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Potential Output in the Seven Major OECD Countries

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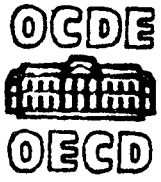
by

Raymond Torres and John P. Martin

Growth Studies Division

May 1989



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This paper outlines the concepts and methods used by the OECD Secretariat to derive estimates of potential output and capacity utilisation for the major seven countries. While there are many alternative definitions of potential output, the one which is currently being used by the OECD Secretariat refers to the level of output that is consistent over the medium-term with stable inflation. The paper also contrasts the OECD approach and estimates with those published recently by the IMF. Finally, it presents the results of some INTERLINK simulations designed to illustrate some of the possible effects of faster productivity and potential output growth on macroeconomic performance.

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Cet article décrit les concepts et les méthodes utilisés par le Secrétariat de l'OCDE pour estimer le potentiel de production et le taux d'utilisation des capacités des sept grands pays de l'OCDE. Le potentiel de production estimé pàr le Secrétariat de l'OCDE est défini comme le niveau de production compatible à moyen terme avec une inflation stable, étant entendu qu'il existe beaucoup d'autres défintions possibles. En outre, l'article compare l'approche et les estimations de l'OCDE avec celles que le FMI a publiées récemment. Enfin, quelques effects possibles d'une plus forte croissance de le productivité et du potential de production sont illustrés au moyen de simulations du modèle INTERLINK.

POTENTIAL OUTPUT IN THE SEVEN MAJOR OECD COUNTRIES

by

Raymond Torres and John P. Martin*

May 1989

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* Administrator, Country Studies II Division and Head of the Growth Studies Division, respectively. The authors would like to acknowledge a strong intellectual debt to Peter Jarrett who has played a leading role in the development of the supply blocks in INTERLINK. Helpful comments and suggestions were received from many colleagues in the Economics and Statistics Department. In particular, we would like to thank Martine Durand, Thomas Egebo, John Fallon, Mike Feiner, Bob Ford, Paul O'Brien, Pierre Poret, Wim Suyker and Pete Richardson. We would also like to thank David Coe for comments and Flemming Larsen for supplying us with the IMF data on output gaps.

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POTENTIAL OUTPUT IN THE SEVEN MAJOR OECD COUNTRIES

I. INTRODUCTION

1. Over the past decade much greater attention has been paid to setting economic policies in a medium-term framework, reflecting a growing concern with structural reform and with the sustainability of imbalances between demand and supply. In this context, potential output can play a useful role as a summary indicator of aggregate supply, and it does so in the OECD Secretariat's medium-term projections. A stated aim of structural policies is to raise productivity growth in the longer-run, thereby improving the supply side of the economy and stimulating potential output growth. In addition, the size of the gap between demand and supply is an important indicator of the sustainability of observed output growth.

2. It is important, however, not to exaggerate the role of measures of potential output in policy analysis for several reasons. First, many different concepts of potential have been proposed in the literature and are in use in OECD countries. Second, a wide variety of empirical methods are used to measure it, ranging form time-series and trend-type analyses to more elaborate calculations based on production functions and factor demand equations -- the precise answers are not insensitive to the chosen methods. Finally, because of these problems, measures of potential are only one of a battery of indicators which policy makers study when trying to make judgements about the current and future path of non-inflationary growth.

3. The aims of this paper are three-fold: i) to explain the method used by the OECD Secretariat to derive a measure of potential output; ii) to present estimates of potential output and the gap between actual and potential output, a measure of capacity utilisation, for the major seven countries; and iii) to illustrate some of the possible effects of faster productivity and potential

output growth on macroeconomic performance. The Secretariat is currently developing measures of potential output for most of the other OECD countries, using a similar approach to the one described here. It is intended to write up these results in due course.

4. The structure of this paper is as follows. Section II explains the definition of potential output chosen by the Secretariat and the method used to derive the estimates. The estimates themselves are reviewed in Section III. The International Monetary Fund has recently been giving greater prominence to potential output in its projections of international economic trends, as well as in its surveillance activities -- see Adams et al. (1987) and IMF (1988). Section IV compares the Secretariat and IMF approaches and estimates. Section V discusses some simulations of the effects of faster productivity and potential output growth using the OECD's INTERLINK model, which embodies the chosen measure of potential in the structure of the major seven country models (1). The final section presents some concluding remarks.

II. THE CONCEPT AND ESTIMATION OF POTENTIAL OUTPUT

5. There are many alternative definitions of potential output and many methods have been used to quantify these concepts, starting with the seminal work by Okun (1962) (2). The particular concept of potential output which is currently being used by the OECD Secretariat refers to the level of output that is consistent over the medium-term with stable inflation. As such, this concept is clearly different from the maximum attainable level of output in an engineering sense that could be produced with given factors of production.

6. This particular concept was chosen in line with the emphasis on control of inflation as a key medium-term priority. In addition, as is shown below, its use ensures consistency between labour market equilibrium and product market equilibrium in INTERLINK.

1. Structure of the supply blocks in INTERLINK

7. The business-sector supply blocks in INTERLINK play a key role in the determination of the estimates of potential output and capacity utilisation. The general framework for modelling supply is broadly that presented in Helliwell et al. (1986) and Jarrett and Torres (1987). The supply blocks for the major seven OECD countries jointly determine factor demands, output supply and producer prices in a consistent framework involving an aggregate three-factor production function of nested CES form. This contains an inner function which combines capital and energy into a single aggregate, referred to as the capital-energy bundle. Specific allowance is made for a vintage element to the capital stock: a flexible "putty/semi-putty" structure has been specified which permits an estimated proportion of the capital stock to be adjusted in each period with shifts in relative energy prices, a process known as "retrofitting" (3). Failure to endogenise the scrapping rate is typically a major weakness in empirical estimation of production functions. This problem is overcome here to the extent that, for a given capital stock, the capital-energy bundle is allowed to vary in line with changes in relative energy prices (4). The capital-energy bundle is then combined with the labour input measured in efficiency units in the "outer" production function. The outer function is characterised by:

i) a constant elasticity of factor substitution;

ii) constant returns to scale;

iii) Harrod-neutral technical progress, i.e. assumed to be solely labour-augmenting and specified as a labour efficiency index.

This leads to the following overall specification of the production functions:

$$QBSV = (\beta * (ETB * ELEFF) ** \rho + \alpha * KEBSV ** \rho)** (1/\rho) \qquad [1]$$

where QBSV is normal output, which represents the output level that would be supplied if the actual quantities of capital, labour and energy were used at average utilisation rates;

ETB is actual business-sector employment;

ELEFF is the labour efficiency index;

KEBSV is the actual capital-energy bundle;

ρ is equal to $(\tau\text{-}1)/\tau$, where τ is the elasticity of substitution in the outer function between labour and the capital-energy bundle;

and β and α are scale parameters.

8. The resulting estimates of the elasticity of substitution are shown in Table 1; details of the estimates are described in Jarrett and Torres (1987). The unweighted mean elasticity across the seven countries is 0.65 implying that, on average, a 1 per cent increase in the price of labour relative to the cost of the capital-energy bundle leads to a rise in the capital-energy/labour ratio of 0.65 per cent.

2. Technical progress

9. In general, technical progress increases total factor productivity (TFP), but it may have different effects on the productivity of individual factors. As noted above, technical progress is assumed to affect labour efficiency: in equilibrium (that is, in the absence of changes in relative factor prices), this implies that technical progress augments labour productivity, keeps capital productivity unchanged and therefore increases the capital/labour ratio (5). Hence, this assumption about the nature of technical progress implies constant profit shares in long-run steady-state growth.

10. Given that the United States has the highest level of TFP (measured at purchasing power parities) among the OECD countries, a "catch-up" hypothesis, with reference to technical progress in the other countries, is incorporated in the estimation of the supply blocks (6). Specifically, the rates of growth of labour efficiency in the other countries were assumed to converge eventually to the U.S. rate which is taken to be exogenous (7).

