decisions, implying relative cost effects and utilisation rate of capactity influence.

- France : - as in Sysifo, manufacturing employment is related to the investment decision-making process. Non-manufacturing employment is affected in the short term by labour market disequilibrium.

- Italy : - manufacturing employment determination incorporates also a real wage term.

- UK : - employment adjusts to a time trend productivity.

Apart from the UK, all the models determine the hours of work as a residual of labour input adjustment. In the UK, working time is not treated but is represented in the cyclical adjustment for earnings.

Block 2 : Government sector

This block is highly dependent on the institutional specifities of the countries and the degree of disaggregation of the models. The most important endogenous parts of the government sector are direct and indirect taxes, social contributions and transfers, which are all related to nominal income components.

Block 3 : External trade

Imports: M = M (Y, COMP)

All models except for Metric take into account the different import contents of domestic demand components. The utilisation rate of capacity appears explicitly in the imports of manufactured goods determination in Sysifo and Metric. The interest rate has a negative effect on imports in Prometeia, presumably representing the cost of holding stocks. Apart from the UK model, which defines competitivity in terms of relative labour cost, all the models measure competitivity as the ratio of domestic production prices to import prices.

Exports: X = X (YF, COMP, UC)

Block 4 : Labour market: wages and unemployment:

wages: W = W (P,u)

The Metric formulation is based on this standard Phillips' curve hypothesis. Sysifo and Prometeia, for institutional reasons, adopted a two stage approach: a negotiated wage process and a wage drift. For Germany, negotiated wages depend on productivity and profits as well as on unemployment. The scala mobile formula is introduced in Prometeia. Additional indexation, unemployment and productivity effects determine the other component of the wage. In the UK model, the wage equation incorporates both labour demand and supply effects. One of the most powerful responses is to output (a sort of Phillips' curve effect). Other explanatory variables are profits, non-wage costs and public sector employment.

Unemployment:

- Germany : - Labour supply is exogenous and changes in unemployment correspond to changes in employment.

- Italy : - Labour supply is endogenous but shows only weak responses. Its determinants are household' disposable income, weight of manufacturing sector.

- France and UK : - unemployment is determined by functions which incorporate labour supply effects such as discouraged worker effects.

The labour supply and unemployment were never exogenised in the block by block analysis.

Block 5 : Prices

Except for export prices, demand prices are determined by a two step procedure:

- determination of import prices: adjusted on foreign prices with, in some cases, domestic price effects;

- determination of domestic prices: P = P (Unit cost, UC)

The determination of domestic prices is based on main equations for production prices in Sysifo, Metric and the Oxford model, and value-added prices in Prometeia. The definition of unit cost varies according to the models. All depend on a unit labour cost normalised to a tendential productivity, except Metric which incorporates current period productivity. Other costs include import costs (UK, Germany), intermediate consumption cost and financial cost (Metric only). Demand pressure effects are introduced via the capacity utilisation rate (Germany, France) or growth in some demand variables (UK, Italy).

The demand deflators are generally obtained by a weighted average of import prices and domestic production prices. In the UK, this may not be apparent because of the use of a reduced form for the price equations. The retail price index specification for the UK also includes an interest rate (related to housing costs).

Export prices have a specific treatment, as they are determined as a weighted average of domestic and foreign prices:

$$PX = PX\ (P,\ PF)$$

Sysifo also includes an effect of utilisation rate of capacity. A special effect of import prices weighted by the ratio of imports to domestic production appears in Prometeia.

Block 6: Monetary sector and exchange rate

- Key short-term interest rate determination

- Germany : - exogenous money market rate.

- France : - money market rate determined by a reaction function, where the most important endogenous determinant is the current balance.

- Italy : - treasury bill rate is also determined by a reaction function depending on current balance and inflation differentials.

- UK : - The interbank rate is exogenous in the standard model unless monetary targets are set.

- Money demand

- Germany : - money demand is simply related to expenditure, interest rate and households' wealth. Money supply adjusts to demand.

