



OECD Economics Department Working Papers No. 85

Simulating the OECD
INTERLINK Model under
Alternative Monetary Policy
Rules

Pete Richardson

<https://dx.doi.org/10.1787/573688010825>

OECD
DEPARTMENT
OF ECONOMICS AND STATISTICS

WORKING PAPERS

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under Alternative Monetary Policy Rules**

Working Paper No. 85

by

**Pete Richardson
(Head, Econometric Unit)**

October 1990



ECONOMICS AND STATISTICS DEPARTMENTWORKING PAPERS

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This paper reviews the influence of a variety of different monetary rules for the G3 economies on the comparative simulation properties of a recent version of the OECD INTERLINK model. The simulated shocks are typically of a "global" nature, with the main objective being to assess the relative effectiveness of alternative monetary policy settings in achieving a stable set of outcomes for main macroeconomic aggregates at the global level. Since the relative performance of different policies seems likely to depend on both the nature of the shocks and specific structural features of the model used, it also examines the extent to which these results are likely to be empirically fragile.

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Cet article passe en revue les différentes règles monétaires des économies des pays G3 et décrit leur influence sur les propriétés de simulation d'une version récente du modèle INTERLINK. Les chocs de simulation ont typiquement une nature "globale", leur objectif principal étant d'évaluer l'efficacité relative de plusieurs alternatives monétaires dans l'obtention de résultats stables pour les principaux agrégats macro-économiques au niveau global. Le caractère empiriquement fragile des résultats obtenus sera également envisagé, dans la mesure où les performances relatives des différentes politiques semble être une fonction tant du caractère des chocs que des structures particulières des différents modèles.

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under Alternative Monetary Policy Rules**

by

Pete Richardson

**OECD Econometric Unit
October 1990**

This paper was written as a contribution to the Brookings Institution Conference on "The Empirical Evaluation of Alternative Policy Regimes" held in Washington DC, March 8-9, 1990. The author, the head of the OECD Econometric Unit, wishes to thank Ralph Bryant and Dale Henderson of the Brookings Institution, Koichi Hamada and his colleagues Andrew Dean, Thomas Egebo, Mike Feiner, Richard Herd and Jeff Shafer for comments on an earlier draft. Special thanks also go to the following members of the Econometric Unit -- Portia Eltvedt, Julie de Kerorguen, Laura Garcia, Serge Petiteau and Rik Ford -- for expert technical assistance and support.

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I. INTRODUCTION

This paper reviews the influence of a variety of different monetary rules for the G3 economies on the comparative simulation properties of a recent version of the OECD INTERLINK model (1). The simulated shocks are typically of a "global" nature, with the main objective being to assess the relative effectiveness of alternative monetary policy settings in achieving a stable set of outcomes for main macroeconomic aggregates at the global level. Since the relative performance of different policies seems likely to depend on both the nature of the shocks and specific structural features of the model used, it also examines the extent to which these results are likely to be empirically fragile.

Stochastic simulation methods provide an important and powerful framework in which questions of stabilisation and policy targetting may be studied, and the work of Frenkel *et al.* (1989) provides a useful starting point in the context of empirical models of the world economy. Large empirical models are however at a comparative disadvantage in carrying out the very large volume of computations required for such analysis. Indeed, the simulation capabilities and resource requirements of INTERLINK do not allow such an exercise, given the combination of model scale, country detail and data base requirements (2). At the same time, there are more compelling reasons to think that the returns to a detailed stochastic simulation exercise with INTERLINK might be relatively low.

Firstly, although work examining forward-looking model solution techniques is under way at the OECD, the main multi-country version of the model still lacks a forward-looking treatment of expectations in financial markets, which would make for some of the key non-linear elements important to stochastic simulation analyses (3). Secondly, it might be argued that an analysis of model responses to stochastic shocks based on sample historical residuals are of only limited interest to policy makers in relation to other elements of uncertainty -- in some respects they could be regarded as something of a diversion. In particular, key uncertainties attach to both the appropriateness of model structure (parameter and structural uncertainty) -- and hence the key model mechanisms on which such simulations rely -- and singular events leading to systematic shifts in variables which are either exogenous or, being only partially modelled, tend to get classified as "stylised assumptions". Indeed, the experience of the last two decades suggests that some of the main trials for policy makers have been and will continue to be associated with discrete events falling into this latter category -- the impact of debt crises and non-OECD behaviour on world trade and payments, the effects of stock market fluctuations and consumer confidence on economic growth and stability and the effects of world-wide inflationary pressures. Thirdly, the results of stochastic

simulations alone may be difficult to digest without first studying the implications of alternative policy rules given deterministic shocks.

This present study therefore follows a more restricted agenda, one examining the implications of alternative monetary policy assumptions given a variety of deterministic global shocks, which are typical of the events faced by authorities and analysts. In particular, it looks at the differences in simulated out-turns for key policy variables associated with the use of different interest rate reaction rules for the G3 economies and examines some of the key mechanisms involved.

The paper is in four parts. Section II discusses the underlying nature of the different monetary rules used and the overall set-up of the simulations, the specification of individual shocks. Section III provides a detailed account of the set of simulation results, discussing the key model mechanisms involved. Section IV provides summary comparisons and an evaluation based on the relative performance of the individual policy options, noting also the extent to which these depend on specific features of INTERLINK. Section V summarises the overall results and conclusions.

II. SIMULATION SPECIFICATION

1. The specification of individual shocks

To illustrate the influence of alternative monetary policy rules on INTERLINK properties, the following four shocks were simulated over a five-year period (1987-1991):

i) An increase in non-OECD import demand

This case assumes a 5 per cent step increase in the level of non-OECD country imports in volume terms. The normal mechanism within the model whereby an ex-ante change in non-OECD imports would progressively be modified by changes in interest-debt repayments and net export revenues is shut off, although interest flows themselves are endogenous and affect service flows and the current balance.

ii) A fall in OECD private consumption

This case assumes a simultaneous 1 per cent ex-ante step reduction in the levels of private consumption for all OECD countries. The shock is administered through calibrated changes in consumption equation residuals, and therefore allows consumption to adjust endogenously to subsequent changes in income, prices and financial sector variables.

iii) A U.S. fiscal contraction

The case of a U.S. fiscal contraction (a reduction in real expenditures equivalent

to 1 per cent of GNP) is one which has featured in a variety of earlier studies, though without a great deal of experimentation in monetary policy assumptions (4). As cuts in U.S. public expenditures become progressively more a reality, so the focus of interest in appropriate monetary policy settings becomes a more pressing issue. At the same time, an update of results for the U.S. fiscal shock provides a useful point of reference for the evolution of model properties.

iv) An increase in OECD wage rates

This case assumes a common ex-ante increase in wage rates for all OECD countries, administered as a 2 per cent increase in wage equation residuals in the starting period. The subsequent scale of effects on wage rates are therefore conditioned by the strength of wage/price interactions and the modifying influence of demand pressure in goods and labour markets.

All simulations additionally assume real government expenditures and marginal tax rates to be maintained at baseline levels for OECD countries. Interest flows, taxes and social security and the nominal values of expenditures are fully endogenous, implying that overall government balances are also endogenous in real and nominal terms.

EMS member countries and the majority of other European economies (Austria, Scandinavia, Switzerland, etc.) are assumed to target interest rates in order to maintain parity with the Deutschmark. The United Kingdom is treated as an exception, operating the same monetary policy options as the G3 countries, which are discussed in the following section. The remaining OECD Member countries are assumed to either operate a policy reaction function linking domestic interest rates to weighted foreign interest rates or to target a constant real exchange rate.

2. The choice of monetary policy rules

As a preliminary to discussing individual simulation results, this section provides a general description of the range of monetary policy rules considered and the underlying model mechanisms involved. A useful background summary of the main features of the financial sector relationships involved is given by Helliwell et al. (1988).

In specifying the range of policy rules considered for the individual G3 countries, an important distinction can be made between two broad classes of policy rules. By and large, the monetary rules considered here can be described as "exact" targetting rules, insofar as the instrument variable is typically set to "exactly" achieve stability in the policy target variable in each period. This is typically achieved by inverting one or more behavioural equations in the models. For example, with a fixed money supply target, short-term interest rates move in simulation so as to give a path of money supply which is unchanged from its baseline path. In effect, money demand, which is determined by a behavioural equation, is equated to the fixed baseline path of money supply by solving the equations in question to determine the market-clearing value of interest rates.

This approach contrasts with somewhat "looser" forms of monetary targetting, which

typically involve the addition of an explicit reaction function linking the setting of the monetary instrument (in this case short-term interest rates) to simulated movements in selected policy targets. For example, one might specify an x-basis-point increase in interest rates per y-per-cent increase above baseline in the monetary aggregate. The main advantages in adopting a "loose" form of monetary rule are that such rules may be simpler for economic agents to understand and also simpler for authorities to implement, since they do not assume a precise knowledge of the underlying behavioural model. Moreover, with an appropriate choice of reaction function coefficient, approximate control of the target variable may be achieved over a period of time. The principal disadvantage is the degree of imprecision and therefore the amount of trial-and-error required in achieving satisfactory control over the target variable.

In practice the distinction between these two forms of rule is likely to be considerably less precise. As elaborated below, setting an "exact" money target through a demand-for-money relationship may well boil down to choosing a reaction function with interest rates responding to calibrated changes in real and nominal income. The principal difference will concern the choice of reaction parameters and the amount of prior knowledge required to make such a choice. In the real world, as opposed to econometric models, neither is likely to be particularly certain.

The following sections elaborate further on the set of alternate policy rules considered for the G3 countries and the underlying reaction function parameters involved.

a) Unchanged nominal interest rates

This is a model default option, with money supply assumed to fully accommodate endogenous movements in money demand. Maintaining unchanged nominal rates implies that real rates, which are key determinants of real investment and consumption, move inversely with inflation.

b) Fixed money targets

For this option, money supply is assumed to be held fixed at baseline values, with short-term interest rates endogenised to eliminate excess money demand (5). Essentially, this implies an inversion of the corresponding money demand equations. These can be expressed in terms of per cent deviations from baseline as:

$$(m^d - p) = a \cdot y - b \cdot r_s + c (m^d - p)_{-1} \quad (1)$$

with $m^d = m^s = 0$, this implies a rule of the form:

$$r_s = \frac{a}{b} \cdot y + \frac{p}{b} - \frac{c}{b} \cdot p_{-1} \quad (2)$$

where r_s = the absolute deviation of short-term rates from baseline
 y = the percentage deviation of real income levels from baseline
 p = the percentage deviation of price levels from baseline

and a and b are respectively the income and interest rate impact elasticities of money demand, and c is the lagged adjustment parameter.

The underlying instability of available money demand estimates suggests that equation (2) may best be characterised as a simple monetary rule linking interest rate reactions to a weighted function of income and price level movements rather than a precise control rule for money aggregates. Although some estimates suggest that the underlying dynamics of money demand equations might give rise to instrument instability, the dynamics of the semi-annual equations in INTERLINK are sufficiently straightforward to provide a stable trade-off between interest rates and nominal income effects.

c) Exchange rate targeting

This option is implemented with the United States assumed to follow a fixed money rule, as in (b) above, and Japan and Germany using interest rates to hold exchange rate parity with the dollar. This effectively involves the endogenisation of short-term interest rates through the inversion of the model's exchange rate equations. Broadly unchanged from the version described by Holtham (1984), the relevant relationships can be expressed in terms of deviations from baseline, as:

$$(e - e^*) = c \cdot (r_s - r_f) + d \cdot w \quad (3)$$

$$e^* = f \cdot e_{-1} - (1 - f) \cdot (p - p_f) \quad (4)$$

where p_f and r_f represent weighted foreign prices and interest rates and e^* the expected exchange rate. Equation (3) determines the deviation between actual and expected rates as a function of interest differentials and the stock of foreign assets, w , expressed as a share of world wealth. Equation (4) represents a backward-looking adaptive expectations mechanism, driven by relative price differentials. Substituting (4) into (3) and holding exchange rates unchanged at their baseline levels, implies an overall reaction function of the form:

$$r_s = r_f + \frac{(1-f)}{c} \cdot (p - p_f) - \frac{d}{c} \cdot w \quad (5)$$

i.e. one relating domestic short rates directly to changes in foreign short rates, price level differentials and asset stocks. With a similar rule applying across most other OECD countries, the U.S. money target and corresponding interest rates act as primary anchors to the system.

This option can be thought of as representing one of a number of possible forms of exchange rate co-ordination. Since a range of different interest rate configurations for the G3 countries would be consistent with stable exchange rates, the choice of the United States as being the country following an independent monetary policy is essentially arbitrary. Equally feasible alternatives might involve either Japan or Germany following a money-supply based rule with the United States targeting the dollar, or the choice of other co-ordinated targets based on a different nominal anchor.

d) Fixed real short-term interest rates

A variety of different measures of real short-term interest rates might be considered, depending largely on the choice of definition for expected inflation rates. For convenience, the current simulations use a relatively simple definition based on the actual GNP inflation rate. Expressed as deviations from baseline, the corresponding real rate is defined as:

$$i_s = r_s - \dot{p} \quad (6)$$

By holding the real short rate unchanged in simulation, this involves a simple rule of the form:

$$r_s = \dot{p} \quad (7)$$

so that in simulation nominal short rates move one-for-one with percentage deviations of the GNP inflation rate from baseline.

e) Fixed real long-term interest rates

Two features of INTERLINK suggest that a long-term real interest rate target might prove to be a more effective means of control than a real short rate. Firstly, it is typically inflation adjusted long rates which enter the cost of capital and borrowing terms in the model's investment and consumption equations. Secondly, since the interest yield curve is

typically represented as an error-correction process, the presence of significant adjustment lags between short and long rates implies that changes in the former feed through only slowly to influence domestic demand.

Defining the real long rate, i_t , in a way analogous to the real short rate, gives:

$$i_t = r_t - \dot{p} \quad (8)$$

which along with the yield curve relationship of the general form:

$$\Delta r_t = g \cdot \Delta r_s - h \cdot (r_t - r_s)_{-1} \quad (9)$$

gives an expression for the short-term rate rule for unchanged long-term real rates as:

$$r_s = \frac{\dot{p}}{g} + \frac{(g-h)}{g} \cdot r_{s(-1)} - \frac{(1-h)}{g} \cdot \dot{p}_{-1} \quad (10)$$

With the parameter g typically less than unity, this implies that initial movements in short rates will be a multiple of the simulated change in the inflation rate rather than the strict one-for-one adjustment implied by equation (7). Note, however, that the sum of the coefficients in equation (10) is unity, implying a long-run equilibrium where both long and short rates are constant in real terms. In effect, the choice of a real long-term rate target essentially accelerates the policy reactions to inflation signals.

Table A overleaf provides a summary of each of the corresponding rules for the G3 countries, evaluated on the basis of actual model parameter values.

In addition to the five options outlined above, preliminary investigations were made using different forms of nominal income targeting rules. These revealed two major difficulties. Firstly, the specific dynamics of the relationship between nominal income and interest rates for the G3 countries in INTERLINK are such as to imply severe instrument instability. Thus, the effects of a change in short rates are typically small in the current semester and build up over a two-year period to be four or five times as large. Under these circumstances, exact contemporaneous targeting gives oscillatory explosive results for sustained shocks to output and prices and some alternative form of iterative control rule is required in order to hit a nominal income target at a future point in time.

Table A

INTERLINK TARGETING RULES

The full set of policy rules used in simulation can be expressed explicitly in the following form:

a) Unchanged nominal rates: $r_s = 0$

b) Fixed money supply: $r_s = a_1 y + a_2 p + a_3 p_{-1}$

	a_1	a_2	a_3
USA	0.50	0.50	0.00
Japan	1.07	2.14	-1.41
Germany	0.89	3.05	-2.48

c) Exchange rate targets: $r_s = r_f + b_1 (p - p_f) + b_2 w$

	b_1	b_2
Japan	0.87	-7.84
Germany	0.87	-2.52

d) Fixed real short rates: $r_s = \dot{p}$

e) Fixed real long rates: $r_s - c_1 \dot{p} + c_2 r_{s-1} + c_3 \dot{p}_{-1}$

	c_1	c_2	c_3
USA	4.76	-0.14	-3.62
Japan	3.33	0.67	-3.00
Germany	3.70	-0.67	-3.37

Notes: All variables are expressed as deviations from baseline. The short rate, r_s , is expressed in percentage point terms; all other variables are expressed in percentage terms.

This problem is compounded by the relative importance of exchange rates in INTERLINK as a means of adjusting future price levels. In common with a number of macroeconomic models, the lags in the transmission of the direct effects of interest rates to demand and prices are sufficiently long that the main leverage of interest rates on prices operates through exchange rates. However, with a global shock the stimulus to nominal income is often broadly similar across countries and the exchange rate mechanism is therefore not one which can be readily exploited if the G3 countries simultaneously attempt to get back towards a baseline nominal GNP path (unless, of course, the EMS assumption is dropped). Preliminary experimentation suggested that it was always possible for nominal income targets for two of the G3 countries to be met approximately within a year or so, but almost entirely at the expense of the third country. This suggests that for global shocks of the kind considered here, unco-ordinated nominal income targeting is likely to very much exacerbate exchange rate pressures unless a more diluted form of target is set, for example, one expressed in terms of nominal income growth rather than income levels.

III. SIMULATION RESULTS IN DETAIL

This section describes each of the individual simulation results in some detail. The busy reader may prefer to turn directly to Section IV, pausing briefly to look at the comparative charts 1 to 4. The relevant detailed results are reported in Tables 1.A to 4.E contained in the Annex.