11. Prior to 1973, rates of growth of labour efficiency ranged from 1.0 per cent for the United States to more than 7 per cent for Japan (Table 2). Over the period 1973 to 1979, technical progress decelerated in all countries lending some support to the catch-up hypothesis. For the 1980s, a continuation of this hypothesis would have implied a further deceleration in the rate of technical progress everywhere. However, the catch-up hypothesis has been partly overridden by the judgement of OECD country experts. Basing their judgement partly on the evidence of a pick up in labour productivity growth over the latest cycle and their assessment of the likely effects of structural policies, some recovery in labour efficiency growth in Canada, the United States and the United Kingdom has been assumed.

3. Definition of potential output

12. Potential output in the business sector is defined as the level of output derived from equation [1], using as inputs:

i) the actual level of the capital-energy bundle;

ii) the labour efficiency index; and

iii) potential business-sector employment.

13. For present purposes, potential output is defined as the maximum level of output consistent with stable inflation. The level of the actual capital-energy bundle is used as one input to the calculation, since it reflects a relatively binding physical constraint on supply. In contrast, it is not appropriate to include actual employment in the definition of potential output since it may deviate from the level consistent with a stable rate of inflation. Instead a measure of potential employment is used which takes account of the wage-price block of INTERLINK.

14. The basic wage-price block can be represented as follows (8):

$$w = p^e + a_0 - a_1 \, UNR + a_2 Z \qquad [2]$$

$$\dot{p} = c^{e}\text{-}b_1[p(-1)\text{-}c(-1)]+b_2(IFU2\text{-}1) + \alpha \qquad [3]$$

($\dot{w} = dw/dt$, etc.).

Where w represents the wage rate, p the price level, UNR the unemployment rate, Z a set of other variables which shift nominal wages, p the output price, c total unit costs (unit labour costs plus unit capital costs plus unit energy costs), and IFU2 the ratio of actual to potential output. In INTERLINK, price and cost expectations are modelled as moving averages of current and past rates of price and cost inflation.

15. Equation [3] includes two error-correction terms. The first expression in brackets -- [p(-1)-c(-1)] -- is the lagged price-cost margin; this variable is specified in level terms, thereby constraining prices to be equal to total unit costs in equilibrium. The second term in equation [3] represents the difference between the ratio of actual to potential output and its average value, which is unity. In such a framework, excess (insufficient) demand will exert an upward (downward) pressure on price inflation.

16. Conditions for long-run equilibrium are two-fold: a) the mark up is constant [$p(-1)=c(-1)+\alpha/b_1$]; and b) expectations are fulfilled ($\dot{p}^{e}=\dot{p}$ and $\dot{c}^{e}=\dot{c}$). Under these conditions, real wages grow in line with labour efficiency in long-run equilibrium (9):

$$\dot{w}\text{-}\dot{p}=ELEFF \qquad [4]$$

Combining equation [4] with the wage equation [2] and solving it for the unemployment rate gives the so-called "non-accelerating wages rate of unemployment" (NAWRU) (10). Conditions a) and b) imply that the unemployment rate is equal to the NAWRU and IFU2 is unity. However, IFU2 can only be equal to unity if potential output is equal to actual output i.e. if potential employment is equal to actual employment (11). This latter condition only holds if the unemployment rate embodied in the definition of potential

employment, the NAWRU, is equal to the actual unemployment rate in long-run equilibrium. Therefore, including the NAWRU in the potential output definition ensures consistency between labour market equilibrium (UNR=NAWRU) and product market equilibrium (actual output=potential output).

17. This leads to the following definition of potential employment:

potential business-sector employment = "normal" labour force * (1-NAWRU) - general government employment.

One point to note is that it is the so-called "normal" labour force rather than the actual labour force which enters the definition of potential employment. The labour force has been "normalised" (by using a geometric moving average) to eliminate, as far as possible, the effects of cyclical fluctuations in labour force participation rates in order to avoid introducing undue volatility in the series for both potential employment and potential output.

18. Potential output, in turn, is defined as:

potential business-sector output = F (potential employment; ELEFF; actual capital-energy bundle),

where F denotes the outer production function discussed above (equation [1]).

Potential output for the whole economy is obtained by adding value added in the government sector and net indirect taxes to business-sector potential output.

III. ESTIMATES OF POTENTIAL OUTPUT

1. Estimation results

19. Given the above general framework and current estimates of supply and

wage-price block parameters, potential output estimates for the business-sector for the major seven countries have been calculated and are presented in Table 3. Estimates of potential output are quite sensitive to the methods used, the exact values of chosen parameters and the assumptions about exogenous variables such as technical progress. Hence, the numerical values presented in Table 3 should be regarded as indicating likely orders of magnitude rather than precise estimates.

20. Estimates for the NAWRU, which play a key role in the calculation of potential output, are shown in Table 4. Plausible estimates of the NAWRU for Germany and the United Kingdom could not be obtained using the existing wage equations in the model. Instead, OECD country experts provided judgmental estimates for the NAWRU for these two countries.

21. The contributions of the various inputs to the growth rate of potential are also shown in Table 3. Excepting Canada, the capital-energy bundle's contribution to potential output growth has shown a marked deceleration until the middle of the 1980s. This reflects in part the rise in real energy prices which curbed the demand for energy. However, the downward trend in the estimated contribution of the capital-energy bundle has been reversed recently, reflecting the investment boom and low real energy prices.

22. The pace of TFP growth in the major seven countries is similar to that of the capital-energy bundle. In the United States, it provided a positive, though weak, stimulus to potential output growth in the 1980s, compared with a zero contribution in the 1974-79 period. Outside the United States, the contribution of TFP declined steadily until the middle of the 1980s (except in the United Kingdom). Thereafter the data suggest a break in the downward trend of TFP growth. In the case of the United Kingdom and, to a lesser extent, Canada, the contribution of TFP increased appreciably during the 1980s.

23. Labour force growth has tended to decelerate in some countries in the 1980s in line with a slowdown in the growth of the working-age population. However, in North America and, to a lesser extent in Japan, its contribution to potential output growth has been fairly strong. The major European countries combine weak labour force growth, rising NAWRUs and strong job

creation in the government sector. As a result, the amount of labour input available to the business sector in these countries has remained broadly stable throughout the period.

24. Finally, some partial simulations were run in order to assess the sensitivity of potential ouput to: (i) a fall in the NAWRU by one percentage point; (ii) a rise in the underlying rate of technical progress -- proxied by an increase in the index for labour efficiency by one percentage point; and (iii) an upward shift in the level of the capital stock by one percentage point. The effects on potential output of these exogenous shocks appear to be fairly similar for each of the seven country models. On average, the semi-elasticity of potential output to the NAWRU is 0.9 (that is, a fall by one percentage point in the NAWRU leads, on average, to a rise of 0.9 per cent in potential output). The elasticity of potential output to technical progress is also quite close to unity -- averaging 0.7 over all the seven countries. In contrast, the simulated effect of the capital stock is small, as the elasticity averages some 0.3. Overall, the results in Table 3 appear to be fairly sensitive to values taken by the NAWRU and the path of technical progress, but less so to estimates of the capital stock.

2. Price and quantity responses to excess demand

25. Chart 1 shows the ratios of actual to potential output, a measure of inflationary pressures, proxying the gap between aggregate demand and supply. These measures are normalised to be unity on average so that a value in excess of unity means that the economy is operating above potential and a value below unity that there is slack in the economy. In general, estimates of the gap fell substantially below the 1973 peak in the middle of the 1970s. They then increased until the late 1970s. In the early 1980s, the gap variable fell below unity almost everywhere (except in Japan), thereby providing support to the disinflationary process over this period. In the late 1980s, the estimated gaps have tended to exceed unity for all countries except Germany and France, suggesting some renewal of inflationary pressures. In the case of Germany, the gap is projected to close by 1990, whereas for France the gap is projected to remain below unity.