- France : - Total liquid assets are determined from saving and interest rates. Money supply is regulated via banks' refinancing cost as a mark-up on the money market rate.

- Italy : - Financial assets are determined from saving and interest rates and prices. Financial wealth in then divided among the alternative assets according to interest rate differentials and nominal income.

- UK : - Private sector wealth is determined from saving, bank lending and other liabilities. Only the monetary aggregate M3 is determined as a function of total final expenditure, interest rate and gross wealth, together with public sector bank deposits. Unless targets are applied, money supply adjusts to demand.

- Exchange rate

Only Prometeia and the Oxford model have introduced endogenous exchange rates. The effective exchange rates are dependent on current balance and inflation differentials. For the UK, money supply, interest rate and wage differentials, and North Sea oil production are other explanatory variables.

List of variables:

Y = real GNP
C = real private consumption
I = real private investment
YD = real disposable income
M = imports of goods and services in real terms
X = exports of goods and services in real terms
P = price index
U = registered unemployment rate
YF = world demand
PF = foreign prices
UC = utilisation rate of capacity
W = nominal wage rate
PM = import price
PX = export price
FC = factor cost
N = employment
COMP = competivitity index

Tables A1 to A4 present the derived elasticities of the demand components evaluated by simulating shocks on the isolated functions. This provides information on the properties of the real sector equations. Disaggregation was dealt with by calculating the total effect of applying a shock simultaneously to all parts of a component. Specification differences posed a problem for the uniform definition of the shocks applied:

- distortion due to disaggregation was avoided by increasing all relevant variables (e.g. all items of disposable income, all prices entering the consumption function, all demand variables influencing imports);

- investment was defined as total private investment including housing investment but with this last item exogenous;

- in some models it is difficult to interpret certain domestic demand effects. For imports, demand components may be used to indicate differences in import content but may also signify capacity constraints or demand pressure. In Metric and Prometeia it is particularly difficult to disentangle these effects;

- competitivity in the export and import functions is evaluated by response to domestic price changes except in the UK model, in which competitivity is defined by relative wage costs;

- capacity constraints on external trade in the UK model include the specific effect of domestic oil production.

Properties of real GDP component functions

Table A1 : Consumption

Effect on total consumption of a maintained increase of:		1st Quarter	1st Year	2nd Year	3rd Year	4th Year	cumulative four year multiplier
10 % in disposable income	D	4.8	6.3	7.9	8.0	8.0	7.6
	F	2.9	5.4	8.9	9.8	9.9	8.5
	I	2.0	4.9	8.8	9.9	10.2	8.5
	UK	4.5	5.3	6.2	6.6	7.0	6.3
10 % in prices	D	-	-	-	-	-	-
	F	-3.9	-1.5	-1.4	0.0	0.1	-0.7
	I	-	-	-	-	-	-
	UK	-1.1	-1.1	-0.9	-0.8	-0.8	-0.9
10 % in wealth	D	0.0	2.1	3.0	3.1	3.1	2.8
	F	0.0	0.1	0.1	0.1	0.1	0.1
	I	0.0	1.1	2.6	3.1	3.2	2.5
	UK	-	-	-	-	-	-
10 % in unemployment	D	-	-	-	-	-	-
	F	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
	I	-	-	-	-	-	-
	UK	-0.3	-0.1	0.0	0.0	0.0	-0.01
5 points increase in interest rate	D	-0.1	-0.9	-1.2	-1.4	-1.5	-1.2
	F	-	-	-	-	-	-
	I	-	-	-	-	-	-
	UK	-0.2	-0.2	-0.1	0.0	0.0	-0.1