1. Non-OECD import demand shock (Annex Tables 1.A - 1.E and Chart 1)

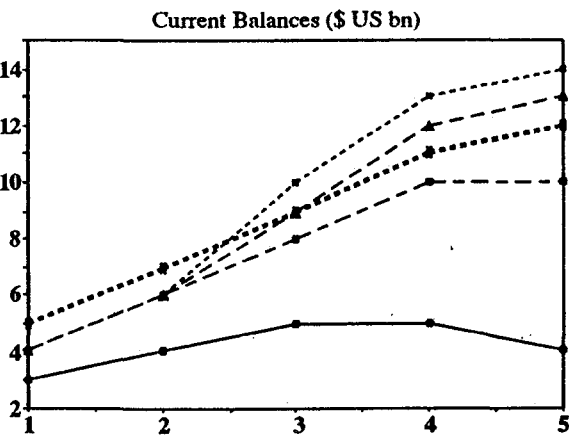
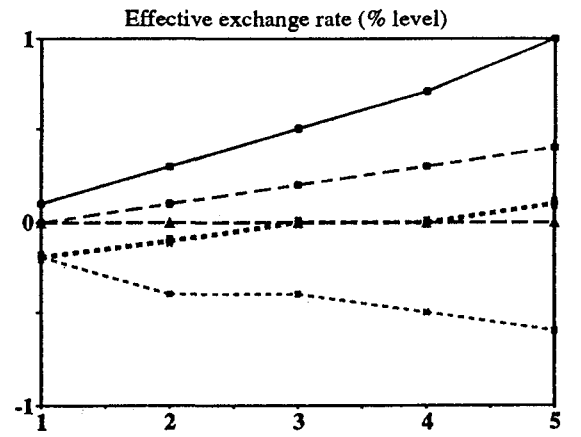
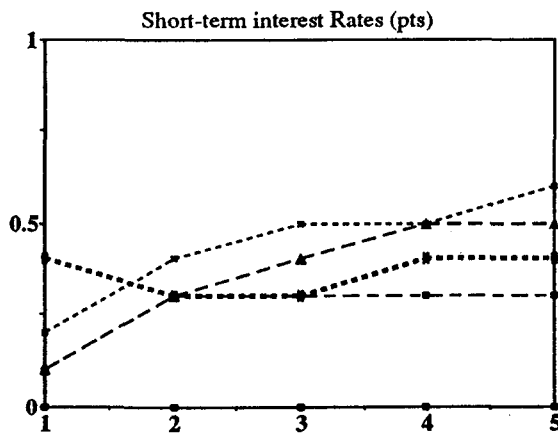
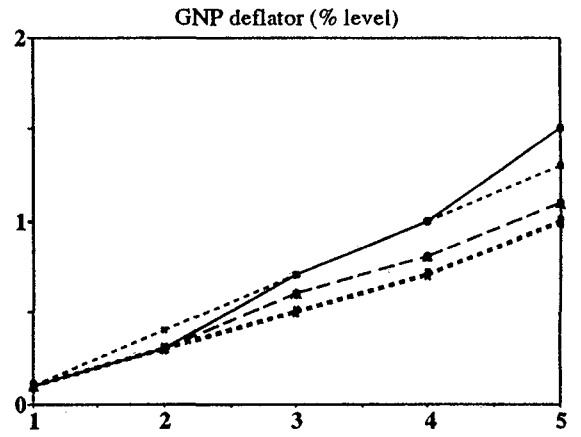
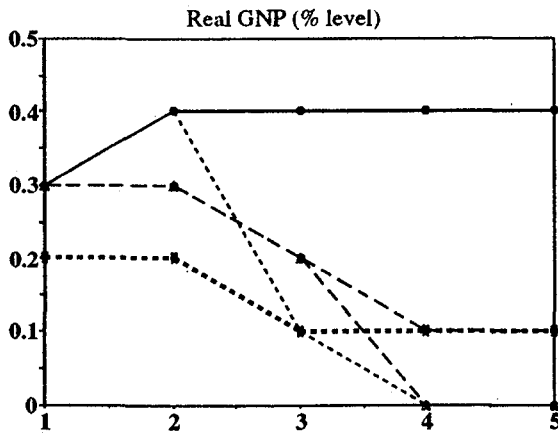
Independent of the monetary policy assumptions, the initial effects of higher non-OECD imports operate in INTERLINK through a fairly conventional trade multiplier process, with higher world exports (about 1 3/4 per cent in the first year) distributed across individual countries according to market performance and specialisation. The resulting demand stimulus raises output and factor demand in the OECD and puts upward pressure on wages and prices. Price levels are further stimulated by transmitted inflation through higher import costs.

The initial distribution of real GNP effects across countries reflects both geographical market specialisation and the relative GNP shares of exports. Thus, although the increases in market-weighted world imports for the United States and Japan are typically higher than for Germany, a higher export share in GNP for Germany implies an effect on German GNP roughly twice that for the United States and marginally higher than that for Japan. Real GNP effects are thereafter modified by multiplier-accelerator responses operating through the supply sector, consumption, and global trade multiplier effects.

The relative strength of price and wage responses between countries reflects broadly the size and persistence of GNP disturbances, the degree of labour market adjustment and the size of output and labour gap terms in the underlying wage/price equations. Resulting differentials in cost and price responses then modify the underlying distribution of trade via

Chart 1

5% step increase in non-OECD imports - USA



- □ — A = fixed interest rate
- * --- B = fixed money supply
- - ▲ - - C = fixed US money supply with exchange rate targets
- - ■ - - D = fixed real short-term rates
- x E = fixed real long-term rates

Chart 1

5% step increase in non-OECD imports - Japan

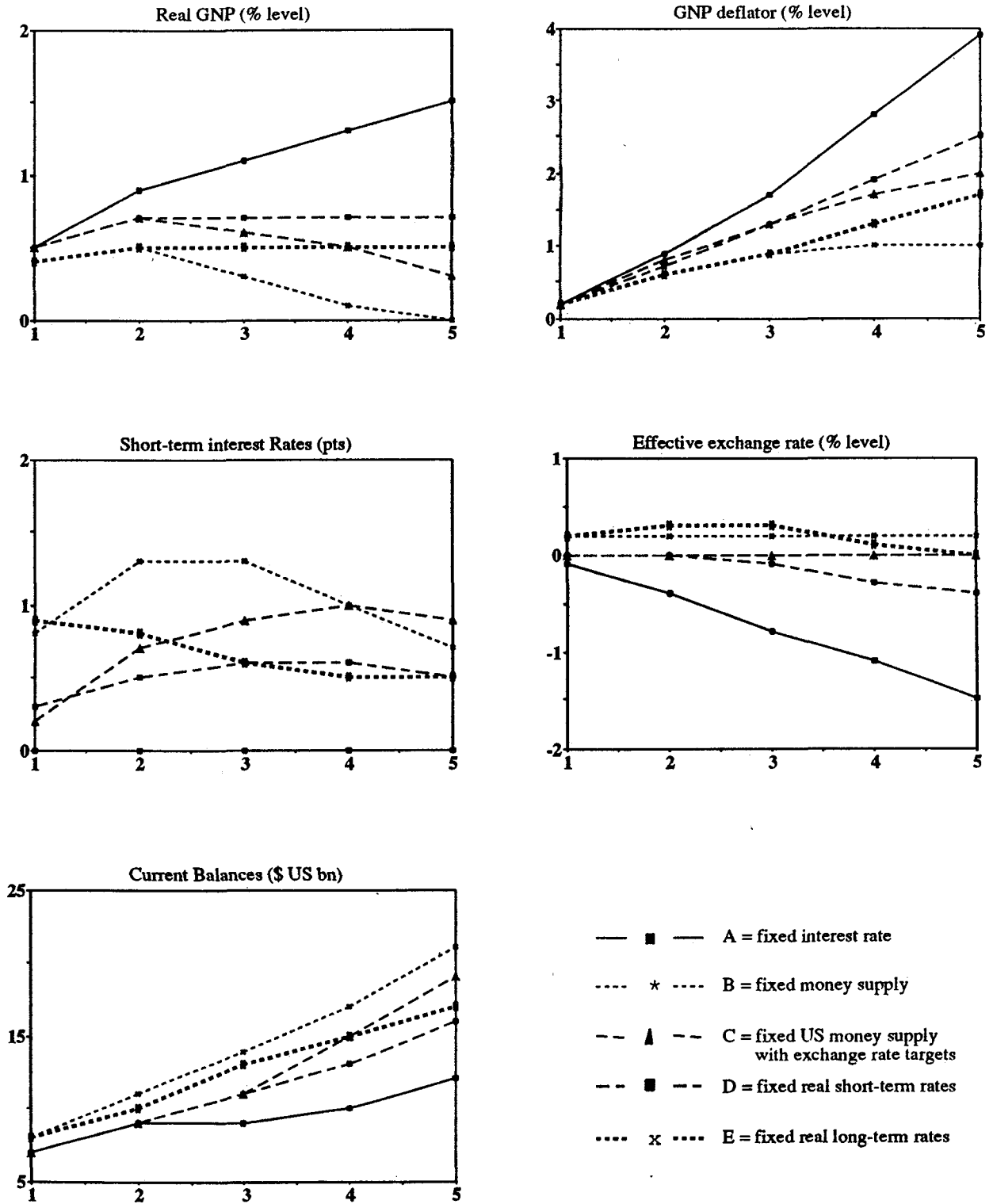
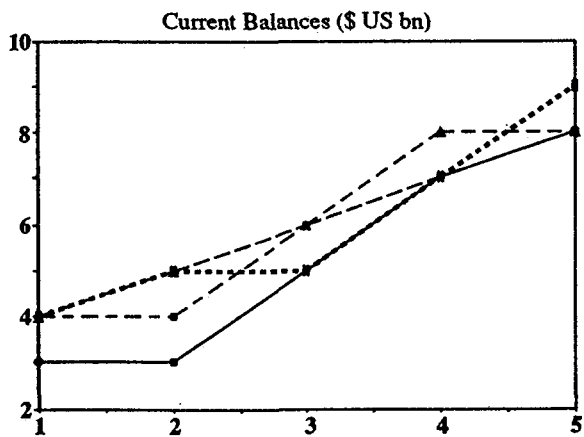
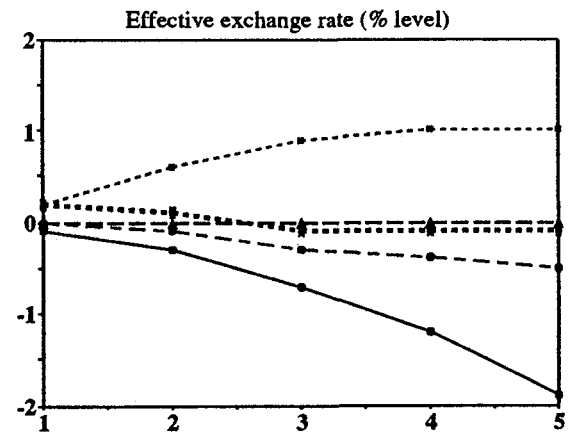
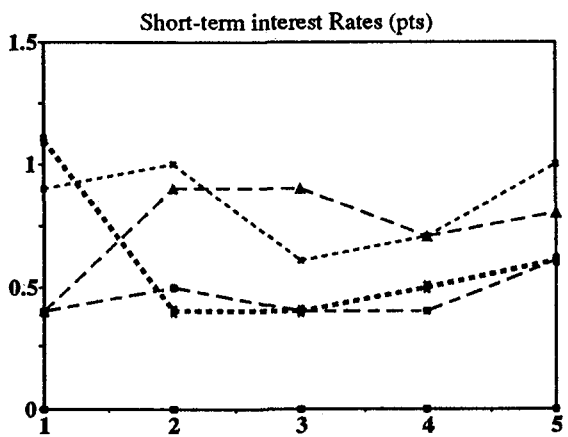
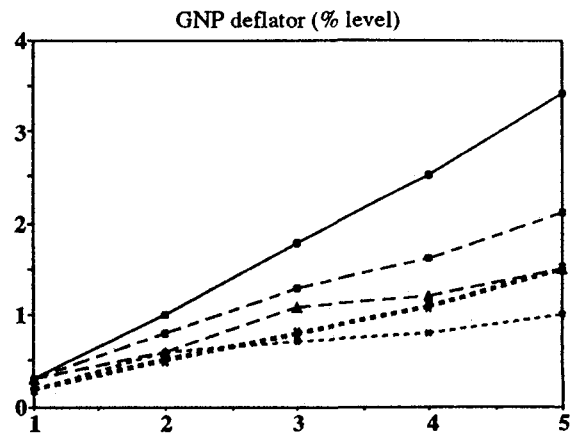
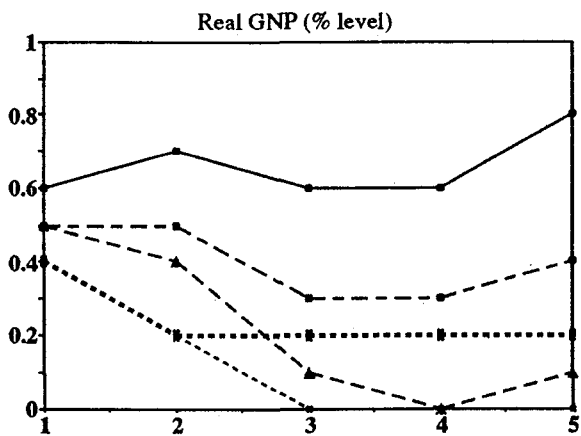


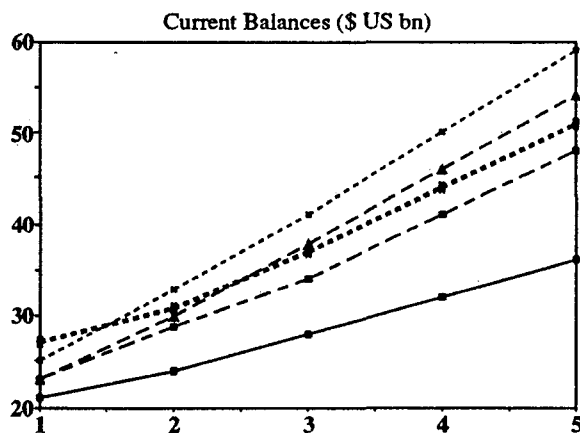
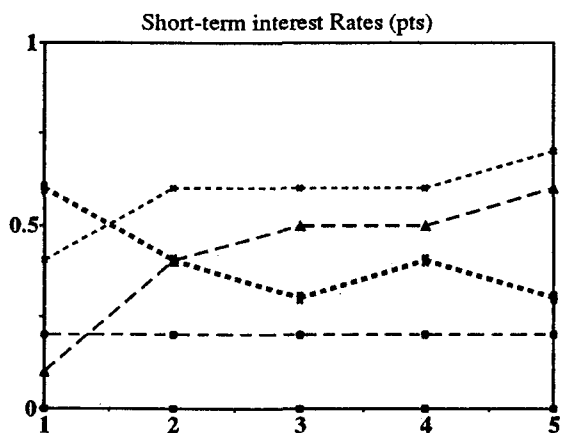
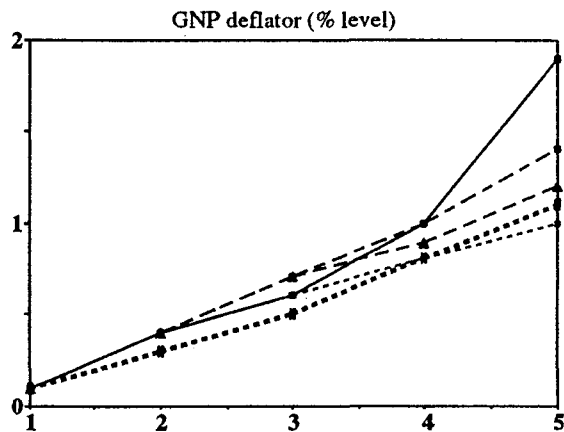
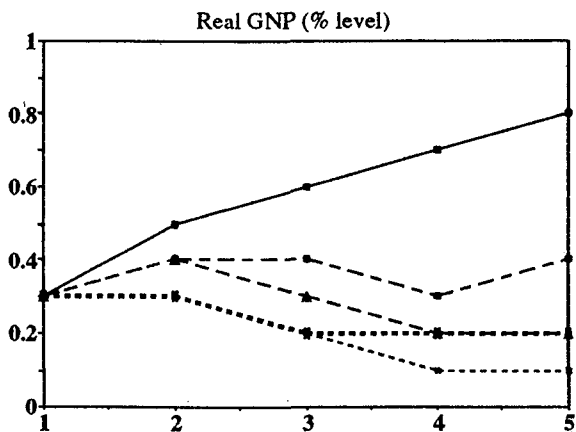
Chart 1

5% step increase in non-OECD imports - Germany



- ■ — A = fixed interest rate
- * B = fixed money supply
- - - ▲ - - - C = fixed US money supply with exchange rate targets
- - - ■ - - - D = fixed real short-term rates
- x E = fixed real long-term rates

5% step increase in non-OECD imports - Total OECD



- □ — A = fixed interest rate
- * --- B = fixed money supply
- ▲ --- C = fixed US money supply with exchange rate targets
- ■ --- D = fixed real short-term rates
- x E = fixed real long-term rates

competitiveness. At the same time, the combination of price and interest rate differentials influence exchange rates, with expected rates in INTERLINK being assumed to depend on price differentials.