26. For given values of demand, a divergence between actual and potential output may be expected to produce two different effects. First, it should exert pressures on price inflation. Empirical evidence to this effect is provided by Stiehler (1987) in his reestimation of the price equations for the major seven country models in INTERLINK. However, Stiehler's estimates suggest a very slow response of prices to a gap. This is in line with other empirical studies on price determination (see Encaoua and Geroski (1986) for a survey).

27. Second, the gap could also influence the split of demand between domestic and foreign supply. At present, INTERLINK, like some other macroeconometric models (e.g. the Metric model of the French economy), allows for some spillover effects from the goods market in the determination of import volumes and prices (12).

28. Table 5 shows correlation coefficients between the gap (or the change in the gap), the change in consumer price inflation and import penetration growth. Import penetration is defined as the ratio of merchandise imports to total domestic demand, both variables measured in real terms. In all cases except Japan and United Kingdom, the gap is highly correlated with variations in inflation, suggesting that an above-average gap is associated with an acceleration of inflation. By contrast, there appears to be almost no correlation between excess demand and import penetration growth except in France, Italy and the United Kingdom. Even in these three countries, the correlation is fairly weak. However, the growth of import penetration appears to be much more strongly correlated with the change in the gap (13).

IV. COMPARISON WITH IMF ESTIMATES

29. The IMF has recently published its own estimates of potential output, using a similar methodology to the one presented here. In both cases, a production function approach is used and some measure of unemployment consistent with stable inflation is estimated. In addition, the IMF study makes use of the OECD business-sector data base.

30. However, there are important differences between the two methodologies. First, the IMF study includes only two factor inputs -- labour and capital -- in the aggregate production function whereas this study also takes account of energy. Second, the Fund estimates a non-accelerating inflation rate of unemployment (NAIRU) from an unemployment equation which includes several structural factors as explanatory variables. In contrast, the NAWRU estimates used here are generally derived from a Philips-curve type of nominal wage equation. Third, the labour input in the OECD estimates is a moving average of the actual or projected labour force times one minus the NAWRU. The IMF method uses an equation linking the dependent variable, actual employment, to some demographic variables and to the gap between the actual unemployment rate and the NAIRU. Finally, the IMF models technical progress by a set of time trends whereas the OECD estimates (except for the United States) are partly determined by the catch-up hypothesis until the early 1980s, as explained above.

31. The latest IMF and OECD estimates of potential output growth for the total economy are compared in Table 6 (14). For the pre-1973 period, the IMF estimates are higher than those of the OECD. This reflects different estimations of TFP. In contrast, the OECD figures for the period 1973-79 show stronger potential output growth compared with IMF estimates. In the IMF study, an arbitrary rise in the scrapping rate was imposed for 1974, thereby reducing substantially capital stock growth. One advantage of the OECD approach is that it takes explicit account of the effects of energy price changes on the capital stock. For the 1980-87 period, the two sets of estimates are very similar. In general, both institutions give similar estimates for potential output growth for the projection period. However, in the case of Canada, the divergence is important, reflecting primarily differences in the estimated contributions of growth in the capital stock.

32. Chart 2 compares the IMF and OECD estimates of the gap variables over the period 1980-87. For all countries except Germany and Italy, both the levels and the fluctuations of the two series are very similar. For Germany, the OECD series indicates a wider gap throughout the 1980s. For Italy, the IMF shows a rather stable gap of over 1 per cent from the mid-1980s on, whereas the OECD estimates suggest that the gap was eliminated by 1986.

V. SIMULATIONS OF TECHNICAL CHANGE AND PRODUCTIVITY GROWTH

33. In this section, the possible effects of changes in technical progress on macroeconomic performance are illustrated by means of some INTERLINK simulations of the outcomes of an exogenous increase in labour efficiency gains, a key determinant of potential output. Two main conclusions emerge from the simulations: first, faster technical progress increases output growth and yields employment gains in all major seven countries. Second, the responses of nominal wages and prices to increased productivity are key factors in explaining inter-country differences.

1. Channels of transmission from a change in technical progress to output, prices and employment

34. A rise in technical progress relative to baseline enhances labour efficiency and, for a given level of output, results in less labour input. However, this negative substitution effect on employment is offset by positive output effects which operate through two main channels:

a) Profitability increases relative to baseline to the extent that higher wages do not absorb all the gains in labour productivity (15). Improved profitability leads to an increase in the desired level of output which firms wish to supply. It can also have positive effects on aggregate demand through the stimulus it gives to investment.

b) Increased productivity serves to lower prices through two effects. First, it lowers unit labour costs directly. Second, as the rate of technical progress increases, the gap between actual and potential output widens, thereby exerting downward pressures on prices relative to baseline. These favourable effects on inflation in turn generate positive effects on consumption demand. Competitiveness also improves in relative terms in those countries where the productivity shock is strongest.

35. The magnitude of these positive output effects depends crucially upon the extent to which the benefits of higher productivity growth are not immediately taken up by higher nominal wages, but instead result in lower price inflation relative to baseline rates.

2. Simulation results of faster technical progress in the United States

36. Table 7 shows the effects of the diffusion of a sustained increase of one percentage point in labour efficiency gains in the United States, which feeds through to other countries not only via international trade linkages but also via the "catch-up" effect described in Section II above. Real public expenditure is kept constant so as to ensure that there is no impact from fiscal policy compared with the baseline. Also, monetary policy is assumed to be non-accommodating (i.e. constant money supply, which could allow interest rates to fall) and the simulation was carried out in linked mode, but with fixed exchange rates.

37. An improvement in technical progress in the "frontier" country leads to employment gains, higher output growth and price disinflation in all countries. Differences occur across countries, reflecting the specific structure of each country model, and in particular the responsiveness of wages and prices to demand and supply.

38. Real wages absorb only part of the productivity gains and therefore profitability improves in all cases. As a result, private investment rises relative to baseline, particularly in the United States and in France. Output rises in all countries relative to baseline; not surprisingly, output growth is strongest in the United States. Employment gains are relatively large in the Germany and France, in line with moderate real wage responses in these two countries. The employment increases are smallest in those cases where the real wage response to enhanced productivity is high, i.e. Japan, Italy and Canada. The United Kingdom combines above-average real wage increases with fairly large employment gains, due to a stronger productivity shock (16).

39. Higher productivity growth leads to falling prices in all countries, thereby stimulating private consumption. In line with the magnitude of the

labour efficiency gains, the United Kingdom shows large price decreases relative to baseline. By contrast, despite the rise in the labour efficiency index, prices only decline moderately in the United States. This is partly explained by a strong wage response to improved productivity and the decline in unemployment.

3. Simulation results of faster technical progress in all countries

40. Table 8 shows the effects of a sustained rise in the labour efficiency index by 1 percentage point in each country with the same assumptions about the stance of monetary, fiscal and exchange-rate policies as in the first simulation.

41. The overall results show that increased labour efficiency leads to significant output effects and employment gains. This reflects on the one hand the positive effects of the rise in profitability on output supply and business investment and, on the other hand, the demand stimulus arising from price deflation. Below-average improvements in profitability occur in the United States and Canada, countries where the wage responses to increased productivity are relatively large. However, due to strong demand reactions to the fall in the price level, employment gains in these two countries are only slightly below average. By contrast, France shows the largest employment increases in line with the moderate response of real wages. In the goods market France is also an outlier: despite real-wage moderation, the price level falls less than in most of the other countries.

VI. CONCLUDING REMARKS

42. This paper has outlined the concepts and methods used by the OECD Secretariat to derive estimates of potential output for the major seven countries. It has also contrasted the OECD approach and estimates with those published recently by the IMF. The following broad conclusions emerge from this study:

i) The OECD has developed a method which has the advantage of including the major determinants of potential output in a consistent way, based on an aggregate three-factor production function. However, the method is sufficiently flexible to allow for judgement of country specialists about several key determinants, in particular the path of technical progress and the measure of labour market equilibrium -- the NAWRU.

ii) Applying this methodology provides a set of estimates of potential output which are consistent with stable inflation over the medium term.

iii) The ratio between actual and potential output of the business sector, a measure of capacity utilisation, is found to be positively correlated with price inflation and enters significantly into the price equations in INTERLINK. While the gap is only weakly correlated with the growth of import penetration, there appears to be a much stronger association with changes in the gap.

iv) The OECD and IMF estimates of potential output growth and capacity utilisation are very similar.