Table A2 : Investment

		1st Quarter	1st Year	2nd Year	3rd Year	4th Year	cumulative four year multiplier
10 % increase in demand	D	14.1	15.4	16.5	7.4	3.2	10.4
	F	18.2	16.8	13.8	10.5	6.7	11.9
	I	8.6	7.2	6.8	7.1	7.4	7.1
	UK	9.5	11.2	13.7	11.0	8.9	11.2
10 % increase in profit	D	0.0	0.3	4.4	8.8	10.9	6.2
	F	1.4	1.6	1.4	1.4	1.4	1.5
	I	0.0	0.6	2.0	1.8	1.4	1.5
	UK	-	-	-	-	-	-
5 points increase in interest rate	D*	0.0	-5.2	-8.4	-5.2	-5.1	-6.0
	F	-0.5	-1.2	-3.0	-3.8	-4.4	-3.1
	I	-1.4	-2.6	-4.7	-5.5	-5.9	-4.6
	UK	0.0	0.0	-0.3	-0.6	-0.7	-0.4

*exogenous in Eurolink version but evaluated here via the user cost response to interest rates found in Metric (similar theoretical derivation of user cost).

Table A3 : Imports

		1st Quarter	1st Year	2nd Year	3rd Year	4th Year	cumulative four year multiplier
10 % increase in demand	D	7.6	7.7	8.0	8.3	8.6	8.2
	F	8.0	9.9	11.1	10.1	10.9	11.0
	I	8.4	12.6	12.9	12.9	12.9	12.8
	UK	32.0	15.1	10.6	10.7	10.5	11.7
10 % increase in import prices	D	-0.9	-2.4	-4.0	-4.1	-4.2	-3.7
	F	-1.6	-3.5	-6.3	-6.6	-6.6	-5.8
	I	-1.4	-2.4	-3.2	-3.2	-3.2	-3.0
	UK	-1.3	-1.1	-2.4	-3.0	-3.0	-2.4

Table A4 : Exports

		1st Quarter	1st Year	2nd Year	3rd Year	4th Year	cumulative four year multiplier
10 % increase in external demand	D	6.1	11.9	18.2	22.2	24.6	19.4
	F	10.3	10.3	10.9	11.4	11.3	11.0
	I	10.5	11.0	9.9	8.7	8.4	9.5
	UK	2.6	4.4	5.6	6.1	6.3	5.6
10 % increase in domestic supply	D	-0.2	-0.8	-3.0	-4.6	-5.4	-3.5
	F	-1.9	-4.2	-5.4	-5.3	-4.9	-5.0
	I	-5.7	-7.0	-4.1	-0.7	0.6	-2.7
	UK	0.9	0.7	0.1	-0.3	-0.2	0.1
10 % increase in export prices	D	-0.7	-1.8	-3.4	-4.4	-5.0	-3.7
	F	-1.4	-3.1	-0.8	-12.7	-15.0	-9.9
	I	-2.4	-6.6	-9.7	-8.9	-8.4	-8.4
	UK	-0.2	-0.9	-2.1	-2.8	-3.1	-2.3

Appendix 2

Table A5 - Effect on GDP of an increase in real public investment of 1 % of GDP

Taking into account	(1) = Domestic demand -consumption -inventories -investment -employment	(2) = (1) + Government Sector -taxes -transfers	(3) = (2) + External Trade -imports -exports	(4) = (3) + Wage rate	(5) = (4) + Prices	(6) = (5) (full model) + Monetary Sector -interest rates -money demand -exchange rate (UK-Italy only)
Germany : 1st year	1.9 (a)	1.8	1.3	1.3	1.3	1.3
2nd year	4.0	3.2	1.5	1.6	1.5	1.4
3rd year	8.1	4.7	1.3	1.4	1.3	1.2
4th year	19.0	6.5	1.0	1.1	1.0	0.9
France : 1st year	1.6	1.5	1.1	1.1	1.2	1.2
2nd year	2.4	1.9	1.1	1.1	1.3	1.3
3rd year	2.8	1.9	1.2	1.2	1.4	1.4
4th year	2.5	1.7	1.1	1.3	1.4	1.4
Italy : 1st year	2.3	2.1	1.0	1.0	1.1	1.3
2nd year	4.2	2.7	1.3	1.3	1.3	2.1
3rd year	6.2	3.1	1.8	1.8	1.5	2.4
4th year	7.5	2.9	1.9	1.8	1.4	2.4
UK : 1st year	1.7	1.6	1.0	1.0	1.0	1.1
2nd year	2.4	2.0	1.1	1.1	1.1	1.3
3rd year	2.6	1.9	1.0	1.2	1.0	1.4
4th year	2.6	1.8	1.0	1.0	0.6	1.0

(a) For Germany, it was necessary to exogenise the utilisation rate of capacity to obtain results for step 1.