With unchanged nominal interest rates (Table 1.A), the real GNP effect for the total OECD area rises over the first two years by 0.5 per cent and continues to drift upwards to be 0.8 per cent above baseline after five years, with world trade about 2 per cent higher. For the United States and Germany, real GNP levels off to be 0.4 per cent and 0.7 per cent respectively higher, whilst GNP in Japan rises more steadily over the period to be 1.5 per cent higher in the fifth year, reflecting a more dynamic trade performance.

With sustained increases in output and employment, inflationary pressures continue throughout the period, with price levels for the United States, Japan and Germany respectively higher by 1.5, 3.9 and 3.4 per cent by the end of the period -- equivalent to average increases in annual inflation rates of 0.3, 0.8 and 0.7 per cent. As illustrated by Chart 1, inflation rates accelerate throughout the period, consistent with long-run model instability under a fixed nominal interest rate rule.

Although there is a common inflationary tendency, price differentials are further reinforced by the exchange rate mechanism -- a steady depreciation of yen and Deutschmark against the dollar resulting in correspondingly higher import costs. For the OECD area, the current trade balance improves steadily over the period, reflecting both the direct effect of higher exports and rising interest flows from the non-OECD associated with rising debt accumulation. The adverse effect on the non-OECD area balance is nonetheless damped to the extent that it too benefits from subsequently higher levels of world trade.

With unchanged monetary aggregates (Table 1.B), the underlying excess demand for money drives up short-term interest rates so that the initial output effects are progressively crowded-out, through lower consumption and investment. In spite of a continuing higher level of world trade, the impact on OECD area GNP is negligible by the fourth year. This reduction in demand pressure in turn tends to alleviate inflationary pressures. U.S. short rates remain 0.5 per cent higher throughout, whereas for Japan and Germany short rates rise sharply in the first two years. For Japan they tend to fall back as real GNP and prices stabilise; for Germany there is some relaxation, but with a further tightening in the final year, due to a rebound in output.

Compared with the previous case, the patterns of price response are significantly altered. Given initially larger increases in real and nominal income for Japan and Germany, corresponding increases in short-term rates are proportionately larger than for the United States, implying a greater degree of crowding-out and moderation in prices. With prices in all three countries tending to move in a broadly similar fashion and smaller increases in U.S. rates, the pattern of currency movements is reversed with the yen and Deutschmark appreciating in dollar terms. For the United States, this implies little overall difference in price response compared with the former case.

For the OECD area, the current balance improvement is significantly increased, by up to a further \$23 billion in the fifth year. This reflects two principal features; the relative reduction in OECD domestic demand and imports, and higher interest flows associated with

a higher non-OECD trade deficit and higher world interest rates. The United States and Japan benefit disproportionately, accounting jointly for about 80 per cent of the further improvement in the area current balance.

For Japan and Germany, targeting exchange rates (Table 1.C) implies looser monetary control than in the money targeting case, with smaller short-run increases in interest rates being required to offset an incipient appreciation against the dollar. This implies a somewhat slower erosion of the gains to real GNP, but at the cost of higher prices. For Japan, where the initial demand stimulus is strongest, GNP remains above baseline throughout the period, though at a declining rate. Compared with the previous case, prices for Japan no longer stabilise and there is an approximate doubling of the increase in the annual inflation rate. For Germany, the induced increase in short rates is sufficient to progressively erode the GNP stimulus, but prices continue to rise over the period.

The main implications for the United States are a somewhat slower erosion of the output effect, given both higher world demand and little overall change in U.S. competitive position. The rate of increase in U.S. prices is, however, somewhat moderated with the neutralisation of the dollar fall in the former case more than compensating for a larger increase in world prices. Movements in the OECD current balance are marginally less favourable over the period, given higher activity and marginally lower interest rates.

Maintaining unchanged real short-term interest rates (Table 1.D) effectively links movements in short rates to inflation in each of the G3 countries. Compared with having fixed money aggregates -- where price and income levels provide the main stimulus to interest rates -- this simulation involves a significant easing of policy. For Japan and Germany, short-term rates are raised by an average 0.5 points (roughly half of the increases of Table 1.B). For the United States, the degree of relaxation is somewhat less.

The overall consequences for output vary across the G3 countries. In the United States, the moderate increase in short rates is sufficient to permit a steady attenuation in the real GNP effects. For Japan, the increase in the real GNP level stabilises in the second year at around 0.7 per cent; for Germany, initial increases are marginally reduced beyond the second year to lie mid-way between those for the alternative accommodating and non-accommodating policy assumptions. Prices too show somewhat different relative movements. For Japan and Germany, continuing demand pressure results in larger increases in price levels, with inflation rates raised by an average 0.4 to 0.5 per cent over the period. For the United States, prices continue to rise but at a slower rate compared with that for a fixed money target (Table 1.B). This result reflects the combination of price and interest rate movements, which give an appreciation of the dollar. Looked at another way, the interest differentials arising in the case of fixed monetary aggregates significantly exceed the underlying inflation differentials.

As discussed in Section II, the case of unchanged long-term real rates (Table 1.E) differs from the former case largely in terms of speeds of response. The net result is a much quicker policy response, with short-term rates rising sharply in the first year, compared with the previous cases, and output and prices are squeezed more in the earlier half of the simulation. Real GNP responses are therefore flatter, levelling off for Japan and Germany and being more quickly eroded for the United States. As a result, price responses for all three

countries are also more subdued. For the United States, overall price increases are smaller than for fixed monetary aggregates, reflecting the earlier squeeze on output. In fact, for all three countries, price responses are lower and the output gains are smoother and more continuing than in case 1.C. By putting an early emphasis on inflation and accepting smaller short-term output increases, the overall result for the G3 countries is, arguably, superior to 1.C, though in the longer run more inflationary than 1.B for Japan and Germany.

2. A fall in OECD private consumption (Annex Tables 2.A to 2.E and Chart 2)

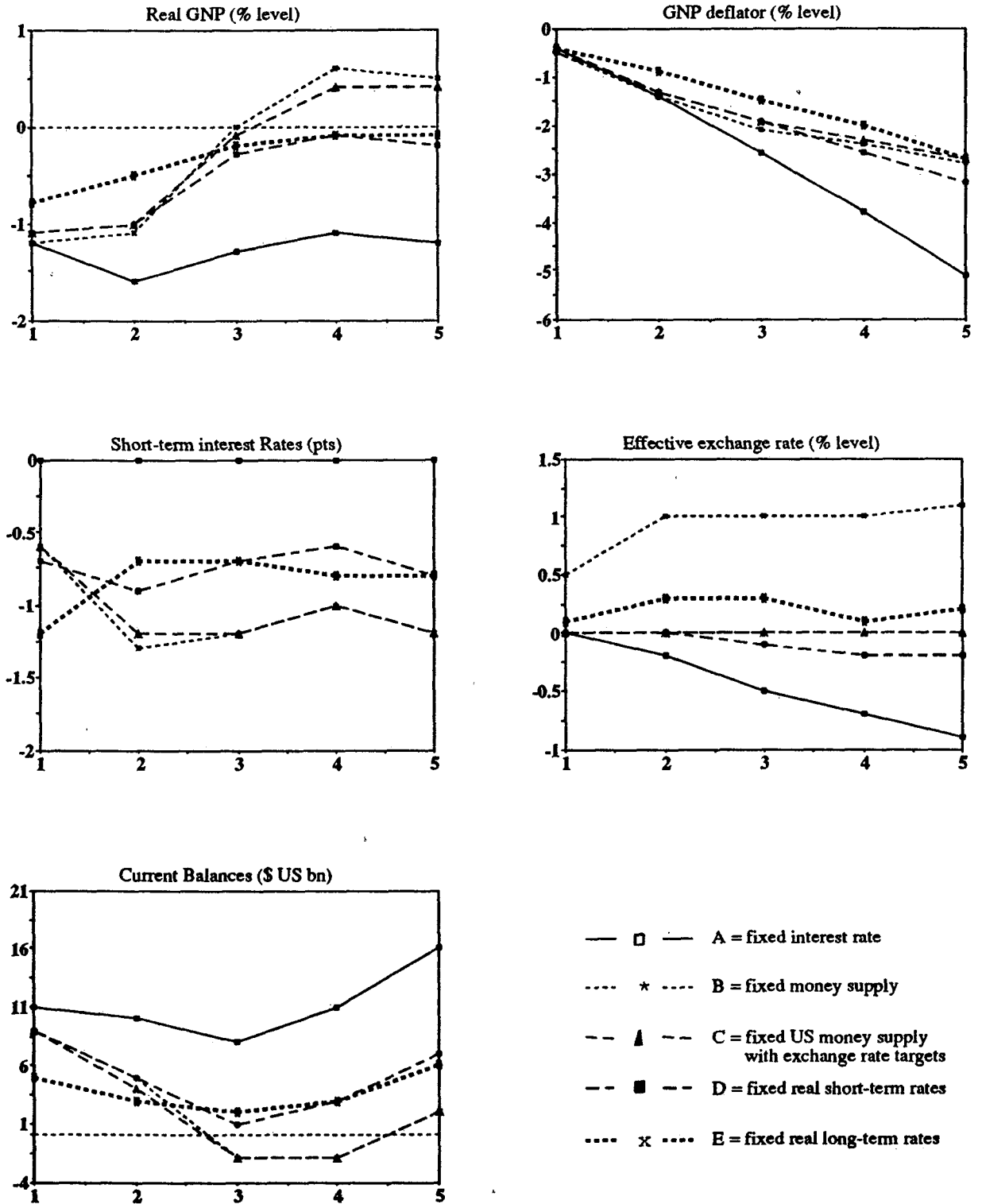
In the absence of monetary controls for the G3 countries (Table 2.A), the effects on output of a global reduction in consumption levels are substantial and sustained, with real GNP reduced in the fifth year by 1 1/4, 2 3/4 and 1 3/4 per cent for the United States, Japan and Germany respectively. This contrasts with corresponding single-country results, shown at the foot of Table 2.A, where real GNP tends to recover substantially over the period. The main differences here reflect trade linkage multipliers and competitiveness effects. In an unlinked case, competitor prices are assumed to be unchanged; with a global shock there is common tendency for prices to fall -- thereby eliminating the scope for trade competitiveness gains. The trade multiplier effects on GNP are also more pronounced for Japan and Germany, reflecting trade multiplier effects.

The effects of the sustained reduction in demand on prices is large, with the annual inflation rate for the United States reduced by around 1 per cent per annum, and 1 1/2 per cent for Japan and Germany. As in the previous simulation, the paths of output and prices show little or no signs of longerrun stability with fixed nominal interest rates.

Over the simulation period, the dollar tends to depreciate whilst the yen and Deutschemark appreciate by 2-2 1/2 per cent. For the OECD area, the short-term effects on trade balances are favourable, with lower import demand at the area level leading the collapse in world trade. A short-term improvement in OECD balances reflects an adjustment delay in non-OECD import behaviour, which is assumed to be export revenue constrained. Once movements in OECD demand stabilise, non-OECD imports catch-up and net area trade balances remain more or less unchanged. The distribution of changes in current balances reflect a combination of factors. For the United States, a higher-than-average import demand elasticity (6), combined with an underlying baseline imbalance ensures an overall improvement. For Japan, relatively high export share, and low import demand elasticities and a substantial baseline surplus imply an overall deterioration. For Germany, the current balance falls progressively over the period, reflecting a higher than average export share elasticity.

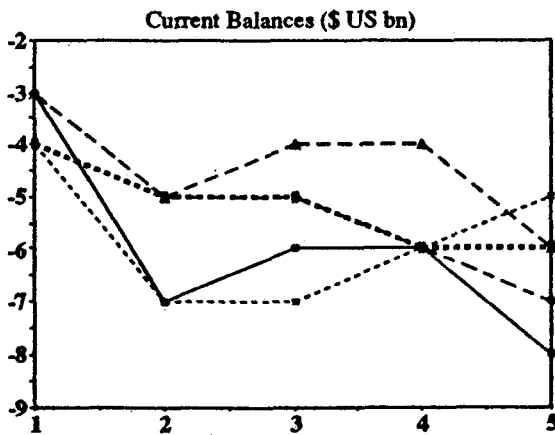
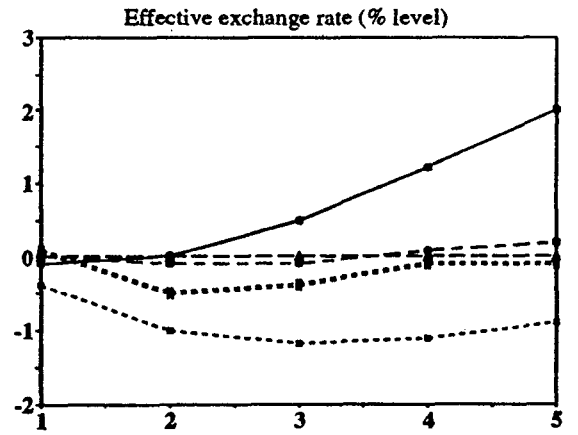
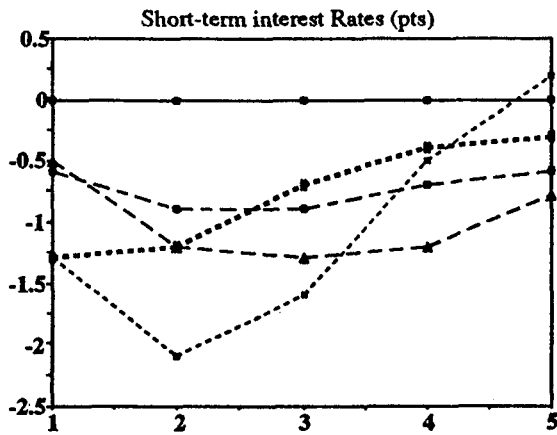
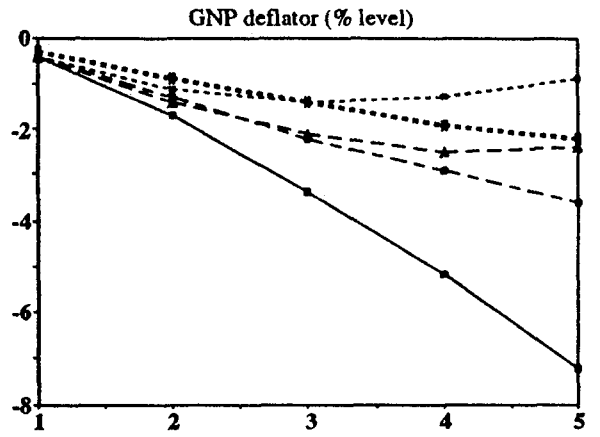
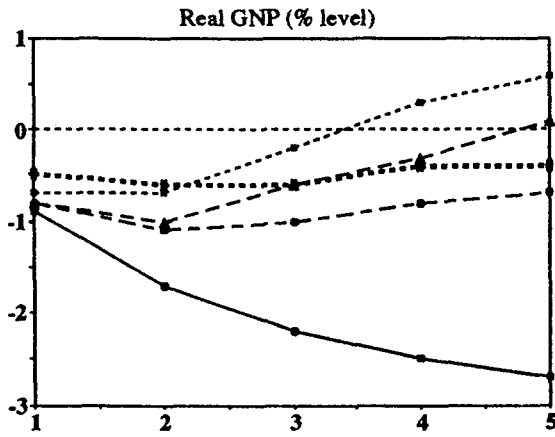
Introducing monetary aggregate targets for the G3 countries (Table 2.B) leads to a major stabilisation of the situation. Short-term rates are driven down substantially to offset the fall in real and nominal demand. As indicated in Table A, significantly lower interest rate elasticities for Japan and Germany imply steeper LM slopes and therefore substantially larger movements in corresponding short rates. Interest rate differentials for Germany and Japan therefore move favourably vis-à-vis the United States and effective exchange rates move in the opposite direction to the previous case, with the dollar appreciating against the Deutschemark and yen.