NOTES

1. See Richardson (1988) for a recent review of the structure and properties of OECD's world macroeconometric model INTERLINK.

2. See Christiano (1981) for an extensive review of the various concepts and methods of measurement. See also many of the articles in the Bosworth and Heathfield (1987) volume.

3. The exact definition of the capital-energy bundle (KEBSV) can be found in Helliwell et al. (1986). KEBSV can be expressed as follows:

   KEBSV = g [KEBSV(-1); IBV; KBV(-1); PENB/UCC; retrofitting parameter; inner elasticity of substitution]

   where IBV is business fixed investment, KBV business capital stock, and PENB/UCC the price of energy relative to the user cost of capital. The partial derivatives of KEBSV with respect to its arguments are all positive except for PENB/UCC and KBV(-1). The partial derivative with respect to relative energy prices is negative. The partial derivative with respect to the lagged capital stock is positive if the retrofitting parameter is non-zero; there is no effect if the retrofitting parameter is zero.

4. If relative energy prices rise (fall), energy requirements fall (rise) relatively to a given capital stock input; therefore a change in the relative price of energy produces a change in the opposite direction in the capital-energy bundle. In that sense, the "putty/semi-putty" structure is equivalent to a production structure without energy but with a capital stock whose scrapping rate would vary with relative energy prices.

5. Because technical progress is assumed to be labour-augmenting, TFP growth is approximately equal to labour efficiency growth times the labour share. TFP growth is defined as:

$$\dot{TFP} = \dot{QBSV} - [a\ \dot{ETB} + (1-a)\ \dot{KEBSV}]$$

where a represents approximately the labour share; and a "dot" over a variable denotes a growth rate. Substituting equation [1] in the text into the above definition and then totally differentiating yields

$$\dot{TFP} = a\ \dot{ELEFF}.$$

6. There is a detailed discussion of the "catch-up" hypothesis in Helliwell et al. (1986).

7. The level of labour efficiency can differ among countries even after convergence in growth rates has been achieved.

8. See Chan-Lee et al. (1987) for a summary of the empirical work underlying the model's most recent wage equations, and Stiehler (1987) for price equations.

9. This holds under the assumption that real interest rates and real energy prices are constant in long-run equilibrium.

10. Combining equations (2) and (4), assuming $\dot{p}^e = \dot{p}$, and solving it for the unemployment rate consistent with stable wage inflation gives the NAWRU as follows:

$$NAWRU = -(\dot{ELEFF} - a_0 - a_2 \bar{Z}) / a_1,$$

where $\bar{Z}$ represents the equilibrium values taken by the Z variables.

11. An additional condition is that capital stock be fully utilised in long-run equilibrium.

12. The INTERLINK's import volume equations include the ratio of current total domestic demand to a moving-average of current and past total domestic demand. Such a variable is used as a proxy for capacity utilisation.

13. A relationship between changes in the gap and variations in price inflation was also tested without success. But the change in the gap lagged one period was positively correlated with changes in inflation.

14. The contribution of changes in the energy input has been substracted from the capital-energy bundle in the OECD calculation. Therefore, Table 6 shows the specific contribution of the capital stock alone for both sets of estimates.

15. Profitability is proxied in the model by the ratio of business sector output prices (PQB) to the dual cost of the production function (CKEL). CKEL is approximately equal to a weighted average of input prices minus total factor productivity (the labour efficiency index times the labour share). Hence, when real factor prices remain constant, a rise in technical progress leads to an increase in PQB/CKEL.

16. The U.K. rate of technical progress is relatively close to that of the United States, the technological leader. As a result, in the model the U.K. rate of labour efficiency growth shows the highest speed of convergence to the U.S. rate. This is why a shock to the U.S. labour efficiency index produces the largest productivity effects for the United Kingdom.

REFERENCES

Adams, C., P.R. Fenton and F. Larsen (1987), "Potential Output in Major Industrial Countries", Staff Studies for the World Economic Outlook, Washington, D.C.: International Monetary Fund, August.

Bosworth, D., and D.F. Heathfield (eds.) (1987), Working Below Capacity, Macmillan, London.

Chan-Lee, J.H., D.T. Coe and M. Prywes (1987), "Microeconomic Changes and Macroeconomic Wage Disinflation in the 1980s", OECD Economic Studies, Spring, pp. 121-157.

Christiano, L.J. (1981), "A Survey of Measures of Capacity Utilization", IMF Staff Papers, March, pp. 144-198.

Encaoua, D. and P. Geroski (1986), "Price Dynamics and Competition in Five OECD Countries", OECD Economic Studies, Spring, pp. 47-74.

Helliwell, J., P. Sturm, P. Jarrett and G. Salou (1986), "The Supply Side in the OECD's Macroeconomic Model, OECD Economic Studies, Spring, pp. 75-131.

IMF (1988), "Potential Output and Capacity Utilization in the Major Industrial Countries", World Economic Outlook, Annex II, August.

Jarrett, P. and R. Torres (1987), "A Revised Supply Block for the Major Seven Countries in INTERLINK", OECD Department of Economics and Statistics, Working Paper No. 41, April.

Okun, A. (1962), "Potential GNP: Its Measurement and Significance" in American Statistical Association, Proceedings of the Business and Economic Statistics Section.

Richardson, P. (1988), "The Structure and Simulation Properties of OECD's INTERLINK Model", OECD Economic Studies, Spring, pp. 57-122.

Stiehler, U. (1987), "Price Determination in INTERLINK", OECD Department of Economics and Statistics, Working Paper No. 44, May.

Table 1

Estimates of the elasticity of substitution (a)

	Elasticity of Substitution between labour and the capital-energy bundle
United States	0.74
Japan	0.32
Germany	0.73
France	0.72
United Kingdom	0.77
Italy	0.64
Canada	0.64

a) For further details on these estimates, see Jarrett and Torres (1987).

Table 2

Labour efficiency growth

(annual growth rates)

	1966-73	1974-79	1980-85	1986-90
United States	1.0	0.0	0.3	0.7
Japan	7.4	3.2	2.8	2.7
Germany	3.6	2.5	1.9	1.7
France	5.1	2.8	1.8	1.6
United Kingdom	2.3	1.0	2.2	2.7
Italy	4.4	2.8	2.0	1.6
Canada	1.8	1.3	0.3	0.7

Table 3

Business-sector potential output growth (a)

	1966-73	1974-79	1980-85	1986-90
United States				
Potential output (business sector)	3.3	2.9	2.6	2.8
of which:				
capital-energy bundle	1.6	1.3	1.1	1.3
labour	1.2	1.6	1.3	1.0
total factor productivity (b)	0.5	0.0	0.2	0.4
Japan				
Potential output (business sector)	9.1	4.3	4.0	4.1
of which:				
capital-energy bundle	3.6	0.9	0.8	0.9
labour	0.7	0.5	1.0	1.0
total factor productivity (b)	4.8	2.9	2.2	2.2
Germany				
Potential output (business sector)	3.9	2.4	2.3	2.4
of which:				
capital-energy bundle	1.7	1.1	0.9	1.1
labour	-0.2	-0.4	0.2	0.0
total factor productivity (b)	2.4	1.7	1.3	1.3
France				
Potential output (business sector)	5.0	3.4	2.1	2.5
of which:				
capital-energy bundle	2.0	1.5	0.8	1.1
labour	-0.4	0.1	0.1	0.2
total factor productivity (b)	3.4	1.8	1.2	1.2
United Kingdom				
Potential output (business sector)	2.5	1.8	2.3	3.2
of which:				
capital-energy bundle	1.8	1.2	1.1	1.1
labour	-0.3	0.1	0.3	0.4
total factor productivity (b)	0.9	0.5	0.8	1.6
Italy				
Potential output (business sector)	4.2	3.0	2.5	2.7
of which:				
capital-energy bundle	1.9	0.9	0.7	1.2
labour	-0.6	0.2	0.6	0.4
total factor productivity (b)	2.9	1.9	1.2	1.0
Canada				
Potential output (business sector)	4.4	4.7	3.4	3.4
of which:				
capital-energy bundle	2.1	2.1	1.9	1.8
labour	1.3	1.8	1.3	1.1
total factor productivity (b)	1.0	0.8	0.2	0.5

a) The calculations are based on gross output data (including energy consumption).

b) Total factor productivity (TFP) growth is equal to labour efficiency growth multiplied by the labour share in value added.