Simulation period: 1981-1984 for Germany and the UK, 1982-1985 for Italy and France.

Table A6 - Effect of an increase in real public investment of 1 % of GDP for **GERMANY**

Taking into account: / effect on:		(1) = Domestic demand -consumption -inventories -investment -employment	(2) = (1) + Government Sector -taxes -transfers	(3) = (2) + External Trade -imports -exports	(4) = (3) + Wage rate	(5) + (4) + Prices	(6) = (5) (full model) + Monetary Sector -interest rates -money demand -exchange rate (UK-Italy only)
Employment	year 1	0.4	0.4	0.2	0.2	0.2	0.3
	year 2	1.4	1.1	0.6	0.6	0.6	0.8
	year 3	2.5	1.6	1.0	1.0	1.0	1.3
	year 4	3.6	1.9	1.3	1.3	1.2	1.6
Average earnings per head*	year 1	1.2	1.1	0.5	0.5	0.7	0.9
	year 2	2.3	1.6	0.7	0.8	1.4	2.2
	year 3	3.1	1.6	0.9	1.2	1.8	3.3
	year 4	3.6	1.5	1.0	1.3	2.0	4.4
Wage component of Households'disposable income	year 1	2.2	1.4	0.7	0.7	0.9	1.1
	year 2	4.9	2.4	1.2	1.3	1.8	2.8
	year 3	7.3	2.8	1.7	1.9	2.5	4.2
	year 4	9.2	2.9	1.9	2.3	2.8	5.5
Households' disposable income	year 1	3.2	2.2	1.2	1.2	1.4	1.7
	year 2	6.0	2.3	1.3	1.3	1.7	3.9
	year 3	8.8	2.9	1.9	1.8	2.2	3.9
	year 4	10.9	2.6	1.8	1.7	2.2	4.5

*This includes adjustment in hours of work

Table A7 : Effect of an increase in real public investment of 1 % of GDP for GERMANY

Taking into account / effect on		(1) = Domestic demand -consumption -inventories -investment -employment	(2) = (1) + Government Sector -taxes -transfers	(3) = (2) + External Trade -imports -exports	(4) = (3) + Wage rate	(5) = (4) + Prices	(6) = (5) (full model) + Monetary Sector -interest rates -money demand -exchange rate (UK-Italy only)
Productivity (per head)	year 1	1.6	1.3	0.8	0.8	0.8	0.7
	year 2	3.1	1.9	0.4	0.5	0.4	0.4
	year 3	6.3	2.5	0.0	0.1	0.0	0.0
	year 4	14.3	3.0	-0.2	-0.1	-0.2	-0.3
Government saving*	year 1	-	-0.4	-0.5	-0.5	-0.5	-0.6
	year 2	-	0.1	-0.3	-0.3	-0.3	-0.4
	year 3	-	0.6	-0.4	-0.4	-0.4	-0.5
	year 4	-	1.3	-0.5	-0.5	-0.5	-0.7

*percentage point difference in government saving/nominal GDP ratio

Table A8 : Effect of an increase in real public investment of 1 % of GDP for GERMANY

Taking into account effect on		(1) = + Domestic demand -consumption -inventories -investment -employment	(2) = (1) + Government Sector -taxes -transfers	(3) = (2) + External Trade -imports -exports	(4) = (3) + Wage rate	(5) = (4) + Prices	(6) = (5) (full model) + Monetary Sector -interest rates -money demand -exchange rate (UK-Italy only)
Consumption price	year 1					0.0	0.0
	year 2					0.2	0.5
	year 3					0.5	0.5
	year 4					0.9	0.8
Production price	year 1					0.1	0.1
	year 2					0.4	0.3
	year 3					0.6	0.6
	year 4					0.7	0.7
Import price	year 1					0.0	0.0
	year 2					0.0	0.0
	year 3					0.1	0.1
	year 4					0.4	0.4
Export price	year 1					0.1	0.1
	year 2					0.4	0.4
	year 3					0.7	0.7
	year 4					1.0	1.0