1% ex-ante reduction in private consumption - USA



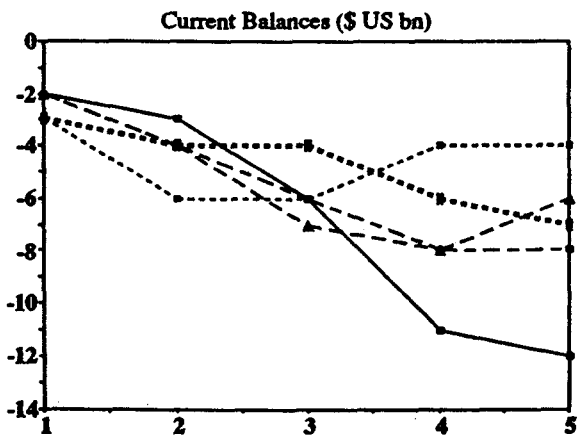
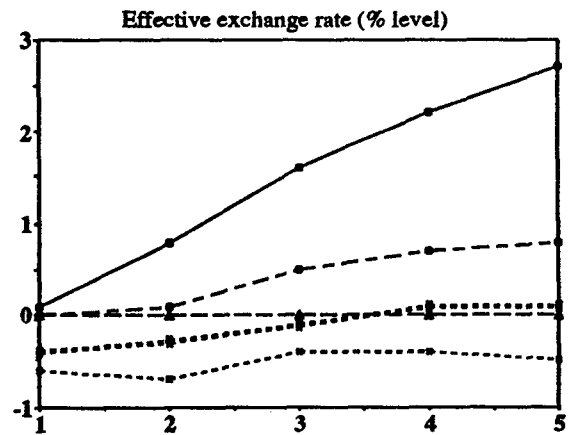
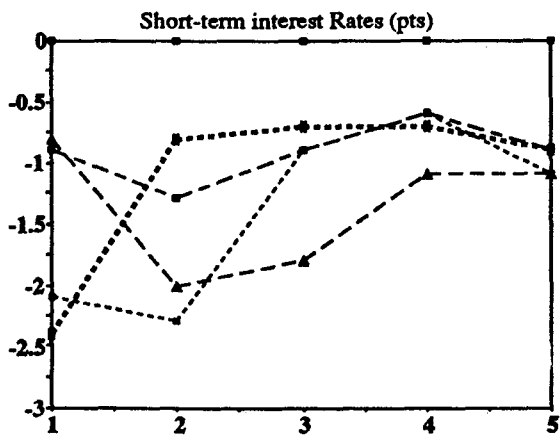
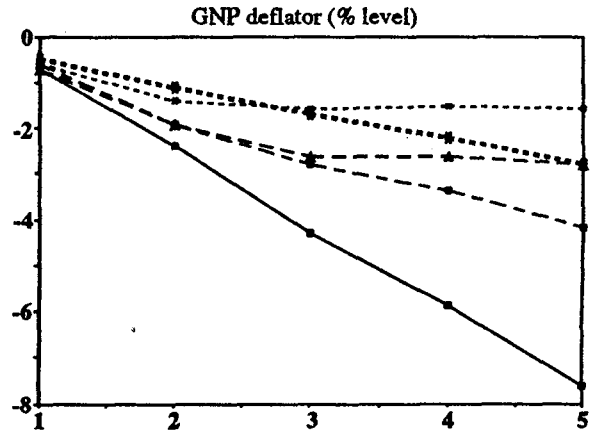
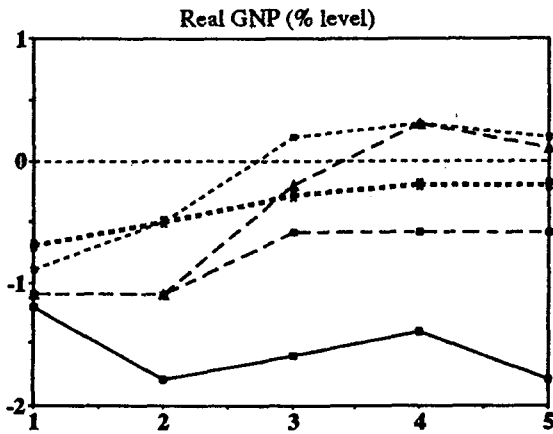
- □ — A = fixed interest rate
- * --- B = fixed money supply
- ▲ --- C = fixed US money supply with exchange rate targets
- ■ --- D = fixed real short-term rates
- x --- E = fixed real long-term rates

1% ex-ante reduction in private consumption - Japan



- ■ — A = fixed interest rate
- * --- B = fixed money supply
- - - ▲ - - - C = fixed US money supply with exchange rate targets
- - - ■ - - - D = fixed real short-term rates
- ... x ... E = fixed real long-term rates

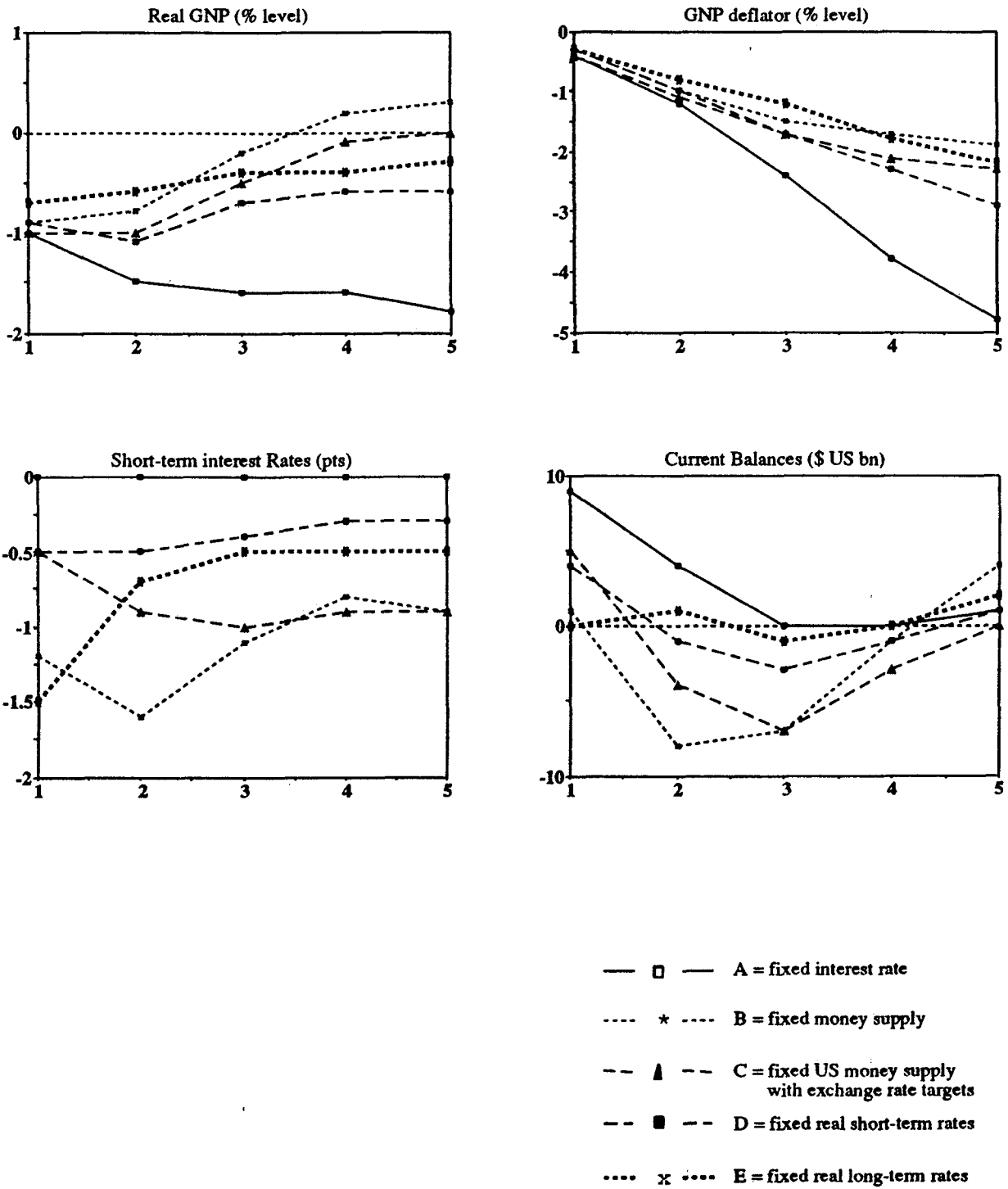
1% ex-ante reduction in private consumption - Germany



- ■ — A = fixed interest rate
- ... * ... B = fixed money supply
- - ▲ - - C = fixed US money supply with exchange rate targets
- - ■ - - D = fixed real short-term rates
- ... x ... E = fixed real long-term rates

Chart 2

1% ex-ante reduction in private consumption - Total OECD



The reductions in short rates feed through fairly quickly to the real side, partially offsetting the initial disturbance to consumption and business and residential investment. For all three countries, the initial decline in GNP is stabilised by the second year, and reversed by the end of the third year, with output rising above baseline thereafter. The cumulative movements in output and employment are nonetheless negative, implying sustained reductions in price levels, although for Japan and Germany the downward trend is reversed in later years. Differential movements in prices also reflect those of exchanges, with dollar appreciation contributing to the above average reduction in U.S. prices. For the OECD area as a whole, the GNP deflator is 1.9 per cent lower by the fifth and real GNP 0.3 per cent higher.

Compared with the previous case, two general factors contribute to differences in current balance movements; lower interest rates imply a significant reduction in interest flows to the OECD countries and more buoyant OECD domestic demand gives a smaller reduction in OECD imports.

Targeting exchange rates (Table 2.C), implies smaller reductions in nominal interest rates compared with the previous case. For Japan and Germany, the process of recovery is significantly delayed, with real GNP getting back towards baseline only in the fourth and fifth years. Cumulative downward pressure on prices continues with little sign of stabilisation towards the end of the period. The results for price and real GNP for the United States are only slightly affected. For output, a reversal of previously adverse short-term movement in trade competitiveness implies a smaller short-term loss of exports, although this effect is only temporary given greater reductions in foreign prices beyond the second year. Weaker world demand also contributes to a smaller rebound in U.S. real GNP. U.S. prices are marginally less weak, given the absence of dollar appreciation.

Since the greater proportion of the short-term reduction in nominal income for the consumption shock comes from the real side, adopting a policy of fixed real short-term (Table 2.D) gives smaller interest rate reductions than with money aggregate targets. This in turn gives a further weakening of the recovery phase, with real GNP staying below baseline throughout the period. For the United States, this implies a relatively soft landing; for Japan and Germany, sustained reductions in GNP levels. Prices and wages are therefore correspondingly weaker, with German prices being generally more responsive to the cumulative reductions in demand. The growing gap between German and other price levels largely offsets the influence of larger reduction in German short rates in first two years, resulting in a longer term Deutschemark appreciation.

As in the case of the non-OECD demand shock, maintaining unchanged long-term real rates (Table 2.E) puts a greater emphasis on the price inflation (deflation) signal and therefore gives a sharper initial reduction in short rates. For the first two years, this results in smaller GNP losses for all G3 countries than in any other case, however. The speed of recovery thereafter is slower than with either money or exchange rate targeting options. Averaged over the period, the GNP losses for Germany and Japan are nonetheless marginally smaller than with an exchange rate target. For the OECD area, GNP is reduced by an average 0.5 per cent, compared with an average 0.8 per cent given by real short-rate targeting. The simulated fall in prices is also somewhat smaller although there is no sign of stabilisation.

Reduction in US government expenditure (1% of GNP) - USA

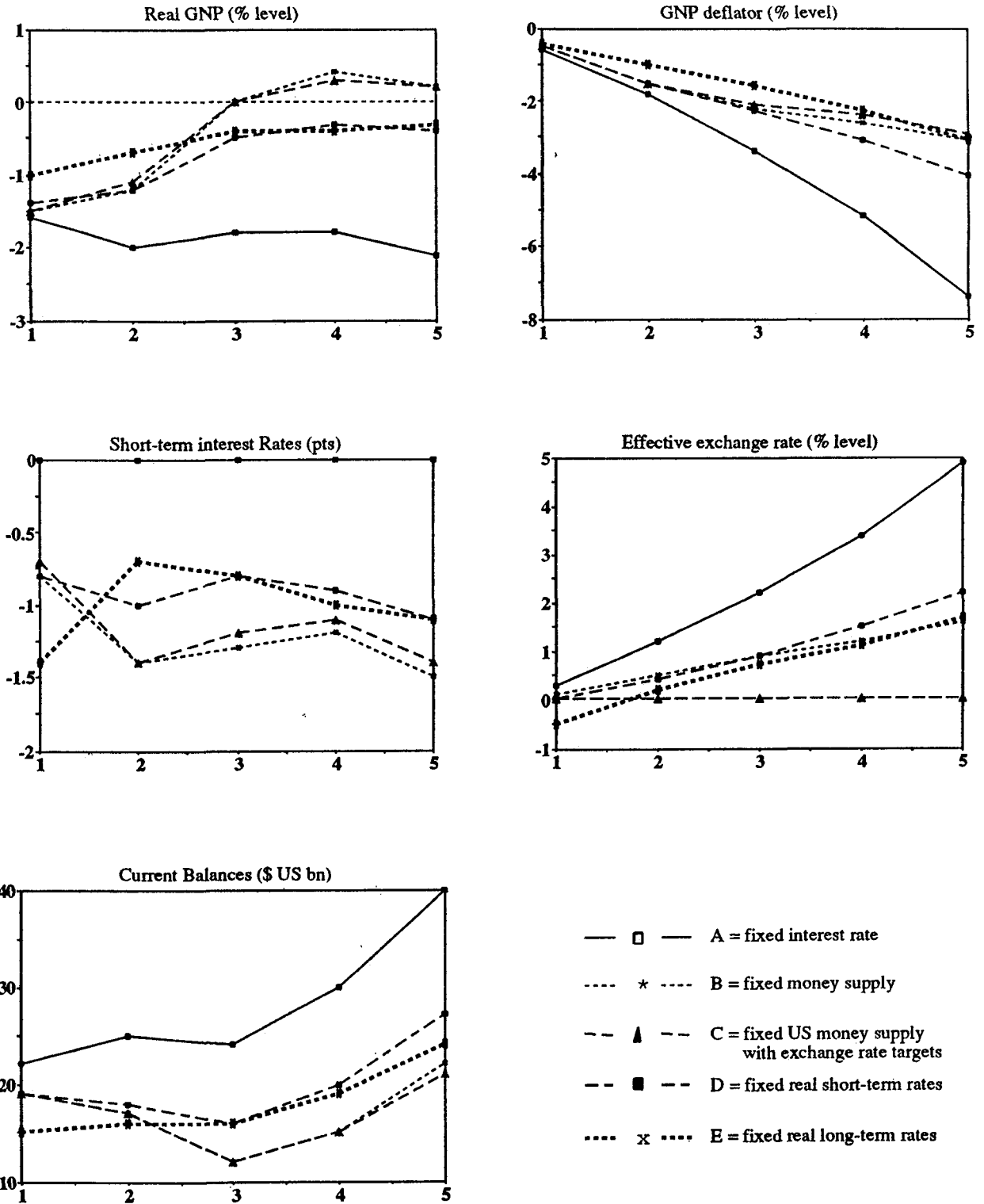


Chart 3

Reduction in US government expenditure (1% of GNP) - Japan

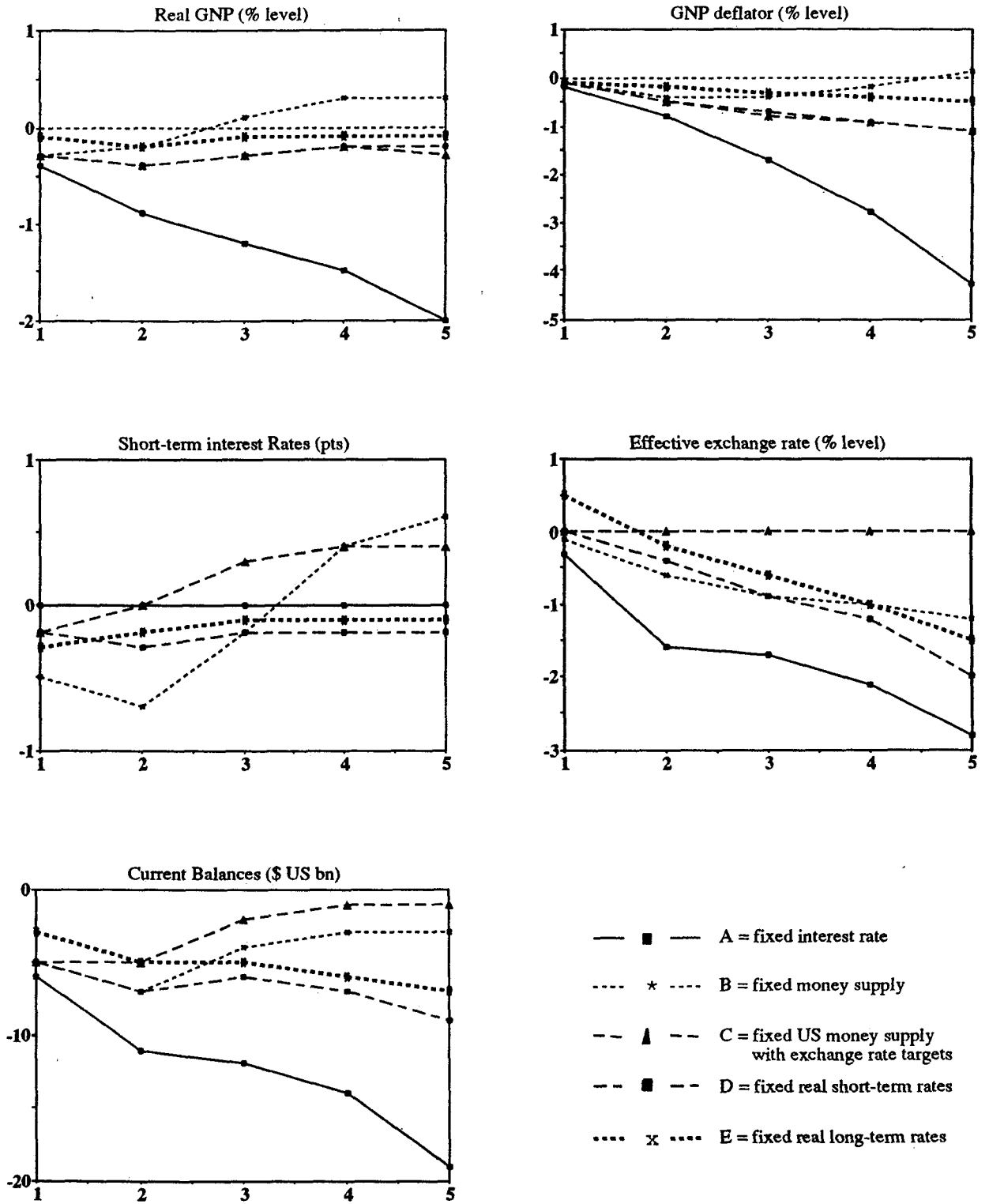
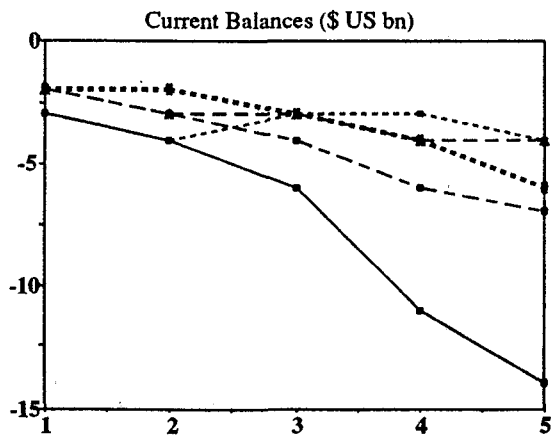
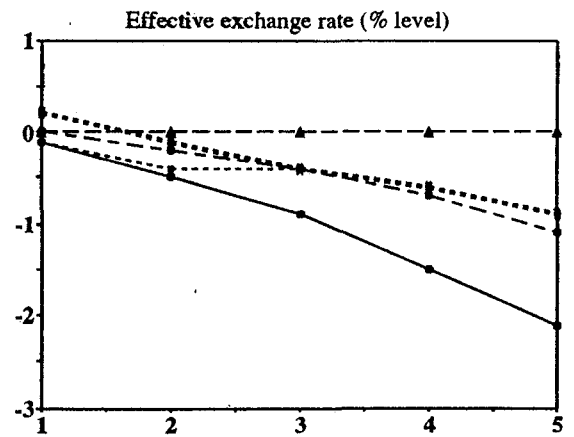
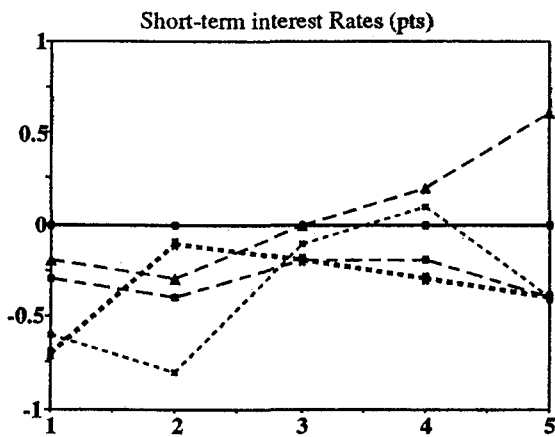
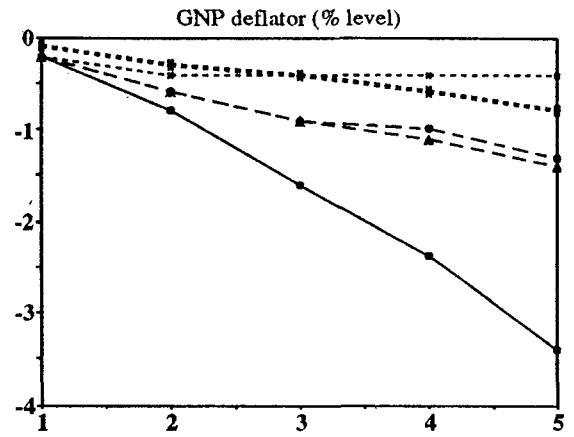
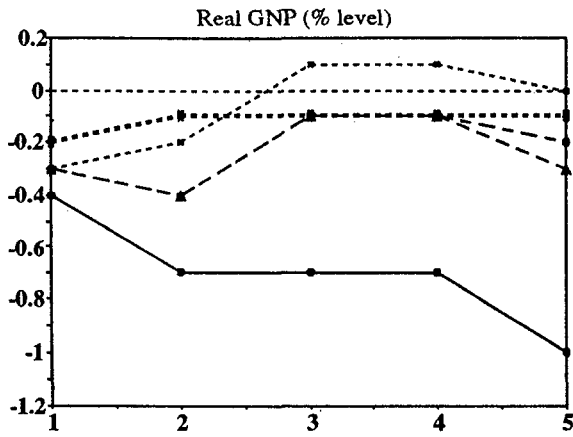