Table 4

Estimates of the NAWRU

	1966-73	1974-79	1980-87
United States	6.4	6.9	6.4
Japan	1.8	2.1	2.1
Germany	3.2	3.6	4.0
France	1.9	4.4	6.1
United Kingdom	3.8	4.1	5.4
Italy	5.0	6.3	7.5
Canada	7.7	8.2	8.7

Table 5

Correlation coefficients between the gap (a), inflation and import penetration, 1971S1-87S2

	United States	Japan	Germany	France	United Kingdom	Italy	Canada
Correlation between the gap and:							
Change in price inflation	0.71	0.17	0.51	0.70	0.25	0.72	0.53
Import penetration growth (b)	0.10	0.05	0.03	0.33	0.29	0.21	0.02
Correlation between the change in the gap (GAP-GAP(-1)) and import penetration growth	0.67	0.17	0.59	0.64	0.23	0.80	0.81

a) The gap is defined as the ratio of actual to potential output.

b) Growth in the ratio of manufacturing imports to domestic demand, both in real terms.

Table 6

IMF and OECD estimates of total-economy potential output growth (a)

	1966-73		1974-79		1980-87		1988-90 (b)	
	IMF	OECD	IMF	OECD	IMF	OECD	IMF	OECD
United States								
Potential output	3.6	3.3	2.0	2.6	2.8	2.5	2.8	2.7
of which:								
Capital (c)	0.8	1.5	0.5	1.1	0.8	1.1	0.8	1.1
Labour	1.0	1.0	1.3	1.4	0.7	1.1	0.7	0.9
TFP	1.1	0.5	0.1	0.0	1.0	0.2	1.0	0.4
Public sector	0.7	0.3	0.1	0.1	0.3	0.2	0.3	0.2
Japan								
Potential output	8.6	8.3	3.5	4.3	3.9	4.0	3.9	4.0
of which:								
Capital (c)	2.3	2.7	1.0	1.9	1.3	1.1	1.6	0.9
Labour	-0.3	0.6	0.7	0.5	0.3	0.9	-0.1	0.9
TFP	5.9	4.9	1.4	1.8	2.0	2.0	2.0	2.1
Public sector	0.7	0.1	0.2	0.1	0.3	0.1	0.4	0.0
Germany								
Potential output	4.5	3.7	1.5	2.3	2.2	2.2	2.1	2.3
of which:								
Capital (c)	1.0	1.5	0.5	0.9	0.7	0.8	0.7	0.9
Labour	-0.8	-0.2	-0.8	-0.3	-0.2	0.1	-0.8	0.0
TFP	3.7	1.9	1.5	1.3	1.4	1.1	1.9	1.2
Public sector	0.6	0.5	0.3	0.4	0.3	0.2	0.3	0.2
France								
Potential output	5.5	4.3	2.3	3.0	2.3	2.1	2.5	2.5
of which:								
Capital (c)	1.1	1.4	0.7	1.1	0.8	0.9	0.9	1.0
Labour	-0.1	-0.2	-1.0	0.1	-0.6	0.0	-0.5	0.3
TFP	3.9	2.5	2.3	1.5	1.8	0.9	1.8	0.9
Public sector	0.6	0.6	0.3	0.3	0.3	0.3	0.3	0.3
United Kingdom								
Potential output	2.7	2.6	1.0	2.0	2.5	2.4	2.6	2.9
of which:								
Capital (c)	0.7	1.7	0.4	0.8	0.6	1.5	0.6	1.1
Labour	-0.9	-0.4	-0.8	0.2	-0.3	0.1	-0.2	0.2
TFP	2.2	0.7	0.8	0.5	1.6	0.5	1.7	1.3
Public sector	0.7	0.6	0.6	0.5	0.6	0.3	0.5	0.3
Italy								
Potential output	5.1	3.8	1.4	2.6	3.0	2.7	2.6	3.0
of which:								
Capital (c)	1.0	1.5	0.6	0.8	0.8	0.8	0.6	1.4
Labour	-1.3	-0.5	-0.3	0.2	-0.1	0.6	-0.4	0.3
TFP	4.9	2.5	0.9	1.5	1.8	1.1	1.5	0.8
Public sector	0.5	0.3	0.2	0.1	0.5	0.2	0.5	0.4
Canada								
Potential output	4.9	4.4	3.6	4.0	3.5	3.5	2.8	3.5
of which:								
Capital (c)	0.9	1.7	0.7	1.5	0.9	1.8	0.9	1.6
Labour	1.1	1.0	1.4	1.4	1.0	1.1	0.8	1.0
TFP	1.7	0.8	0.9	0.6	1.1	0.2	0.7	0.4
Public sector	1.2	0.9	0.6	0.5	0.5	0.5	0.4	0.5

a) The calculations are based on value-added data not gross output data as in Table 3.

b) 1988-92 for the IMF.

c) In order to make the two sets of estimates comparable, the contribution of the capital-energy bundle in the OECD calculations has been adjusted to exclude the effect of energy.

Table 7

Effects of a Labour Efficiency Growth Increase (by 1 p.p.) in the U.S.

(Deviations from baseline in per cent)

Years:	1	3	5	1	3	5
Output				Private Consumption		
U.S.	0.6	2.0	2.8	0.2	1.0	1.6
Japan	0.1	0.4	0.9	0.0	0.2	0.5
Germany	0.1	0.4	0.8	0.0	0.1	0.2
France	0.0	0.5	1.3	0.0	0.1	0.4
U.K.	0.1	0.4	0.7	0.0	0.2	0.6
Italy	0.0	0.2	0.5	0.0	0.1	0.3
Canada	0.0	0.1	0.4	0.0	0.1	0.4
Prices				Private Investment		
U.S.	-0.1	-0.6	-0.5	1.5	6.3	8.8
Japan	-0.0	-0.1	-0.3	0.1	0.3	0.7
Germany	-0.0	-0.0	-0.1	0.1	0.5	0.8
France	-0.0	-0.1	-0.1	0.1	0.9	2.5
U.K.	-0.0	-0.2	-0.8	0.0	0.3	0.4
Italy	-0.0	-0.2	-0.6	0.0	0.1	0.2
Canada	-0.0	-0.2	-0.5	0.0	0.2	0.7
Employment				Real Foreign balance		
U.S.	0.2	0.7	1.2	-0.1	-0.1	-0.3
Japan	0.0	0.1	0.2	0.0	0.2	0.3
Germany	0.0	0.1	0.4	0.0	0.2	0.4
France	0.0	0.1	0.4	0.0	0.0	0.0
U.K.	0.0	0.2	0.3	0.0	0.1	0.2
Italy	0.0	0.1	0.2	0.0	0.1	0.2
Canada	0.0	0.1	0.2	0.09	0.0	0.0
Real wages				Profitability		
U.S.	0.3	0.5	2.5	0.3	0.5	0.6
Japan	0.0	0.2	0.5	0.0	0.0	0.1
Germany	0.0	0.1	0.2	0.0	0.0	0.1
France	0.0	0.1	0.1	0.0	0.2	0.5
U.K.	0.0	0.2	0.6	0.0	0.1	0.3
Italy	0.0	0.2	0.5	0.0	0.1	0.1
Canada	0.0	0.2	0.4	0.0	0.1	0.3
Labour efficiency index						
U.S.	0.74	2.75	4.79			
Japan	0.01	0.29	0.89			
Germany	0.01	0.24	0.73			
France	0.02	0.35	1.06			
U.K.	0.02	0.48	1.39			
Italy	0.01	0.29	0.87			
Canada	0.02	0.36	1.07			