Table A9 - Effect of an increase in real public investment of 1 % of GDP for **FRANCE**

Taking into account: / effect on:		(1) = Domestic demand -consumption -inventories -investment -employment	(2) = (1) + Government Sector -taxes -transfers	(3) = (2) + External Trade -imports -exports	(4) = (3) + Wage rate	(5) = (4) + Prices	(6) = (5) (full model) + Monetary Sector -interest rates -money demand -exchange rate (UK-Italy only)
Employment	year 1	0.5	0.4	0.3	0.3	0.3	0.4
	year 2	1.3	1.1	0.6	0.6	0.7	0.7
	year 3	1.7	1.3	0.7	0.7	0.8	0.8
	year 4	1.7	1.3	0.7	0.8	0.9	0.9
Average real earnings per head	year 1	-	-	-	0.1	0.1	0.1
	year 2	-	-	-	0.1	0.1	0.1
	year 3	-	-	-	0.2	0.2	0.1
	year 4	-	-	-	0.2	0.1	0.2
Wage component of real disposable income	year 1	0.5	0.4	0.3	0.3	0.4	0.4
	year 2	1.3	0.9	0.5	0.6	0.6	0.4
	year 3	1.6	1.0	0.5	0.7	0.7	0.7
	year 4	1.6	1.0	0.6	0.8	0.8	0.9
real disposable income	year 1	0.4	0.3	0.2	0.2	0.3	0.3
	year 2	0.9	0.6	0.3	0.4	0.4	0.4
	year 3	1.2	0.7	0.4	0.5	0.5	0.5
	year 4	1.2	0.7	0.4	0.6	0.5	0.5

Table A10 : Effect of an increase in real public investment of 1 % of GDP for FRANCE

Taking into account / effect on		(1) = Domestic demand -consumption -inventories -investment -employment	(2) = (1) + Government Sector -taxes -transfers	(3) = (2) + External Trade -imports -exports	(4) = (3) + Wage rate	(5) = (4) + Prices	(6) = (5) (full model) + Monetary Sector -interest rates -money demand -exchange rate (UK-Italy only)
Productivity (per head)	year 1	1.2	1.1	0.8	0.9	0.9	0.9
	year 2	1.4	1.1	0.6	0.7	0.7	0.7
	year 3	1.2	0.9	0.6	0.7	0.8	0.7
	year 4	0.9	0.7	0.6	0.6	0.7	0.7
Government saving*	year 1	-	-0.6	-0.6	-0.6	-0.7	-0.7
	year 2	-	0.2	-0.1	-0.1	-0.1	0.1
	year 3	-	-0.3	-0.6	-0.6	-0.5	-0.6
	year 4	-	-0.2	-0.4	-0.3	-0.3	-0.4

*percentage point difference in government saving/nominal GDP ratio

Table A11 : Effect of an increase in real public investment of 1 % of GDP for FRANCE

Taking into account effect on		(1) = + Domestic demand -consumption -inventories -investment -employment	(2) = (1) + Government Sector -taxes -transfers	(3) = (2) + External Trade -imports -exports	(4) = (3) + Wage rate	(5) = (4) + Prices	(6) = (5) (full model) + Monetary Sector -interest rates -money demand -exchange rate (UK-Italy only)
Consumption price	year 1					-0.1	-0.1
	year 2					0.0	-0.1
	year 3					0.0	0.0
	year 4					0.1	0.0
Production price	year 1					0.1	0.0
	year 2					0.0	0.0
	year 3					0.0	0.0
	year 4					-0.1	0.0
Import price	year 1					-0.3	-0.3
	year 2					-0.2	-0.1
	year 3					-0.1	-0.1
	year 4					-0.1	-0.1
Export price	year 1					0.1	0.1
	year 2					0.2	0.1
	year 3					0.2	0.2
	year 4					0.2	0.1