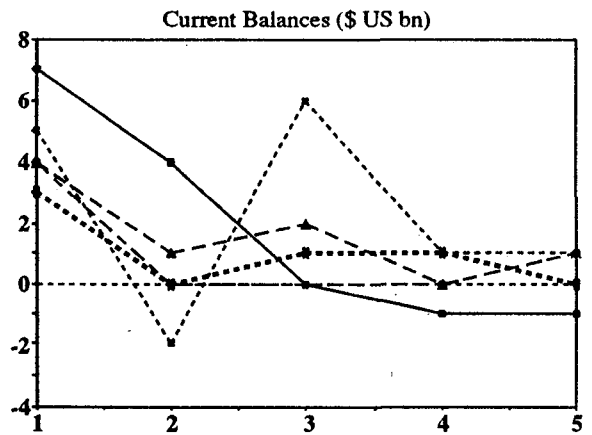
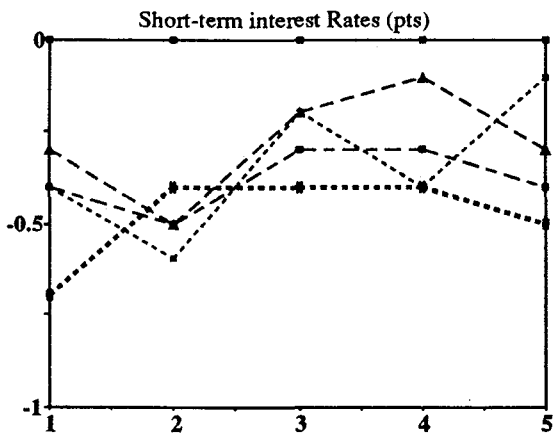
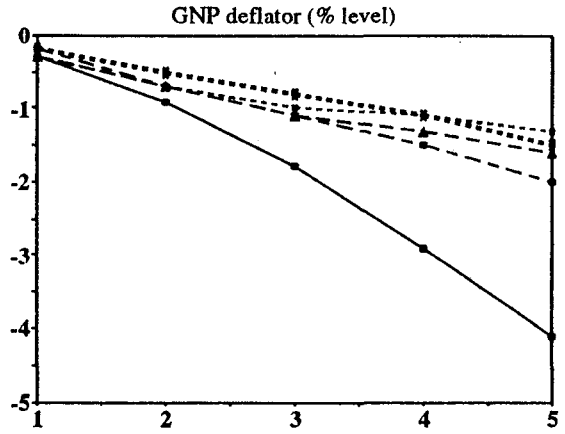
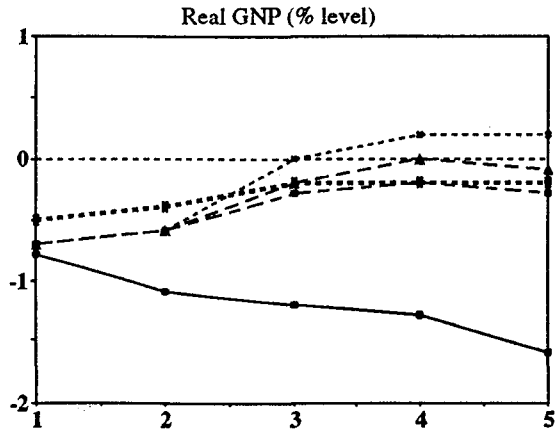
Chart 3

Reduction in US government expenditure (1% of GNP) - Germany



- ■ — A = fixed interest rate
- * --- B = fixed money supply
- - ▲ - - C = fixed US money supply with exchange rate targets
- - ■ - - D = fixed real short-term rates
- x --- E = fixed real long-term rates

Reduction in US government expenditure (1% of GNP) - Total OECD



- □ — A = fixed interest rate
- * B = fixed money supply
- ▲ --- C = fixed US money supply with exchange rate targets
- ■ --- D = fixed real short-term rates
- x E = fixed real long-term rates

3. U.S. fiscal shock (Annex Tables 3.A to 3E, Chart 3)

With unchanged nominal interest rates, and floating exchange rates (Table 3.A) a U.S. fiscal contraction produces a relatively high GNP multiplier, in the region of 1.9, and substantial and growing international spillovers. Trade linkage effects contribute to steady reductions in exports and real GNP in all major trading partners, with average reductions of 1.5 and 0.7 per cent for Japan and Germany respectively. At the same time, downward pressure on prices both in the U.S. and world markets leads to a general disinflation, averaging 0.8 per cent per annum for the OECD area as a whole. This in turn implies rising real interest rates and further downward output adjustments.

Given the origin and degree of demand contraction, U.S. prices take the lead in the disinflation. Given the form of exchange rate expectations and a very substantial improvement in U.S. net foreign assets, this puts upward pressure on the dollar, up by 5 per cent by the end of the period. OECD area current balances improve in the short-run with the non-OECD adjusting slowly to lower export earnings. The U.S. current balance improves substantially over the period (\$20-\$40 billion), with a rising proportion mirrored in lower Japanese and German surpluses as non-OECD imports also contract. Although favourable to the current configuration of trade imbalances, the international repercussions are large, both for output and employment, and the results show general signs of longer-term instability (Chart 3).

In this context, a money targeting rule (Table 3.B) proves to be a very powerful force for stabilisation. In the United States, the implied reduction in short rates (an average 1 1/4 percentage points) has a quick acting effect on consumption and investment. The previously falling path for real GNP is checked by the second year, is effectively neutralised by the third year and output bounces back thereafter. For the rest of the OECD, the trade induced contraction is therefore quickly attenuated and GNP reduced by relatively little over the period.

With regard to prices, downward pressure on U.S. prices is somewhat alleviated and exchange rate pressures are significantly dampened by the movement in interest rate differentials. A smaller fall in U.S. demand combined with lower interest payments implies more modest improvements in the U.S. current balance (by an average \$17 billion) and correspondingly smaller adjustments in the imbalances.

The results for this particular simulation indicate some fairly substantial changes in model properties compared with earlier published results. This primarily reflects the incorporation of a revised U.S. consumption function, now incorporating an explicit effect from the value of household equity holdings. Being inversely related to long-term rates, this gives stronger stimulus to consumption as short and long rates are reduced. Effectively, the U.S. model now incorporates full crowding-out within 2-3 years (7).

Compared with the previous case, exchange rate targeting (Table 3.C) implies little or no short-term adjustment in short rates for Japan and Germany, and more severe competitiveness losses. For these countries, real GNP losses are therefore more continuing. Indeed maintaining an exchange rate target involves longer-term increases in short rates, coinciding with falling rates of inflation. For the United States, real GNP and price profiles

are more or less unchanged.

As for the other shocks, an unchanged real short rate (Table 3.D) generally implies somewhat smaller reductions in U.S. interest rates, implying a generally slower demand recovery and a more pronounced fall in prices. For Japan and Germany, short rates fall relative to the exchange rate targeting case and, in spite of a more depressed U.S. economy, there is little difference in the out-turns for real GNP.

Targeting long-term real rates (Table 3.E) again gives larger immediate reductions in U.S. short-term rates than any of the other policy options. For the United States, this has the result of giving a larger short-term stimulus to the real side and a smaller real GNP loss in the first two years of the simulation. The subsequent easing of nominal rates implied by the inflation path, however, means that full recovery is not achieved over the five year period. Even so, for Japan and Germany, the initial cuts in short rates are sufficiently stimulative to the domestic economy to offset much of the spillover from U.S. trade and the GNP results are superior to those given by exchange rate targeting.

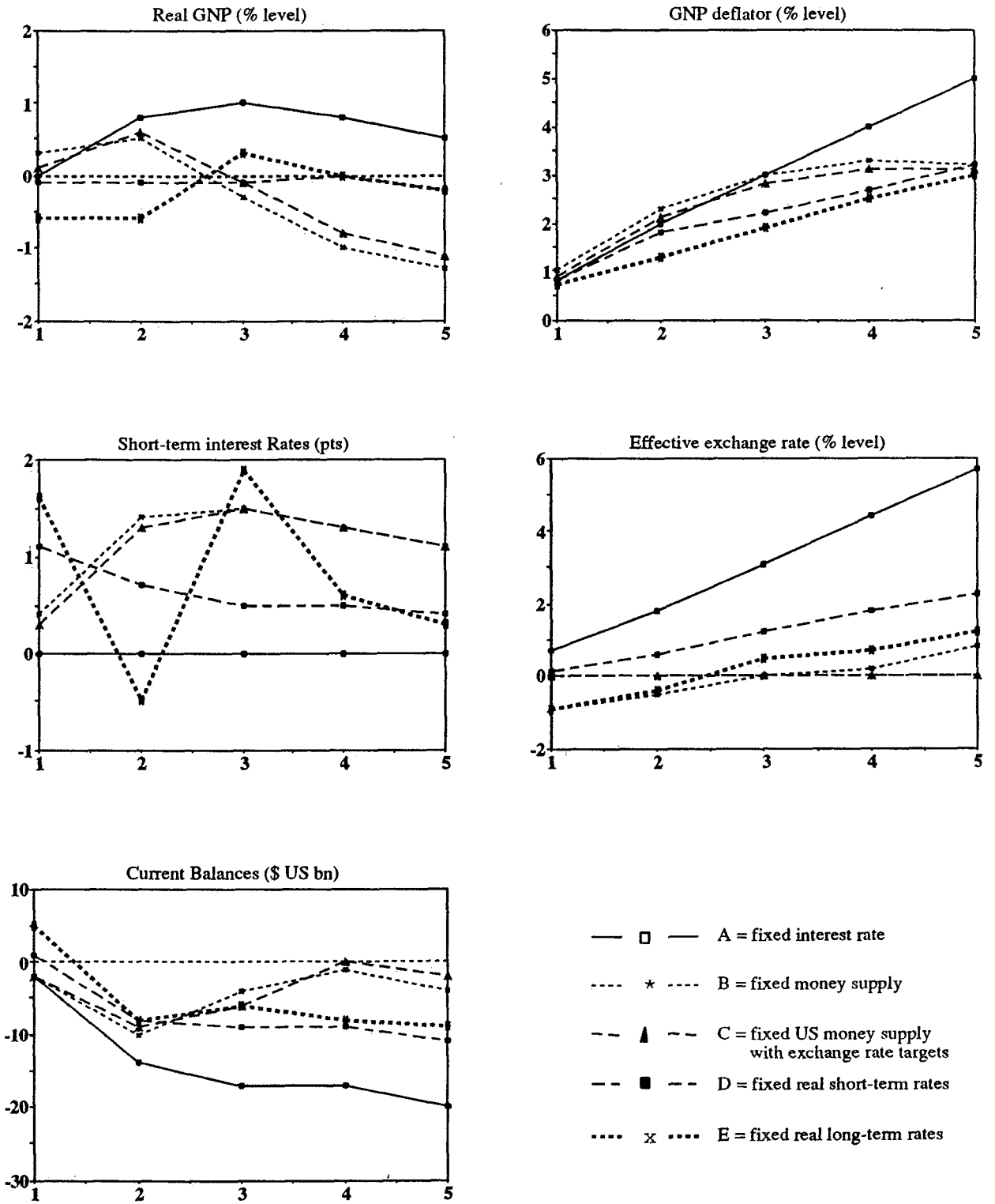
Given the different profile for output, the fall in U.S. prices is generally smaller than with a fixed money supply. By the fifth year, however, the cumulative output loss is marginally greater and the terminal price level is similar to that with money targets. Effective exchange rate movements are also broadly in line with those in Table 3.B, with the effects of a narrow spread of interest rate movements being offset by the narrower spread of price differentials. Averaged over the period, U.S. current balance movements are also broadly similar to those with money targeting, although the profile is more skewed.

4. OECD wage shock (Tables 4.A to 4.E, Chart 4)

The OECD wage simulation assumes a single increase of 2 per cent in the residuals for private sector wage rate equations in the starting period. The specific form of these equations (augmented Phillips curves, with backward-looking price expectations) and the price blocks (cost-plus-based equations with potential output gap terms) implies a generally dynamic inflation response, modified or checked only by the endogenous reactions of output and employment. The presence of lagged price responses to increases in wage costs also implies a sustained increase in real wages and real labour costs up until wage movements are curtailed by demand pressure. The effects on output and demand depend primarily on the responses of real disposable income and consumption, the influence of higher labour costs on profitability, output expectations and factor demand, and the influence of inflation on real interest rates and investment. Trade competitiveness effects are important only insofar as there are major divergences in price responses across countries.