Table 8

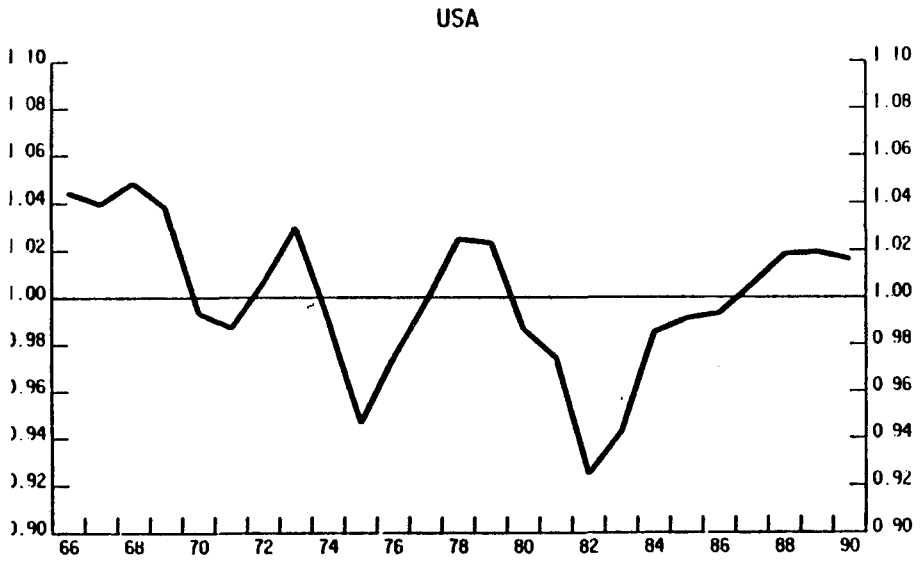
Effects of a Labour Efficiency Growth Increase (by 1 p.p.) in all Countries

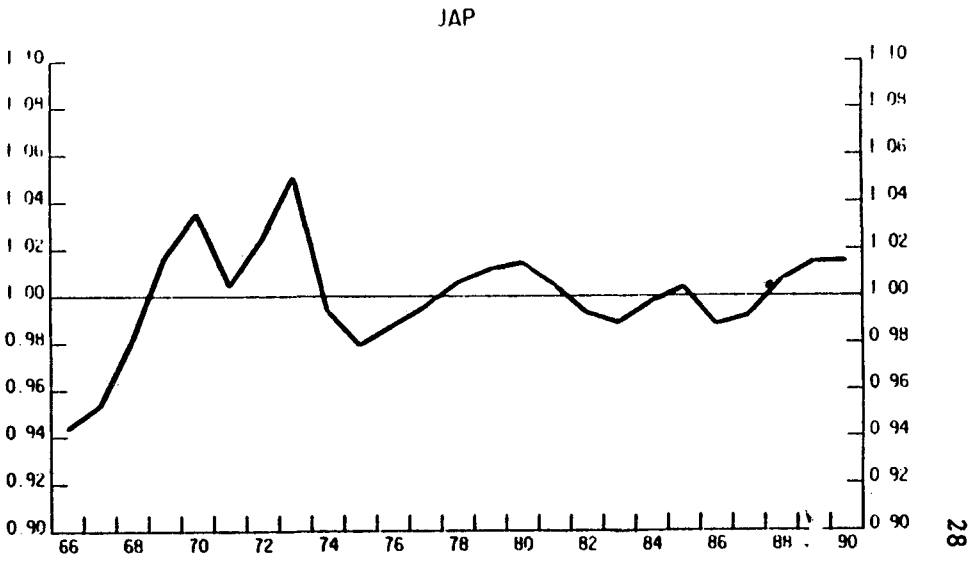
(Deviations from baseline in per cent)

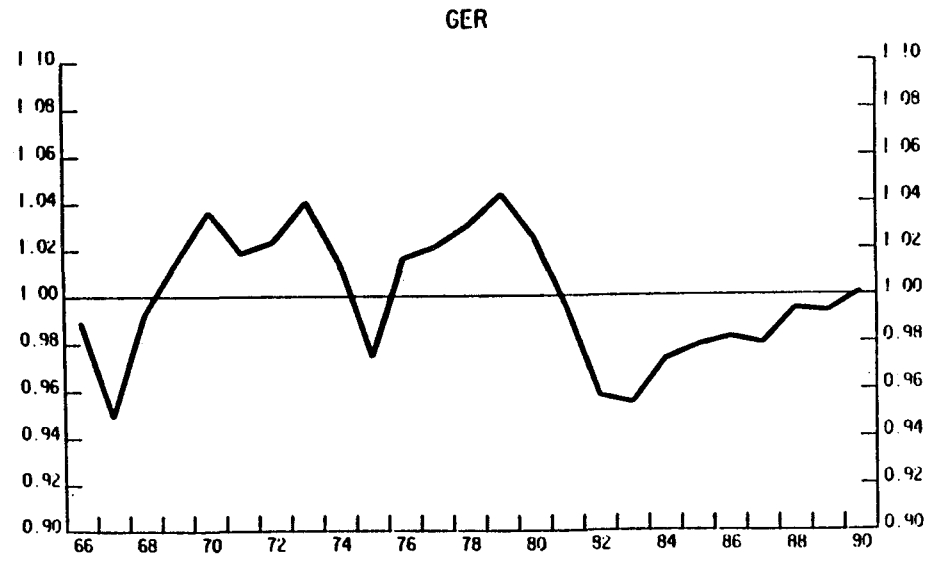
Years:	1	3	5	1	3	5
Output				Private Consumption		
U.S.	0.7	2.0	2.6	0.2	1.1	1.7
Japan	0.7	2.0	3.1	0.4	1.4	2.2
Germany	0.6	1.9	2.6	0.3	1.2	1.9
France	0.8	3.1	4.9	0.2	1.1	2.0
U.K.	0.5	1.1	2.2	0.2	0.9	2.0
Italy	0.3	0.8	1.4	0.1	0.8	1.5
Canada	0.3	1.3	2.3	0.2	1.0	1.8
Prices				Private Investment		
U.S.	-0.1	-0.5	-0.7	1.6	6.3	8.1
Japan	-0.4	-1.4	-2.6	0.5	2.7	4.7
Germany	-0.2	-1.4	-3.5	1.0	2.5	2.5
France	-0.3	-1.3	-1.7	1.2	6.0	9.7
U.K.	-0.3	-1.9	-3.7	0.5	1.5	3.9
Italy	-0.3	-1.5	-2.3	-0.2	-0.1	0.5
Canada	-0.2	-1.1	-2.0	0.2	1.6	4.2
Employment				Real Foreign Balance		
U.S.	0.3	0.7	0.7	-0.0	-0.1	-0.4
Japan	0.2	0.5	1.0	0.0	0.2	0.3
Germany	0.1	0.7	0.7	-0.0	0.2	0.7
France	0.2	0.9	1.8	-0.1	-0.4	-0.7
U.K.	0.1	0.4	0.7	-0.1	0.2	0.2
Italy	0.1	0.4	0.6	0.0	0.2	0.2
Canada	0.2	0.6	0.8	0.0	0.2	0.3
Real wages				Profitability		
U.S.	0.3	1.7	3.1	0.3	0.4	0.4
Japan	0.4	1.3	2.2	0.1	0.6	1.1
Germany	0.2	0.8	1.5	0.3	0.8	1.2
France	0.1	0.5	1.0	0.4	1.2	1.9
U.K.	0.2	0.9	1.7	0.2	0.8	1.4
Italy	0.2	1.1	2.1	0.3	0.8	1.1
Canada	0.2	1.3	2.4	0.3	0.6	0.7
Labour efficiency index						
All countries	0.7	2.7	4.8			
Productivity of labour						
U.S.	0.4	1.3	2.0			
Japan	0.5	1.5	2.1			
Germany	0.5	1.2	1.9			
France	0.6	2.1	3.0			
U.K.	0.5	0.7	1.5			
Italy	0.2	0.4	0.8			
Canada	0.1	0.7	1.5			