Table A12 - Effect of an increase in real public investment of 1 % of GDP for **ITALY**

Taking into account: / effect on:		(1) = + Domestic demand -consumption -inventories -investment -employment	(2) = (1) + Government Sector -taxes -transfers	(3) = (2) + External Trade -imports -exports	(4) = (3) + Wage rate	(5) = (4) + Prices	(6) = (5) (full model) + Monetary Sector -interest rates -money demand -exchange rate (UK-Italy only)
Employment	year 1	0.4	0.4	0.2	0.2	0.2	0.3
	year 2	1.4	1.1	0.6	0.6	0.6	0.8
	year 3	2.5	1.6	1.0	1.0	1.0	1.3
	year 4	3.6	1.9	1.3	1.3	1.2	1.6
Average real earnings per head*	year 1	1.2	1.1	0.5	0.5	0.5	0.5
	year 2	2.3	1.6	0.7	0.8	0.8	0.9
	year 3	3.1	1.6	0.9	1.2	1.0	1.1
	year 4	3.6	1.5	1.0	1.3	1.0	1.4
Wage component of real disposable income	year 1	2.2	1.4	0.7	0.7	0.7	0.7
	year 2	4.9	2.4	1.2	1.3	1.2	1.5
	year 3	7.3	2.8	1.7	1.9	1.6	2.0
	year 4	9.2	2.9	1.9	2.3	1.8	2.5
Real disposable income	year 1	3.2	2.2	1.2	1.2	1.2	1.3
	year 2	6.0	2.3	1.3	1.3	1.1	2.6
	year 3	8.8	2.9	1.9	1.8	1.3	1.7
	year 4	10.9	2.6	1.8	1.7	1.2	1.5

*This includes adjustment in hours of work

Table A13 : Effect of an increase in real public investment of 1 % of GDP for ITALY

Taking into account effect on		(1) = + Domestic demand -consumption -inventories -investment -employment	(2) = (1) + Government Sector -taxes -transfers	(3) = (2) + External Trade -imports -exports	(4) = (3) + Wage rate	(5) = (4) + Prices	(6) = (5) (full model) + Monetary Sector -interest rates -money demand -exchange rate (UK-Italy only)
Productivity (per head)	year 1	2.0	1.8	0.8	0.9	1.1	1.1
	year 2	3.1	1.9	0.8	0.8	1.5	1.1
	year 3	4.1	1.8	1.0	0.8	1.4	1.1
	year 4	4.6	1.4	0.9	0.5	1.1	1.0
Government saving*	year 1	-	-0.6	-1.0	-1.0	-0.9	-1.0
	year 2	-	0.4	-0.7	-0.6	-0.5	-0.4
	year 3	-	0.4	-0.6	-0.5	-0.4	-0.2
	year 4	-	0.5	-0.5	-0.5	-0.4	-0.3

*percentage point difference in government saving/nominal GDP ratio

Table A14 : Effect of an increase in real public investment of 1 % of GDP for ITALY

Taking into account effect on		(1) = + Domestic demand -consumption -inventories -investment -employment	(2) = (1) + Government Sector -taxes -transfers	(3) = (2) + External Trade -imports -exports	(4) = (3) + Wage rate	(5) = (4) + Prices	(6) = (5) (full model) + Monetary Sector -interest rates -money demand -exchange rate (UK-Italy only)
Consumption price	year 1					0.2	0.4
	year 2					0.6	1.3
	year 3					0.9	2.2
	year 4					1.0	3.0
Production price	year 1					0.1	0.2
	year 2					0.5	0.8
	year 3					0.7	1.6
	year 4					0.9	2.4
Import price	year 1					0.0	1.1
	year 2					0.0	3.1
	year 3					0.0	5.3
	year 4					0.0	7.1
Export price	year 1					-0.4	0.2
	year 2					-0.2	1.7
	year 3					0.0	3.6
	year 4					0.2	5.2