Assuming unchanged nominal interest rates (Table 4.A), overall model responses prove to be highly unstable. Although higher wage costs lead to downward adjustments in employment levels and there is a significant weakening of consumption, there are also strong stimulative pressures coming from business and residential investment, as real interest rates are substantially reduced. In general, the influence of reduced profitability entering directly into output expectations is too weak to offset these positive effects and for the major countries there is a general tendency towards higher output over the medium term. The balance of

Increase in OECD wage rates - USA



Increase in OECD wage rates - Japan

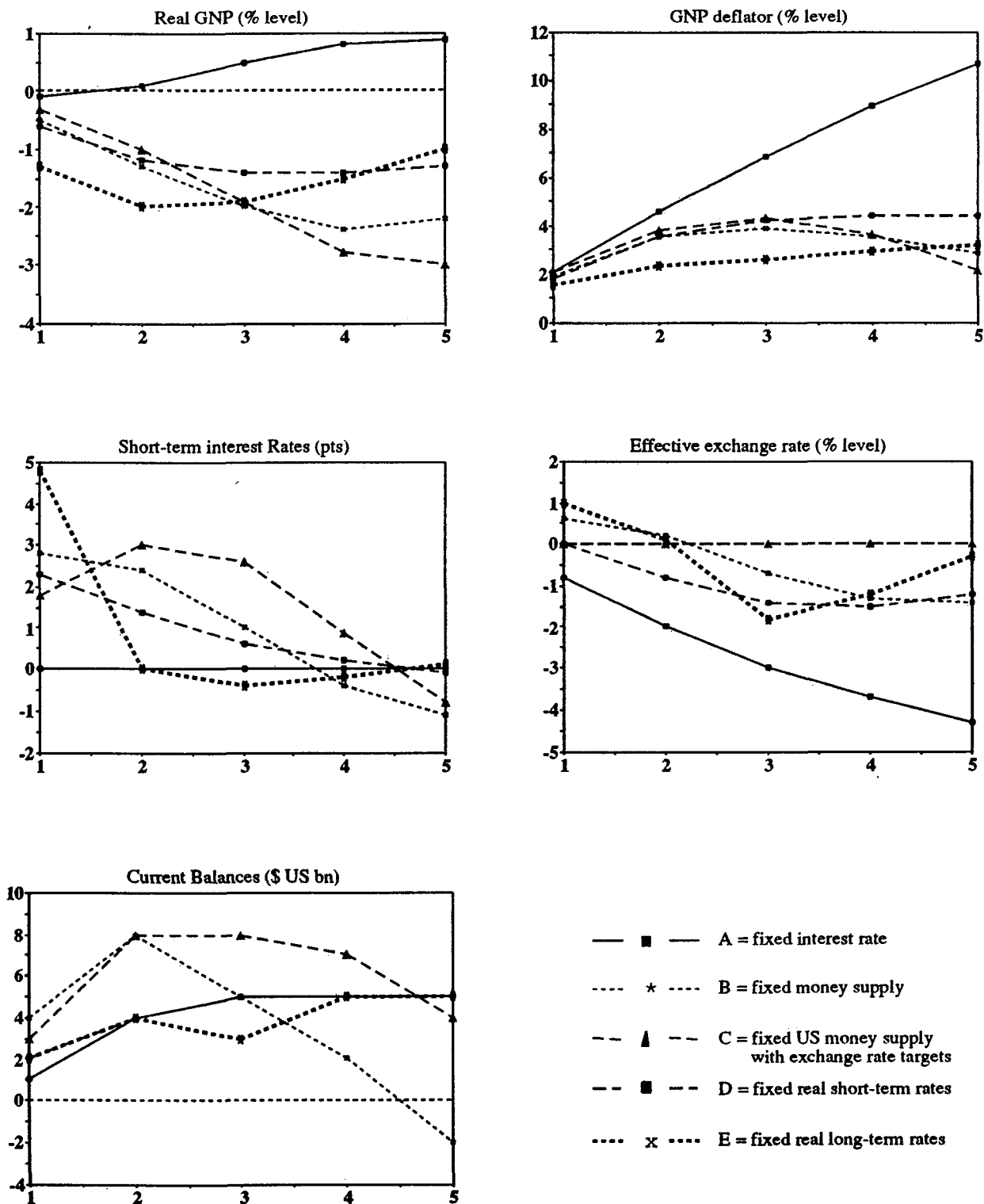
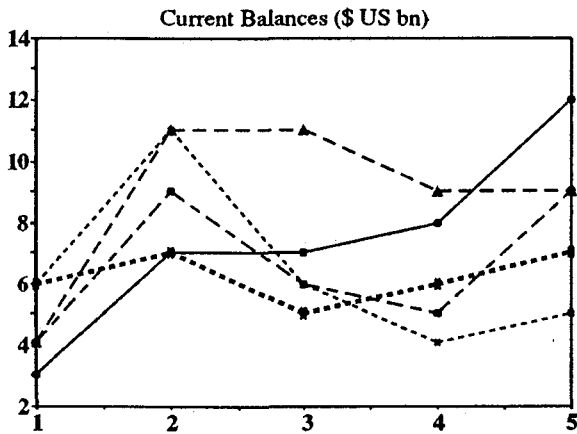
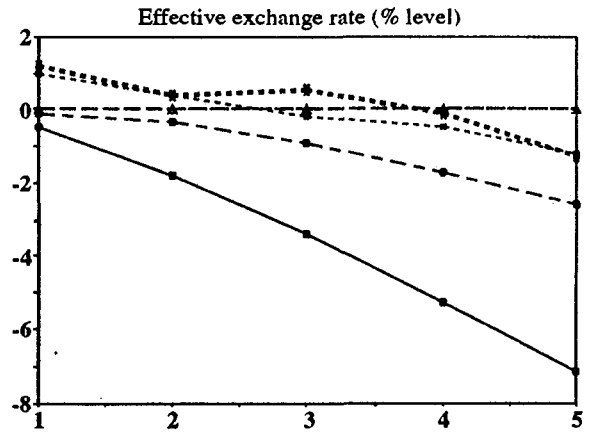
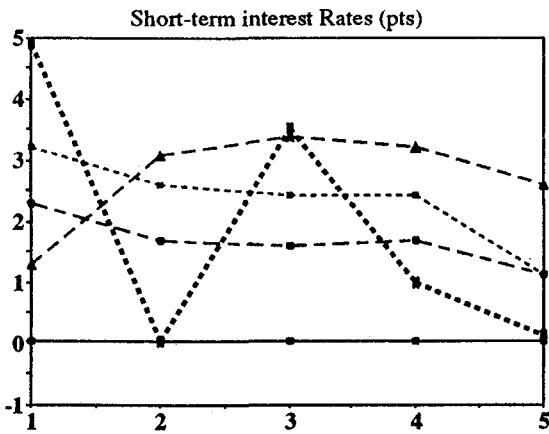
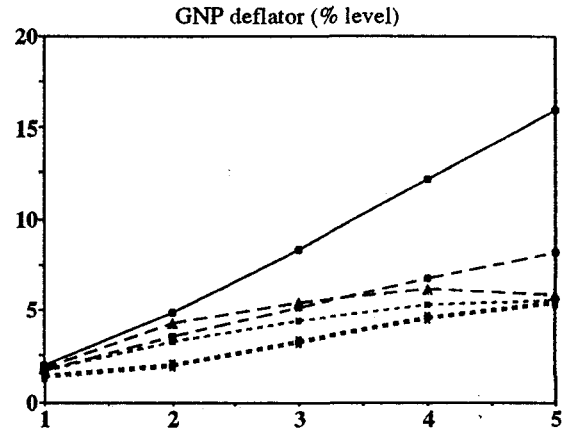
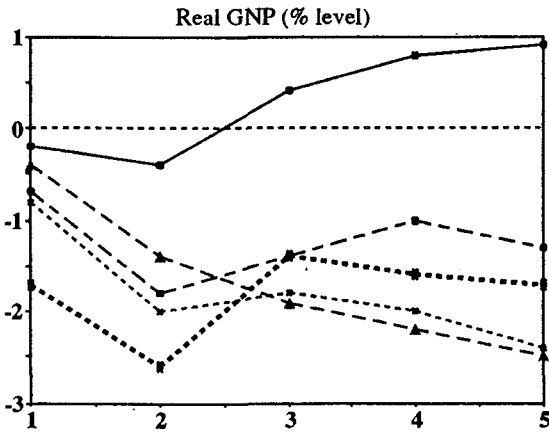


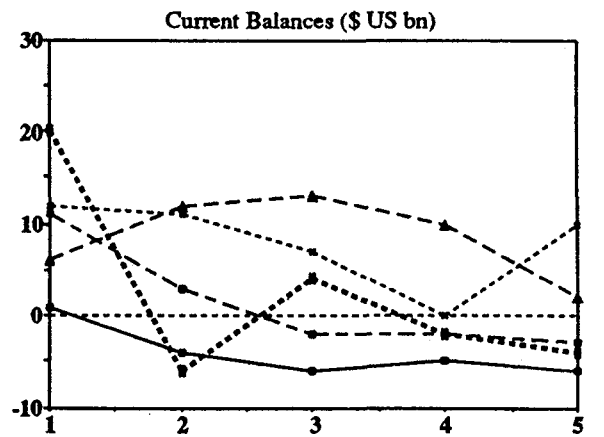
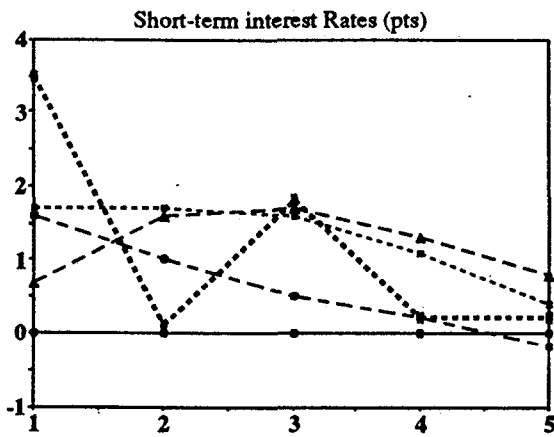
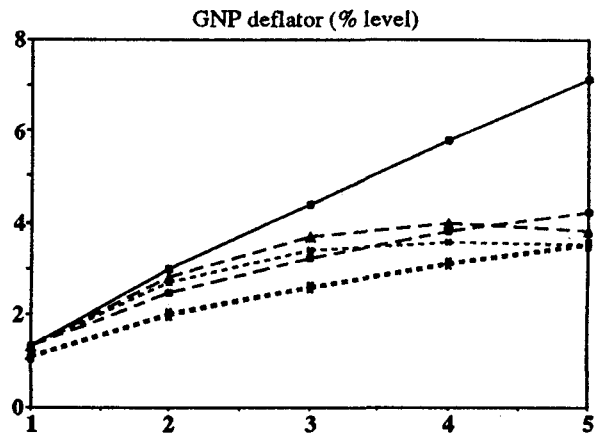
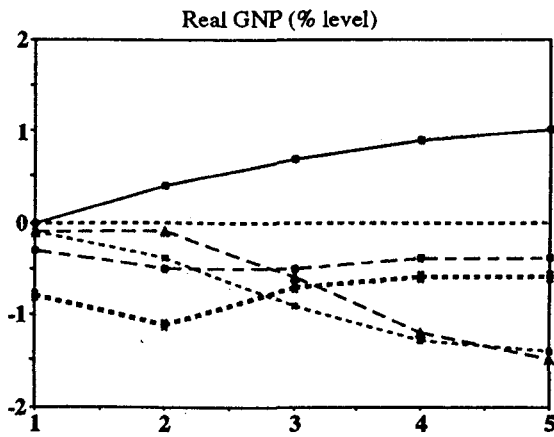
Chart 4

Increase in OECD wage rates - Germany



- ■ — A = fixed interest rate
- - - * - - - B = fixed money supply
- - - ▲ - - - C = fixed US money supply with exchange rate targets
- - - ■ - - - D = fixed real short-term rates
- · · · x · · · · E = fixed real long-term rates

Increase in OECD wage rates - Total OECD



- □ — A = fixed interest rate
- * B = fixed money supply
- - ▲ - - C = fixed US money supply with exchange rate targets
- - ■ - - D = fixed real short-term rates
- x E = fixed real long-term rates

these real effects varies across countries in the short run. U.S. real GNP remains unchanged in the first year but rises by an average 0.8 per cent thereafter. For Japan and Germany there are particularly large reductions in consumption and real GNP falls during the first year or so, but increases thereafter, because of rising investment and trade influences.

Although the labour market adjusts to give lower employment, the timing and influence of these effects are generally too weak to stabilise the wage/price spiral and result in a steady acceleration of global inflation. In the short run, the size of wage/price movements depends on the degree of current period simultaneity. The largest inflation effects are for Germany and Japan (annual average rates of 2 and 3 per cent respectively), reflecting quick wage-price adjustments and relatively weak feedbacks from unemployment to wages. For Germany there is a relatively low wage/unemployment elasticity; for Japan a more flexible labour supply response tends to lead to smaller changes in unemployment. For the United States, price inflation responds more weakly, with a 1 per cent increase in the annual average rate. This largely reflects longer lags between wage and price adjustments, assumed to reflect more rigid wage contracting practices in North America. The gradual divergence in price behaviour contributes to the significant dollar appreciation over the period, which in turn reinforces import price pressures for Japan and Germany.

For the OECD area, the main influences on the current balance are adverse, coming from a loss of competitiveness vis-à-vis the non-OECD and higher activity rates. The United States is generally adversely affected, reflecting a higher GNP level. Japan and Germany benefit because of generally weaker demand and smaller import elasticities.

With a fixed money supply (Table 4.B), interest rates rise significantly, reversing the fall in real interest rates and putting stronger downward pressure on demand. Proportionately larger initial increases in short rates for Japan and Germany again reflect correspondingly steeper LM slopes (as illustrated in Table A) and the larger increases in nominal demand, coming from the higher price responses noted earlier. Although real GNP for the United States is higher in the first two years, demand is checked to give a moderation in inflationary pressure and interest rates eventually rise sufficiently to give higher real rates and a resulting contraction in consumption and investment. The contractionary effects on real GNP are considerably larger for Japan and Germany than for the United States, reflecting the correspondingly larger initial increases in short rates.

Compared with the previous case, there is a significant moderation in inflation with increases in prices levelling off or declining during the last two years. For Japan, the balance of real and price adjustment is sufficiently favourable to imply a subsequent easing of interest rates, which eventually return below baseline. For Germany, there is less of a favourable price adjustment and therefore a more sustained increase in short-term rates, until the fifth year.

The fairly diverse interest rate and price movements give a somewhat varied pattern of exchange rate responses. For the United States, significantly smaller interest rate increases and a balance of payments deterioration give an effective depreciation over the first two years. Thereafter the easing of Japanese rates and stability in U.S. price levels are sufficient to give an overall appreciation. This is mirrored by movements in the yen and Deutschemark rates, which rise initially and then fall back as short rates are eased.

Given substantially higher interest rates and lower activity rates, the OECD current balance is favourably affected. For the United States, the general deterioration given in the previous case is attenuated by higher interest rates and, eventually, reduced demand levels. The overall effects on current balances for Japan and Germany remain favourable.

Given the specific pattern of exchange rate movements obtained under money targets, exchange rate targeting for Japan and Germany (Table 4.C) involves smaller increases in short rates in the first year of simulation, followed by sharper increases in the second and subsequent years. This at first implies a lesser brake on demand, followed by larger reductions in later years. Inflationary pressures are correspondingly stronger through most of the simulation period. For Japan, downward pressure on demand is sufficiently strong and sustained to give a smaller price response by the fifth year; for Germany the later squeeze is too little and too late to give any improvement over money targeting. The outcomes for U.S. inflation and output, with exchange rate targeting, are little affected from those with money targets, except in terms of marginal timing differences.

Compared with money targets, an unchanged real short-rate rule (Table 4.D) has more varied implications for each of the G3 countries. For the United States, there is a larger initial increase in short rates in the first year (1.1 compared with 0.4), followed by considerable easing as the inflation rate comes quickly under control. As a result, U.S. real GNP falls slightly in the first two years and remains at a slightly lower level over much of the period. Compared with the previous cases, there is a more substantial easing of price pressures although the price level increase in the fifth year is broadly the same. For Japan and Germany, increases in interest rates are generally smaller, implying smaller output losses but higher inflation, notably so for Germany.

With an unchanged real long-term rate (Table 4.E), the inflation signal again gives accelerated and very substantial increases in short rates. For Japan and Germany, interest rate movements are unduly large and variable on an annual basis. The corresponding semi-annual time paths are more erratic, with unrealistically large short-rate increases occurring in the initial period.

For the United States, the initial rise in short rates puts firm downward pressure on demand and real GNP. Price level increases are generally lower than in all other cases, although by the final year the overall level is only marginally below that given by a money supply rule. For Germany and Japan, the bringing forward of short-rate increases again accelerates the process by which demand is squeezed. Short-run reductions in real GNP are therefore significantly larger and price levels a lot more subdued. The resulting early slowdown in inflation rates, however, leads to a subsequent easing of short rates and the squeeze on output is correspondingly smaller by the third year so that prices continue to rise in the third and fourth years.

Although providing a substantial attenuation in inflationary pressures over the period for all G3 countries, the implied volatility in short rates needed to hold real long rates unchanged, notably for Japan and Germany, is clearly impractical and implies the need for additional short-rate smoothing.

IV. A COMPARATIVE EVALUATION OF POLICY RULES

In drawing specific conclusions from the results presented in the previous section, it is useful first to establish some basic criteria for assessing the relative effectiveness of the alternative policy rules considered. To this end, Table B below provides a summary of the Table overall simulation results classified by shock and policy option, concentrating narrowly on three key economic variables for the G3 countries -- the real GNP level, the inflation rate and the current account balance. In each case, these are averaged over the five-year simulation period, and therefore largely abstract from short-term, period-to-period movements. To the extent that the latter are important, for example, where specific instabilities are present, the reader is referred to the various charts in Section III. Chart 5 plots the corresponding inflation and real GNP pairings for each policy, by country and simulation shock.

The general diversity of results obtained across the range of model simulations suggests that a number of important trade-offs exist and it is difficult to reject the notion that superior sets of out-turns might be obtained by a combination of more flexible rules and a wider range of policy instruments. However, we are not concerned here with issues of policy optimisation, but rather the relative stabilisation performance and robustness of different monetary rules, with some emphasis also on speeds of adjustment and potential instabilities involved. As a further guide to such an assessment, Table C provides a classification by simulation of those rules which appear to be most effective in meeting three specific criteria:

- minimising inflation effects;
- minimising real GNP effects;
- minimising a simple average of inflation and real GNP effects.

To the extent that the emphasis of policy may also vary with the sign of the shock -- inflation being the main focus with a positive demand shock and GNP being the focus of a negative demand shock -- both inflation and GNP criteria are useful. The rather arbitrary simple average of inflation and output attempts to provide a broader criterion of overall stability. In terms of Chart 5, such "preferred" options correspond to those which lie closest to the respective axes and the point of origin.