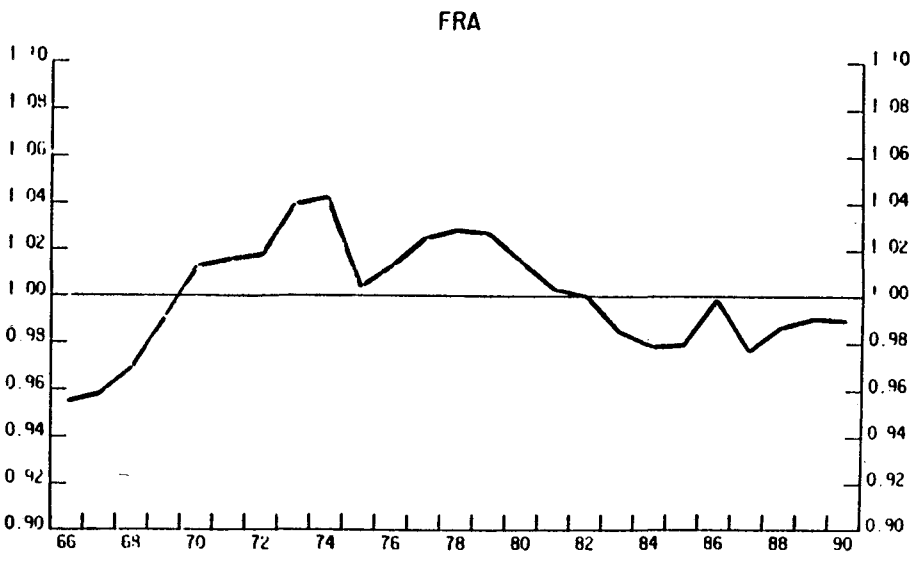
Chart 1

RATIO OF ACTUAL OUTPUT TO POTENTIAL OUTPUT









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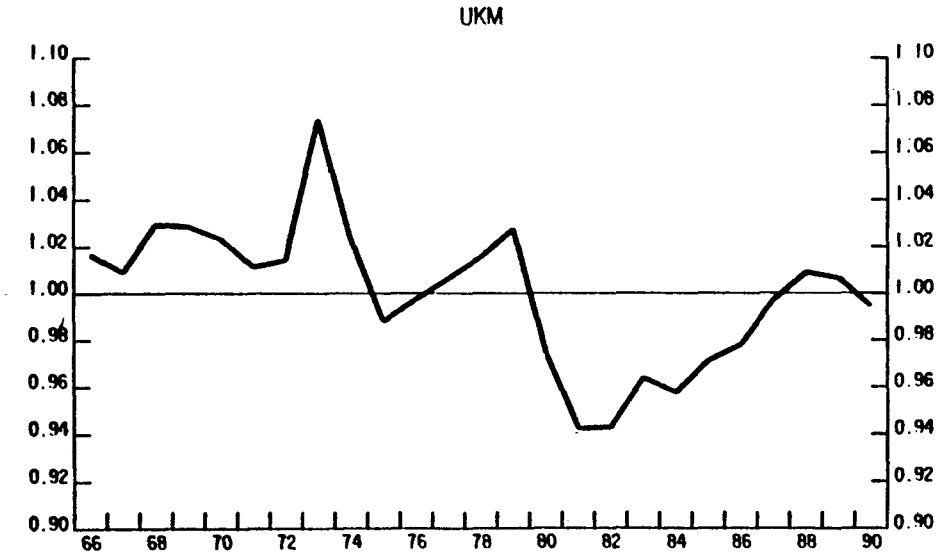
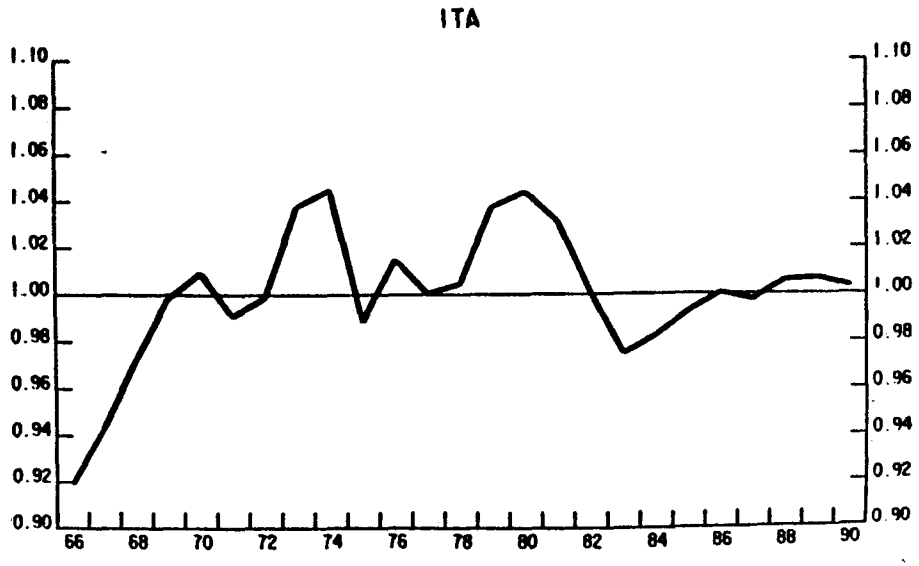




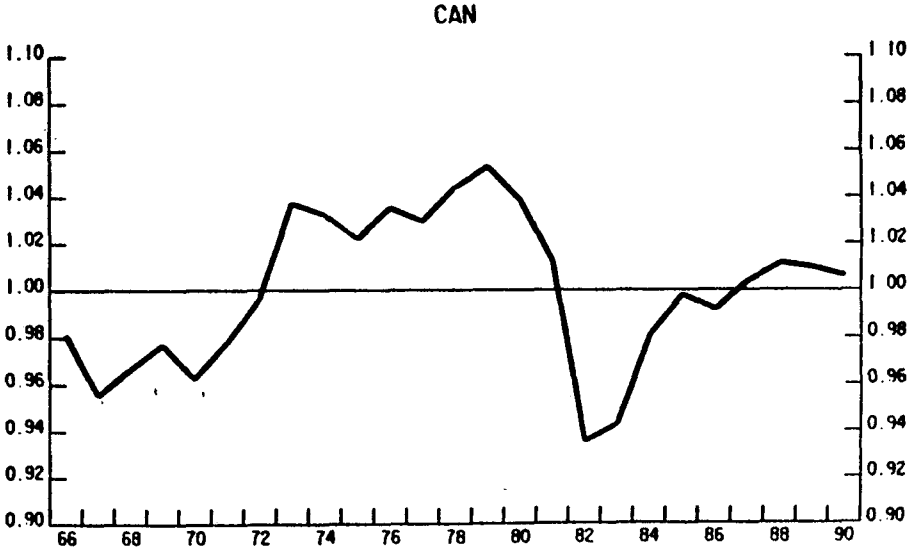


Chart 2

OUTPUT GAPS

(in per cent of potential output)