Table A15 - Effect of an increase in real public investment of 1 % of GDP for UK

Taking into account: effect on:		(1) = Domestic demand -consumption -inventories -investment -employment	(2) = (1) + Government Sector -taxes -transfers	(3) = (2) + External Trade -imports -exports	(4) = (3) + Wage rate	(5) = (4) + Prices	(6) = (5) (full model) + Monetary Sector -interest rates -money demand -exchange rate (UK-Italy only)
Employment	year 1	0.7	0.7	0.4	0.5	0.4	0.5
	year 2	1.9	1.7	0.9	1.0	0.9	1.1
	year 3	2.5	2.0	1.0	1.1	1.0	1.3
	year 4	2.6	1.8	1.0	1.1	0.8	1.2
Average real earnings per head	year 1	-	-	-	0.1	0.2	-0.2
	year 2	-	-	-	0.7	0.6	0.2
	year 3	-	-	-	2.3	1.9	1.8
	year 4	-	-	-	2.2	1.9	2.0
Wage component of real disposable income	year 1	0.5	0.4	0.3	0.5	0.5	0.2
	year 2	1.4	1.3	0.7	1.4	1.3	1.0
	year 3	1.8	1.5	0.8	3.1	2.7	2.8
	year 4	1.9	1.4	0.8	3.1	2.6	2.9
Real disposable income	year 1	0.8	0.6	0.4	0.5	0.5	0.2
	year 2	1.9	1.1	0.7	1.0	0.9	0.7
	year 3	2.5	1.2	0.8	2.0	1.6	1.5
	year 4	2.7	1.1	0.8	1.8	1.4	1.4

Table A16 : Effect of an increase in real public investment of 1 % of GDP for UK

Taking into account / effect on		(1) = Domestic demand -consumption -inventories -investment -employment	(2) = (1) + Government Sector -taxes -transfers	(3) = (2) + External Trade -imports -exports	(4) = (3) + Wage rate	(5) = (4) + Prices	(6) = (5) (full model) + Monetary Sector -interest rates -money demand -exchange rate (UK-Italy only)
Productivity (per head)	year 1	1.2	1.1	0.7	0.7	0.7	0.7
	year 2	1.0	0.7	0.3	0.4	0.4	0.5
	year 3	0.7	0.4	0.2	0.3	0.2	0.3
	year 4	0.6	0.3	0.3	0.2	0.0	0.1
Government saving*	year 1	-	-0.3	-0.5	-0.5	-0.5	-0.4
	year 2	-	0.0	-0.4	-0.4	-0.4	-0.2
	year 3	-	0.1	-0.4	-0.5	-0.5	-0.1
	year 4	-	0.0	-0.5	-0.8	-0.7	-0.3

*percentage point difference in government saving/nominal GDP ratio

Table A17 : Effect of an increase in real public investment of 1 % of GDP for UK

Taking into account / effect on		(1) = Domestic demand -consumption -inventories -investment -employment	(2) = (1) + Government Sector -taxes -transfers	(3) = (2) + External Trade -imports -exports	(4) = (3) + Wage rate	(5) = (4) + Prices	(6) = (5) (full model) + Monetary Sector -interest rates -money demand -exchange rate (UK-Italy only)
Consumption price	year 1					0.0	0.4
	year 2					0.2	1.0
	year 3					1.0	2.3
	year 4					2.1	4.3
Production price	year 1					0.2	0.5
	year 2					0.5	1.5
	year 3					1.6	3.2
	year 4					2.7	5.3
Import price	year 1					0.0	1.6
	year 2					0.1	2.3
	year 3					0.4	3.4
	year 4					0.6	4.5
Export price	year 1					0.1	1.0
	year 2					0.2	1.8
	year 3					0.7	3.0
	year 4					1.3	4.6