On this basis, a number of general points emerge:

Firstly, a fairly general conclusion is that most of the alternative rules considered appear to be effective stabilisers over a five-year period relative to a regime of fixed nominal interest rates. This is because the IS curves in the relevant country models are moderately steep and interest rates have significant effects on output and prices, more so in relation to a regime where movements in real interest rates are the uncontrolled outcome of fluctuations in inflation and are potentially destabilising. Indeed, with INTERLINK, a regime of fixed nominal interest rates seems to imply long-run price instability for all of the shocks considered (8).

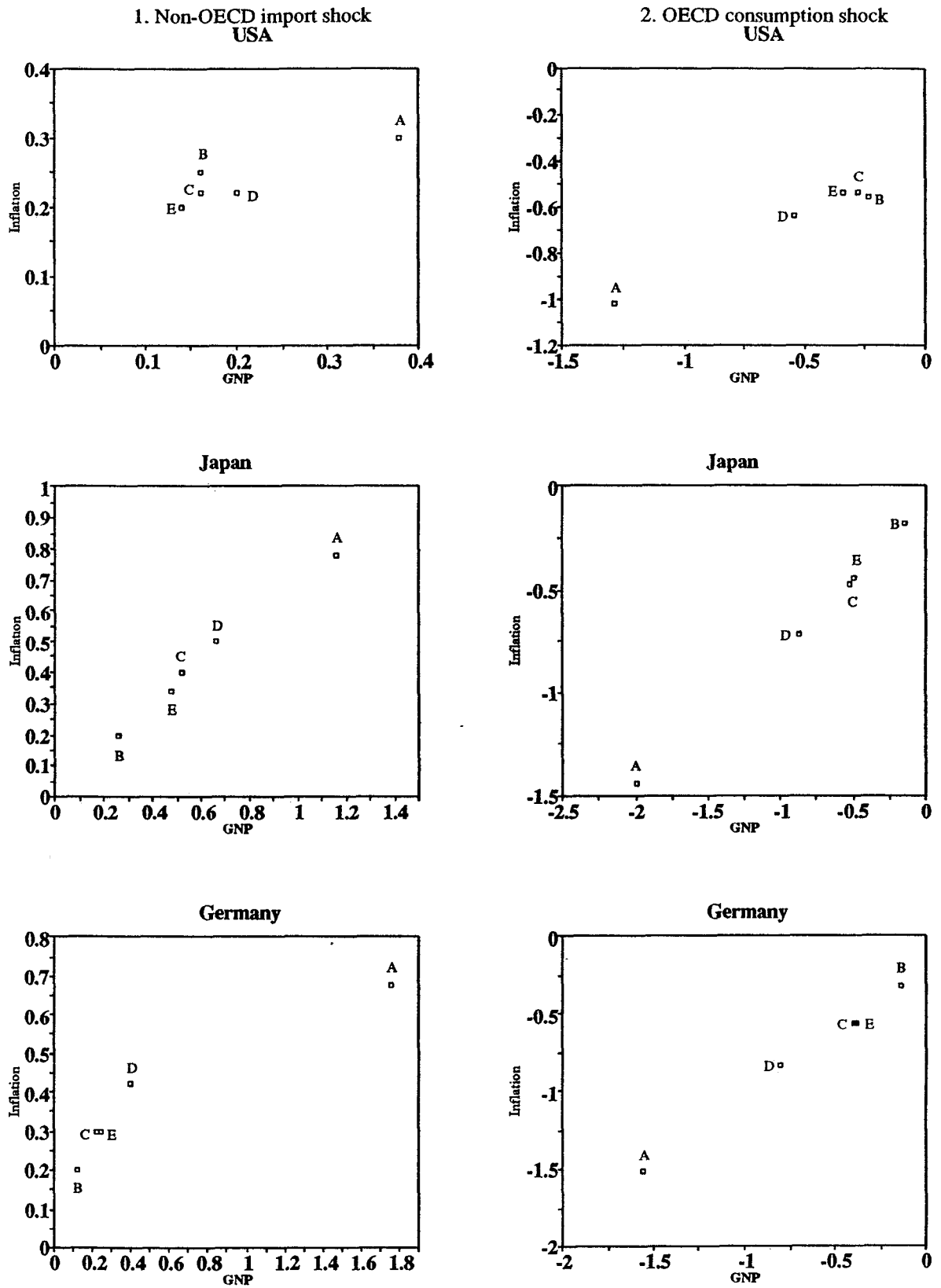
More specifically, interest rate rules based on money supply targeting (option B)

Table B
SUMMARY COMPARISONS

	1. Non-OECD Import Shock			2. OECD Consumption Shock			3. US Fiscal Shock			4. OECD wage shock		
	US	JAP	GER	US	JAP	GER	US	JAP	GER	US	JAP	GER
A. Fixed nominal rates												
GNP level	.38	1.16	1.76	-1.28	-2.00	-1.56	-1.86	-1.50	-0.70	0.66	0.44	0.30
Inflation	.30	.78	.68	-1.02	-1.44	-1.52	-1.48	-0.86	-0.68	1.00	2.14	3.18
Current balance	4	9	5	11	-6	-7	28	-12	-8	-14	4	7
B. Fixed money targets												
GNP level	.16	.26	.12	-0.24	-0.14	-0.14	-0.42	0.04	0.06	-0.36	-1.68	-1.80
Inflation	.25	.20	.20	-0.56	-0.18	-0.32	-0.62	0.00	-0.08	0.64	0.56	1.12
Current balance	14	9	6	2	-6	-5	17	-4	-3	-4	3	6
C. Exchange rate targets												
GNP level	.16	.52	.22	-0.28	-0.52	-0.40	-0.42	-0.30	-0.24	-0.24	-1.80	-1.68
Inflation	.22	.40	.30	-0.54	-0.48	-0.56	-0.58	-0.22	-0.28	0.62	0.42	1.18
Current balance	9	12	6	2	-4	-5	17	-3	-3	-4	6	9
D. Fixed real short rates												
GNP level	.20	.66	.40	-0.54	-0.88	-0.80	-0.76	-0.28	-0.22	-0.10	-1.18	-1.24
Inflation	.22	.50	.42	-0.64	-0.72	-0.84	-0.82	-0.22	-0.26	0.64	0.88	1.64
Current balance	8	11	6	5	-5	-6	20	-7	-4	-7	4	6
E. Fixed real long rates												
GNP level	.14	.48	.24	-0.34	-0.50	-0.38	-0.56	-0.12	-0.12	-0.22	-1.54	-1.80
Inflation	.20	.34	.30	-0.54	-0.44	-0.56	-0.62	-0.10	-0.16	0.60	0.064	1.10
Current balance	9	13	6	5	-5	-5	18	-5	-3	-5	4	6

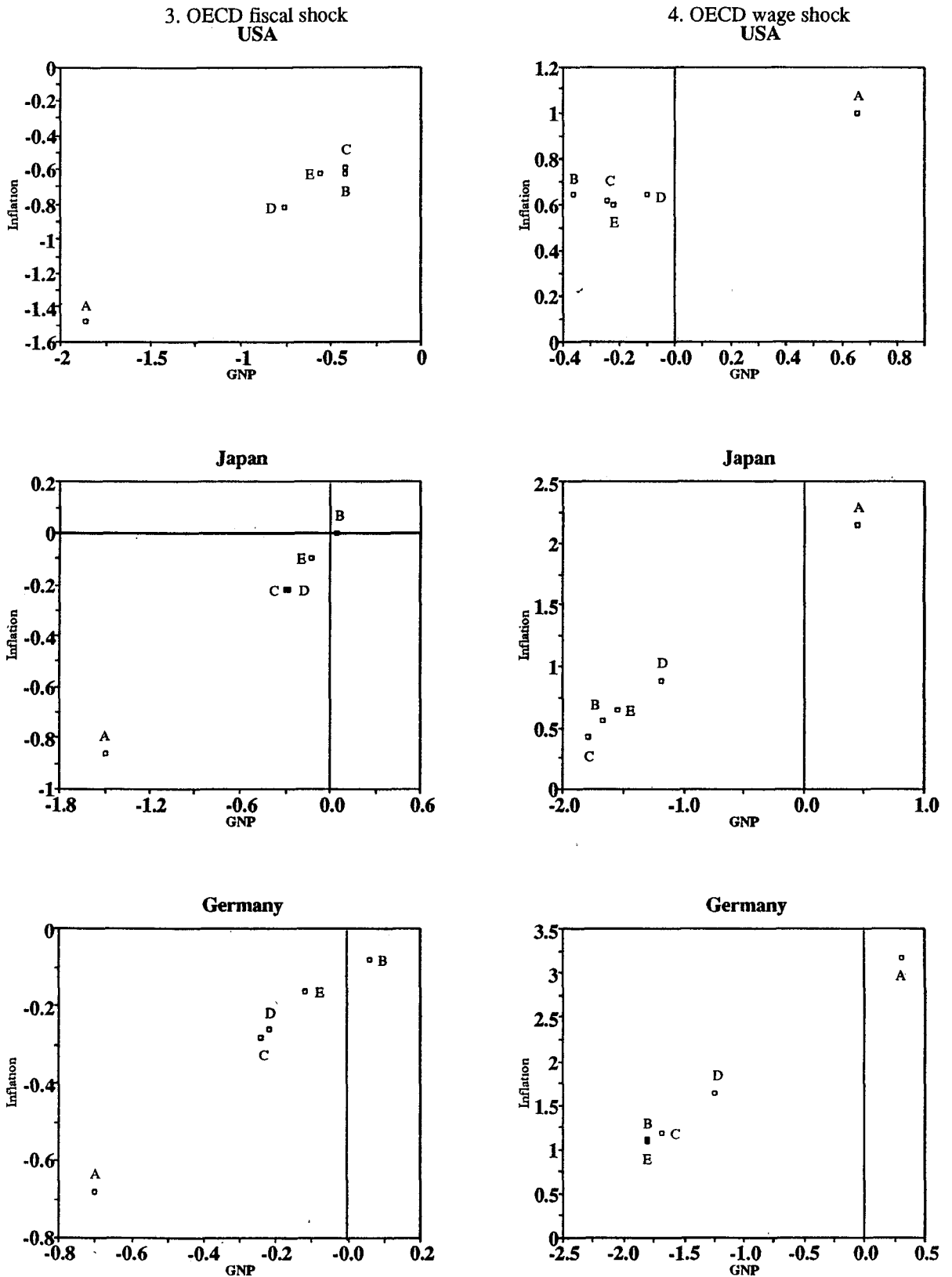
Notes: Deviations from baseline are five-year averages; real GNP levels and inflation rates are in percentage terms, current account balances are in U.S. \$bn.

Chart 5 : Real GNP and Inflation out-turns under alternative policy rules



Out-turns for policies A to E, as defined in Table B

Chart 5 : Real GNP and Inflation out-turns under alternative policy rules



Out-turns for policies A to E, as defined in Table B

Table C

CLASSIFICATION OF ALTERNATIVE RULES

<u>Shock</u>	<u>Preferred policy rules</u>		
	USA	Japan	Germany
1. <u>Non-OECD import shock</u>			
Inflation	D/C/E	B	B
GNP	B/C/E	B	B[C/E]
Both (1)	E	B	B
2. <u>OECD consumption shock</u>			
Inflation	B/C/E	B	B
GNP	B/C/E	B	B
Both	B/C/E	B	B
3. <u>U.S. fiscal shock</u>			
Inflation	B/C/E	B	B
GNP	B/C[E]	B	B/E
Both	B/C[E]	B	B
4. <u>OECD wage shock</u>			
Inflation	B/C/D/E	C	B/C/E
GNP	D	A	A
Both	C/D/E[B]	D	D[B/C/E]

1. Gives equal weight to GNP and inflation responses in absolute terms.

2. / indicates clusters which are not significantly different.
 [] indicates points which are inferior, but not greatly so.

3. A to E represent respective policy rules as follows:

- A. Unchanged nominal interest rates
- B. Money supply targeting
- C. Exchange rate targeting
- D. Unchanged real short-term interest rates
- E. Unchanged real long-term interest rates

seem to have the most effective stabilising influence across the broad range of global demand-side shocks. There are individual cases where one or other of the G3 countries is better or no worse off under alternative rules, but usually at the expense of the other two.

The apparent effectiveness of the money target-based rule, particularly for Japan and Germany, derives from two key features of the models; the particularly strong influence of interest rates on private sector demand and the particular strength of the policy reactions implied by the steepness of the corresponding LM curves (illustrated by Table A). The former is a fairly robust feature of the model; the latter somewhat less so. Indeed, the empirical fragility of money demand relationships suggests that the notion of precise "money supply" targeting cannot be taken literally. The implied reaction functions linking short rates to a combination of real income and price levels appear nonetheless to be effective stabilisers in the context of INTERLINK, for a broad range of demand shocks.

A third broad observation concerns the relative performance of money and exchange rate targeting rules (rows B and C) for Japan and Germany. Here, the results suggest an important trade-off between output and prices (Chart 5). With a positive demand shock, both output and inflation appear to be higher with exchange rate targeting than without, which is suggestive of such an option being less effective for these countries if the primary policy concern is stabilisation. This in turn raises the issue of whether more optimal forms of exchange rate co-ordination are possible.

It is important, though, to note that this result also reflects the specific model features which determine the configuration of exchange rate movements with money supply targeting (case B), since these essentially determine the subsequent adjustments to interest rates in case C. For the positive non-OECD shock, it is the larger increases in Japanese and German interest rates relative to U.S. rates which are all-important in producing the dollar depreciation. These in turn reflect the relative steepness of LM curves embodied in the models, the relative distribution of trade and output effects and the strength of relative price movements. The former feature is clearly not a robust feature of empirical multi-country models, although the latter probably is (9).

The difference in LM curve slopes is even more noticeable in the case of the reduction in OECD consumption, where the pattern of changes in nominal income for all three countries is generally more similar in the short run, but U.S. interest rate reductions are relatively smaller, implying dollar appreciation. In the case of the U.S. fiscal shock, there is much less scope for disagreement about relative interest rate movements, since the effects of a contraction on U.S. income is initially many times greater than for its G3 partners. Nonetheless, in INTERLINK the relative movements in interest differentials are too small to offset the combination of expectations effects generated by relative price movements and an improving U.S. net asset position, so that the dollar appreciates unless monetary policy in Japan and Germany become more restrictive (10). Again, this is not an empirically robust result.

A further important reservation in the case of exchange rate targeting relates to the specification of expectations. To the extent that these are modelled as stable, backward-looking processes, it is hardly surprising that the benefits and costs of exchange rate targeting are shown as being relatively slight. In the real world, one of the main objectives of

exchange rate co-ordination would be precisely to stabilise the otherwise volatile reactions of expectations (11).

For most demand shocks, the maintenance of unchanged real interest rates -- short or long -- gives some degree of stabilisation although for Japan and Germany money targeting is more effective. In general, a fixed real long-rate rule (case E) appears to be a more effective stabiliser than a fixed short-rate rule (case D). As illustrated in Section II, an essential feature of this option is that it gives a relatively high weight to inflation as a signal and thereby brings forward the degree of policy action given by either short-rate or money supply rules. The robustness of such results are therefore strongly dependent on the specification of the interest yield curve in the model.

For the United States, the differential effects of alternative rules are less clearly defined across demand shocks and Chart 5 illustrates a far greater degree of clustering of points, also reflected in the classification of "preferred policies" in Table C. For a non-OECD shock, where the United States is less affected than either Japan or Germany, fixed real interest rates are marginally more stabilising, particularly with a real long-rate target. For the consumption shock, the evidence is more mixed, with the minimum output disturbance given by a money target and little difference in inflation responses as between a fixed real long rate and either of the money target options. In the case of a U.S. fiscal shock, a money target rule is generally most effective for the United States, with exchange rate targeting being marginally superior, but largely at the expense of Japan and Germany.

The general pattern of results and ranking of rules differs for the supply-side OECD wage shock. In fact, fixed nominal interest rates minimise the output effects for Germany and Japan, since the stimulation of activity resulting from substantially reduced real interest rates more than outweighs the adverse effects of higher wage costs. However, this is entirely at the expense of price stability.

Among the alternative rules, fixed real short-term rates in general perform best in terms of the combined output/inflation criterion. For the United States, there is very little to choose between rules on the basis of inflation, although a fixed long-term real rate gives the greatest stabilisation. For Japan, minimum inflation over the period is given by exchange rate co-ordination, although Chart 4 shows this result to be influenced by the choice of terminal point. For most of the simulation period, a fixed long-term real rate provides the most stable path for prices, although in the longer run the inflation rate has yet to stabilise. This is also true for Germany, where there is little difference in terminal inflation values for the fixed real long rate and money target rules.

An important reservation in following a fixed real long-rate rule is that the path of short rates is very erratic in the case of a sustained inflation shock, a feature which reflects the specific dynamics of the rule (illustrated in Table A). For Japan and Germany, the simulated movements in short rates necessary to achieve such a target simulation are not at all realistic, suggesting the need for an additional instrument smoothing criterion. A fixed real short rate gives a generally more credible result, although with higher inflation costs.

V. CONCLUDING REMARKS

This paper has presented simulation results using the OECD INTERLINK model which illustrate the implications of a selection of alternative simple monetary policy rules for four simulated shocks of a global nature. The results, in general, suggest that a variety of simple monetary rules might be used effectively to stabilise output and inflation responses, although a number of important trade-offs exist which might be better exploited by a more flexible choice of targets and instruments.