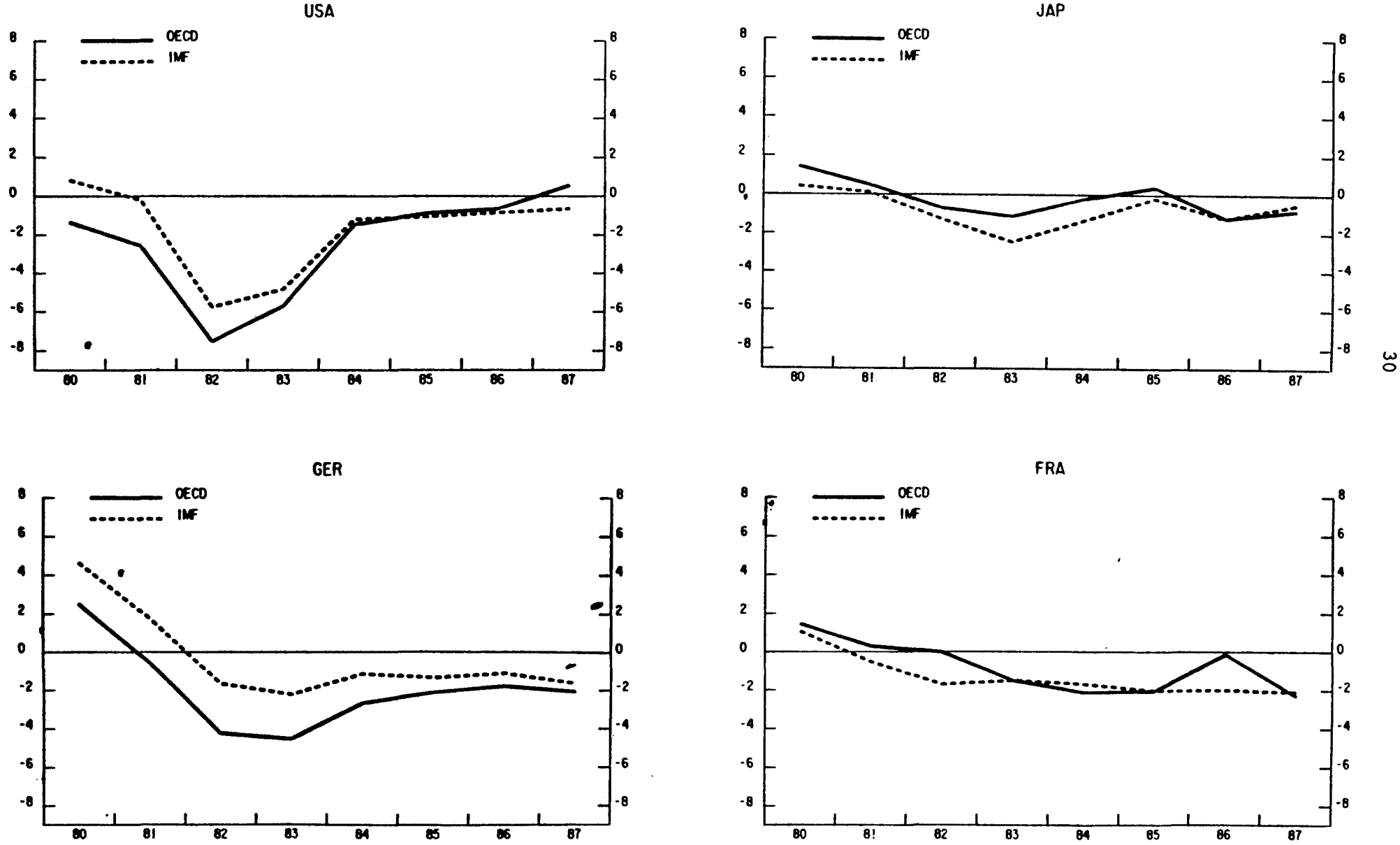
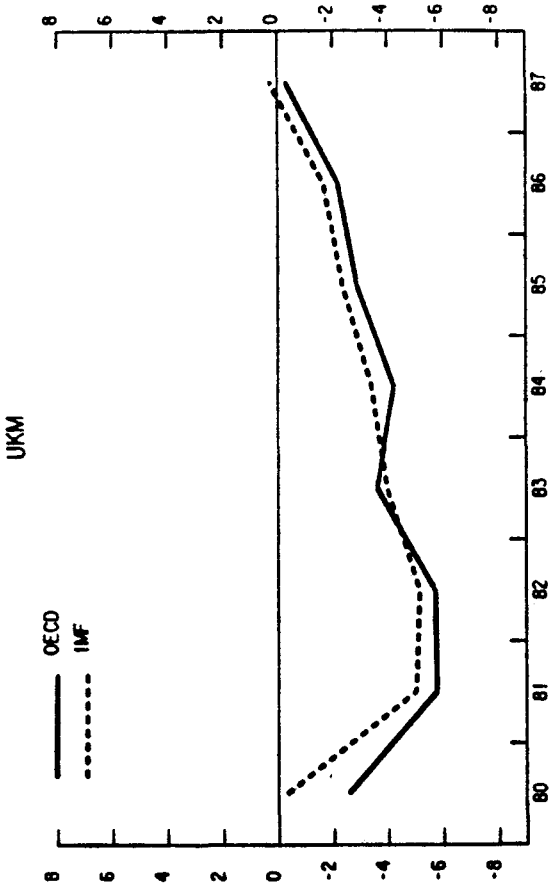
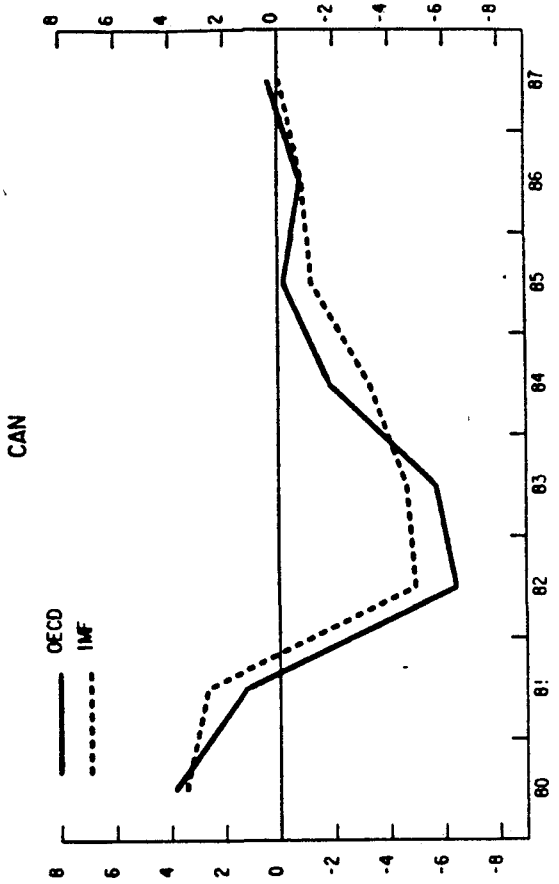
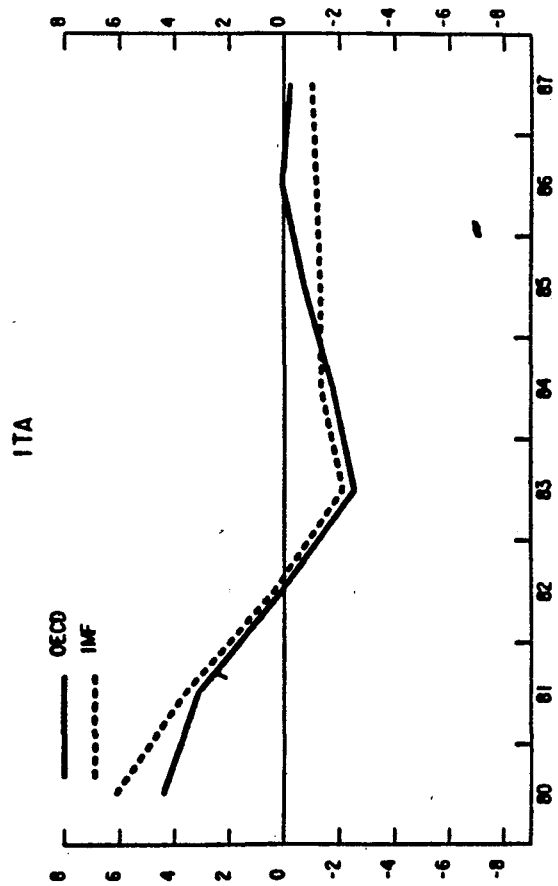


Chart 2 (continued)







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