BIBLIOGRAPHY

ARTUS P. (1983): Formation conjointe des prix et des salaires dans cinq grands pays industriels. In: Annales de l'Insée, n° 49, Janvier-Mars

ARTUS P., BOURNAY J;, MORIN P., PACAUD A., PEYROUX C., STERDYNIAK H., TEYSSIER R. (1980): METRIC - Une modélisation de l'économie Française. Insée, Paris

BACCHILEGA G., ONOFRI P. (1984): Nota illustrativa del modello di Prometeia. In: Ricerche quantative per la politica economica, Perugia, 16-18 Febbraio

BERGSTROM A.R., WYMER C. (1976): A Model of Disequilibrium Neoclassical Growth and an Application to the United Kingdom. In: BERGSTROM A.R. (ed.) Statistical Inference in Continuous Time Economic Models, North Holland, Amsterdam

BISMUT C., KRÖGER J. (1983): The Dilemmas of Economic Policy in France and Germany: Inflation, Unemployment and Current Account. CEQC, Document de travail n° 8305

CELLIER F., LE BERRE R., MIQUEU D. (1984): Le modèle multinational Atlas - Première partie: les modèles par pays. In: Economie et Prévision, n° 62

CESARI R., D'ADDA C. (1984): Interest Rate and exchange rate policies in Italy 1981-1983. Conference on Money, Credit and Economic Activity, Oxford, 2-4 April

CHOW G.C. (1975): Analysis and Control of Dynamic Economic Systems. Wiley, New York

CHOW G.C. (1978): Evaluation of Econometric models by decomposition and aggregation. Princeton Econometric Research Program Memorandum, October

DEATON A., MUELLBAUER J. (1980): An Almost Ideal Demand System. In: American Economic Review, Vol. 70

DEBONNEUIL M., STERDYNIAK H. (1982): Apprécier une dévaluation. In: Economie et Statistique, n° 142, mars

DEBONNEUIL M., STERDYNIAK H. (1983): La Boucle prix-salaires dans l'inflation. OFCE, Document de travail n° 83-01

DELEAU M., MALGRANGE P., MUET P.A. (1981): Une étude de la dynamique des modèles macroéconomiques. CEPREMAP. Document de travail n° 8107

DRAMAIS A. (1983): Analyse des politiques économiques comparées avec le modèle Eurolink. 4ièmes journées internationales de l'Association d'Econométrie Appliquée, Bruxelles, 8-9 décembre

DUNN, G.P , JENKINSON N.H., MICHAEL I.M., MIDGLEY G. (1984): Some Properties of the Bank Model. Bank of England, Discussion Papers, Technical Series, n° 9, March

KREMP E., LE DEM J., OUDIZ G. (1983): Industrie et Dualisme Interne. In: Dualité, Change et Contraintes Extérieures dans cinq Economies Dominantes. Le projet SACHEM-OUEST, Economie Prospective Internationale n° 13-14

KRÖGER J., SANDER U., WESTPHAL U. (1984): Simulationsexperimente mit dem Sysifo Modell. In: LANGER H.G., MARTIENSEN J., QUINKE H., Modellforum 83 - GMD Workshop 11-13 April. Berichte der Gesellschaft für Mathematik und Datenverarbeitung - Bericht n° 146

LYBECK J.A., CARLSSON E. (1982): From small to large: a Systematic Comparison of Gradually More Complex Econometric Models. Göteborgs Universitet. Memorandum n° 84, November

de MENIL G., WESTPHAL U.: Comparative Studies in Stabilisation policy, France and West Germany. North Holland (to be published)

NORDHAUS W.D. (1970): Recent Developments in Price Dynamics. In: The Econometrics of Price Determination. Conference, October 30-31, Washington D.C.

E.P.A. (1984): Proceedings of the EPA International Symposium on Economic Interdependence under Flexible Exchange Rates and the EPA World Economic Model of February 1984

OECD (1984): A Comparison of Simulation Properties of National Econometric Models. In: OECD Economic Studies, N° 2, Spring

Oxford Economic Forecasting (1984): Macroeconomic Model of the UK, January

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