For demand-side shocks, there is some evidence that money-supply-target-based rules are generally more effective for Japan and Germany and that there are no stabilisation gains to be made from the specific form of exchange rate targeting considered here. This result is empirically fragile, being sensitive to the precise specification of the exchange rate model -- one which in INTERLINK excludes important forward-looking elements -- and the relative LM slopes for individual G3 countries -- for which empirical evidence is mixed. For the United States, the results are generally more mixed and a fixed real long-rate rule appears to be marginally more effective in a number of cases, though by relatively narrow margins.

In the case of a supply-side wage shock, fixed real interest rate rules appear to be more effective given a mixed inflation- and output-based criterion. With a sustained inflationary shock, however, a fixed real longrate rule may imply instrument instability for some countries.

In addition to the specific simulations presented, preliminary tests were made using alternative nominal income targeting rules. Exact targeting in this form proved to be unsuccessful on two counts: i) the specific dynamics of the interest rate/nominal income relationship in the model implies severe instrument instability, and ii) the relative importance of the exchange rate mechanism in this relationship makes the simultaneous pursuit of precise nominal income level targets by the G3 countries difficult, except at the expense of other OECD country objectives. On the other hand, inspection of the exact money target rules used confirms these to be close to being looser forms of nominal income-based rules for interest rates.

Just how far these results conflict with other evidence on the effectiveness of monetary rules is difficult to say. A number of specific model features are both influential and empirically fragile, and the absence of explicit forward-looking elements and credibility effects in the current version of INTERLINK may be a serious disadvantage. On the other hand, global shocks differ from single-country shocks by putting rather less emphasis on the exchange rate mechanism and are also more likely to involve backward-looking expectations elements in the face of major one-of-a-kind shocks. In this respect, the conclusion that the relative performance of simple policy rules varies with the nature of the shocks facing the economy is difficult to reject.

FOOTNOTES

1. The model used is the January 1990 version of INTERLINK. Basic references to its broad structure and simulation properties are given by Richardson (1987a), (1987b) and (1988) and the detailed list of studies therein. More recent studies contributing to the system are described by Herd (1987), Torres *et al.* (1989), Egebo *et al.* (1990) and Martin and Torres (1990). Recent revisions include changes to manufactures import and export prices, manufactures import volumes, housing investment for the major countries, supply blocks for the smaller countries, measures of business sector potential and U.S. consumption. More recent changes incorporated in the autumn 1990 version include re-estimated consumption functions and price blocks for the smaller country models.
2. INTERLINK is a semi-annual model combining 23 individual OECD countries with 6 non-OECD regional sub-models. It involves approximately 5000 equations and a 20-year data base of 7500 series.
3. Preliminary work involves dynamic optimisation and forward-looking solution techniques for single country sub-models, based on software developed in conjunction with the PROPE group at Imperial College, London.
4. Useful comparative studies of empirical model properties for a U.S. fiscal shock are given by Bryant *et al.* (1988 and 1989), Helliwell (1988) and, in the context of INTERLINK, by Herd and Ballis (1988) and Herd (1989).
5. The money demand equations in INTERLINK relate to broad money aggregates, referring to M2 for the United States, M2 plus CD's for Japan and M3 for Germany.
6. In the current version of INTERLINK, income elasticities for manufactures import demand are 2 1/2, 2 and 1 1/2 for the United States, Germany and Japan respectively.
7. Other important changes to the U.S. model include the incorporation of a stock-based housing investment equation and a more dynamic equation for manufactures imports. Neither of these changes significantly affects U.S. multipliers in this case.
8. Although the analysis is confined to a five-year period, a possible longer-term stabilisation of the simulated accelerations and decelerations in prices given with the unchanged nominal interest rate assumption seems quite out of the question.
9. Confirmation of the general disagreement in country ranking of LM slope coefficients for multi-country models is given by Helliwell *et al.* (1988) and Brayton and Marquez (1988).
10. For a number of other multi-country models, the reverse is true, so that exchange rate targeting would imply a greater relaxation of interest rates for Japan and Germany.

11. An alternative way of proceeding in the context of INTERLINK would be to assess the effectiveness of alternative policies, subject also to systematic changes in exchange rate expectations.

AnnexSIMULATING THE OECD INTERLINK MODEL
UNDER ALTERNATIVE MONETARY POLICY RULESTables

Tables 1.A to 4.E are organised as follows:

Simulations

1. 5% increase in non-OECD imports
2. 1% ex ante reduction in OECD private consumption
3. U.S. real fiscal contraction (1% of real GNP)
4. 2% ex ante increase in OECD wage rates

G3 Policy Options

- A. Fixed nominal interest rates
- B. Fixed money supply
- C. Exchange rate targets (Japan and Germany)
- D. Unchanged real short rates
- E. Unchanged real long rates

Changes in real GNP, GNP deflator and effective exchange rates are expressed as percentage derivations from baseline levels; changes in short-term interest rates are expressed as percentage points; current account trade balances are expressed in U.S.\$ bn.

Table 1.A

Simulation: 5% increase in non-OECD import demand

Policy option A: Fixed nominal interest rates

	deviations from baseline				
<u>Year</u>	1	2	3	4	5
<u>Real GNP (% level)</u>					
US	0.3	0.4	0.4	0.4	0.4
Japan	0.5	0.9	1.1	1.3	1.5
Germany	0.6	0.7	0.6	0.6	0.8
Total OECD	0.3	0.5	0.6	0.7	0.8
<u>GNP deflator (% level)</u>					
US	0.1	0.3	0.7	1.0	1.5
Japan	0.2	0.9	1.7	2.8	3.9
Germany	0.3	1.0	1.8	2.5	3.4
Total OECD	0.1	0.4	0.6	1.0	1.9
<u>Short-term rate (pts)</u>					
US					
Japan	unchanged				
Germany					
Total OECD					
<u>Effective exchange rate (% level)</u>					
US	0.1	0.3	0.5	0.7	1.0
Japan	-0.1	-0.4	-0.8	-1.1	-1.5
Germany	-0.1	-0.3	-0.7	-1.2	-1.9
<u>Current Balances (\$ US bn)</u>					
US	3	4	5	5	4
Japan	7	9	9	10	12
Germany	3	3	5	7	8
Total OECD	21	24	28	32	36

Table 1.B

Simulation: 5% increase in non-OECD import demand

Policy option B: Fixed monetary aggregates (broad)

	deviations from baseline				
<u>Year</u>	1	2	3	4	5
<u>Real GNP (% level)</u>					
US	0.3	0.4	0.1	0.0	0.0
Japan	0.4	0.5	0.3	0.1	0.0
Germany	0.4	0.2	0.0	0.0	0.0
Total OECD	0.3	0.3	0.2	0.1	0.1
<u>GNP deflator (% level)</u>					
US	0.1	0.4	0.7	1.0	1.3
Japan	0.2	0.6	0.9	1.0	1.0
Germany	0.2	0.6	0.7	0.8	1.0
Total OECD	0.1	0.4	0.6	0.8	1.0
<u>Short-term rate (pts)</u>					
US	0.2	0.4	0.5	0.5	0.6
Japan	0.8	1.3	1.3	1.0	0.7
Germany	0.9	1.0	0.6	0.7	1.0
Total OECD	0.4	0.6	0.6	0.6	0.7
<u>Effective exchange rate (% level)</u>					
US	-0.2	-0.4	-0.4	-0.5	-0.6
Japan	0.2	0.2	0.2	0.2	0.2
Germany	0.2	0.6	0.9	1.0	1.0
<u>Current balances (\$ US bn)</u>					
US	4	6	10	13	14
Japan	8	11	14	17	21
Germany	4	5	6	7	9
Total OECD	25	33	41	50	59

Table 1.C

Simulation: 5% increase in non-OECD import demand

Policy option C: US maintains monetary aggregate
Germany and Japan target exchange rates

	deviations from baseline				
<u>Year</u>	1	2	3	4	5
<u>Real GNP</u> (% level)					
US	0.3	0.3	0.2	0.0	0.0
Japan	0.5	0.7	0.6	0.5	0.3
Germany	0.5	0.4	0.1	0.0	0.1
Total OECD	0.3	0.4	0.3	0.2	0.2
<u>GNP deflator</u> (% level)					
US	0.1	0.3	0.6	0.8	1.1
Japan	0.2	0.8	1.3	1.7	2.0
Germany	0.3	0.6	1.1	1.2	1.5
Total OECD	0.1	0.4	0.7	0.9	1.2
<u>Short-term rate</u> (pts)					
US	0.1	0.3	0.4	0.5	0.5
Japan	0.2	0.7	0.9	1.0	0.9
Germany	0.4	0.9	0.9	0.7	0.8
Total OECD	0.1	0.4	0.5	0.5	0.6
<u>Effective exchange rate</u> (% level)					
US	unchanged				
Japan					
Germany					
<u>Current balances</u> (\$ US bn)					
US	4	6	9	12	13
Japan	7	9	11	15	19
Germany	4	5	6	8	8
Total OECD	23	30	38	46	54

Table 1.D

Simulation: 5% increase in non-OECD import demand

Policy option D: Unchanged real short-terms rates

	deviations from baseline				
<u>Year</u>	1	2	3	4	5
<u>Real GNP (% level)</u>					
US	0.3	0.3	0.2	0.1	0.1
Japan	0.5	0.7	0.7	0.7	0.7
Germany	0.5	0.5	0.3	0.3	0.4
Total OECD	0.3	0.4	0.4	0.3	0.4
<u>GNP deflator (% level)</u>					
US	0.1	0.3	0.6	0.8	1.1
Japan	0.2	0.7	1.3	1.9	2.5
Germany	0.3	0.8	1.3	1.6	2.1
Total OECD	0.1	0.4	0.7	1.0	1.4
<u>Short-term rate (pts)</u>					
US	0.1	0.3	0.3	0.3	0.3
Japan	0.3	0.5	0.6	0.6	0.5
Germany	0.4	0.5	0.4	0.4	0.6
Total OECD	0.2	0.2	0.2	0.2	0.2
<u>Effective exchange rate (% level)</u>					
US	0.0	0.1	0.2	0.3	0.4
Japan	0.0	0.0	-0.1	-0.3	-0.4
Germany	0.0	-0.1	-0.3	-0.4	-0.5
<u>Current balances (\$ US bn)</u>					
US	4	6	8	10	10
Japan	7	9	11	13	16
Germany	4	4	6	7	8
Total OECD	23	29	34	41	48

Table 1.E

Simulation: 5% increase in non-OECD import demand

Policy option E: Unchanged real long-term rates

	deviations from baseline				
<u>Year</u>	1	2	3	4	5
<u>Real GNP (% level)</u>					
US	0.2	0.2	0.1	0.1	0.1
Japan	0.4	0.5	0.5	0.5	0.5
Germany	0.4	0.2	0.2	0.2	0.2
Total OECD	0.3	0.3	0.2	0.2	0.2
<u>GNP deflator (% level)</u>					
US	0.1	0.3	0.5	0.7	1.0
Japan	0.2	0.6	0.9	1.3	1.7
Germany	0.2	0.5	0.8	1.1	1.5
Total OECD	0.1	0.3	0.5	0.8	1.1
<u>Short-term rate (pts)</u>					
US	0.4	0.3	0.3	0.4	0.4
Japan	0.9	0.8	0.6	0.5	0.5
Germany	1.1	0.4	0.4	0.5	0.6
Total OECD	0.6	0.4	0.3	0.4	0.3
<u>Effective exchange rate (% level)</u>					
US	-0.2	-0.1	0.0	0.0	0.1
Japan	0.2	0.3	0.3	0.1	0.0
Germany	0.2	0.1	-0.1	-0.1	-0.1
<u>Current balances (\$ US bn)</u>					
US	5	7	9	11	12
Japan	8	10	13	15	17
Germany	4	5	5	7	9
Total OECD	27	31	37	44	51

Table 2.A

Simulation: 1% ex-ante reduction in OECD private consumption levels

Policy option A: Fixed nominal interest rates

	deviations from baseline				
<u>Year</u>	1	2	3	4	5
<u>Real GNP</u> (% level)					
US	-1.2	-1.6	-1.3	-1.1	-1.2
Japan	-0.9	-1.7	-2.2	-2.5	-2.7
Germany	-1.2	-1.8	-1.6	-1.4	-1.8
Total OECD	-1.0	-1.5	-1.6	-1.6	-1.8
<u>GNP deflator</u> (% level)					
US	-0.4	-1.4	-2.6	-3.8	-5.1
Japan	-0.4	-1.7	-3.4	-5.2	-7.2
Germany	-0.7	-2.4	-4.3	-5.9	-7.6
Total OECD	-0.4	-1.2	-2.4	-3.8	-4.8
<u>Short-term rate</u> (pts)					
US	unchanged				
Japan					
Germany					
Total OECD					
<u>Effective exchange rate</u> (% level)					
US	0.0	-0.2	-0.5	-0.7	-0.9
Japan	-0.1	0.0	0.5	1.2	2.0
Germany	0.1	0.8	1.6	2.2	2.7
<u>Current balances</u> (\$ US bn)					
US	11	10	8	11	16
Japan	-3	-7	-6	-6	-8
Germany	-2	-3	-6	-11	-12
Total OECD	9	4	0	0	1

Corresponding real GNP responses on an unlinked basis are as follows:

US	-0.9	-0.9	-0.5	-0.4	-0.3
Japan	-0.5	-0.7	-0.8	-0.8	-0.6
Germany	-0.5	-0.4	-0.2	-0.1	-0.1

Table 2.B

Simulation: 1% ex-ante reduction in OECD private consumption levels

Policy option B: Fixed monetary aggregates (broad)

	deviations from baseline				
<u>Year</u>	1	2	3	4	5
<u>Real GNP (% level)</u>					
US	-1.2	-1.1	0.0	0.6	0.5
Japan	-0.7	-0.7	-0.2	0.3	0.6
Germany	-0.9	-0.5	0.2	0.3	0.2
Total OECD	-0.9	-0.8	-0.2	0.2	0.3
<u>GNP deflator (% level)</u>					
US	-0.5	-1.4	-2.1	-2.4	-2.8
Japan	-0.4	-1.1	-1.4	-1.3	-0.9
Germany	-0.6	-1.4	-1.6	-1.5	-1.6
Total OECD	-0.3	-1.0	-1.5	-1.7	-1.9
<u>Short-term rate (pts)</u>					
US	-0.6	-1.3	-1.2	-1.0	-1.2
Japan	-1.3	-2.1	-1.6	-0.5	0.2
Germany	-2.1	-2.3	-0.9	-0.6	-1.1
Total OECD	-1.2	-1.6	-1.1	-0.8	-0.9
<u>Effective exchange rate (% level)</u>					
US	0.5	1.0	1.0	1.0	1.1
Japan	-0.4	-1.0	-1.2	-1.1	-0.9
Germany	-0.6	-0.7	-0.4	-0.4	-0.5
<u>Current balances (\$ US bn)</u>					
US	9	5	-2	-2	2
Japan	-4	-7	-7	-6	-5
Germany	-3	-6	-6	-4	-4
Total OECD	1	-8	-7	-1	4

Table 2.C

Simulation: 1% ex-ante reduction in OECD private consumption levels

Policy option C: US maintains monetary aggregate
Germany and Japan target exchange rates

	deviations from baseline				
<u>Year</u>	1	2	3	4	5
<u>Real GNP</u> (% level)					
US	-1.1	-1.0	-0.1	0.4	0.4
Japan	-0.8	-1.0	-0.6	-0.3	0.1
Germany	-1.1	-1.1	-0.2	0.3	0.1
Total OECD	-1.0	-1.0	-0.5	-0.1	0.0
<u>GNP deflator</u> (% level)					
US	-0.4	-1.3	-1.9	-2.3	-2.7
Japan	-0.4	-1.4	-2.1	-2.5	-2.4
Germany	-0.7	-1.9	-2.6	-2.6	-2.8
Total OECD	-0.4	-1.1	-1.7	-2.1	-2.3
<u>Short-term rate</u> (pts)					
US	-0.6	-1.2	-1.2	-1.0	-1.2
Japan	-0.5	-1.2	-1.3	-1.2	-0.8
Germany	-0.8	-2.0	-1.8	-1.1	-1.1
Total OECD	-0.5	-0.9	-1.0	-0.9	-0.9
<u>Effective exchange rate</u> (% level)					
US	unchanged				
Japan					
Germany					
<u>Current balances</u> (\$ US bn)					
US	9	4	-2	-2	2
Japan	-3	-5	-4	-4	-6
Germany	-2	-4	-7	-8	-6
Total OECD	5	-4	-7	-3	0

Table 2.D

Simulation: 1% ex-ante reduction in OECD private consumption levels

Policy option D: Fixed real short-term rates

	deviations from baseline				
<u>Year</u>	1	2	3	4	5
<u>Real GNP (% level)</u>					
US	-1.1	-1.0	-0.3	-0.1	-0.2
Japan	-0.8	-1.1	-1.0	-0.8	-0.7
Germany	-1.1	-1.1	-0.6	-0.6	-0.6
Total OECD	-0.9	-1.1	-0.7	-0.6	-0.6
<u>GNP deflator (% level)</u>					
US	-0.5	-1.3	-1.9	-2.6	-3.2
Japan	-0.4	-1.3	-2.2	-2.9	-3.6
Germany	-0.6	-1.9	-2.8	-3.4	-4.2
Total OECD	-0.3	-1.0	-1.7	-2.3	-2.9
<u>Short-term rate (pts)</u>					
US	-0.7	-0.9	-0.7	-0.6	-0.8
Japan	-0.6	-0.9	-0.9	-0.7	-0.6
Germany	-0.9	-1.3	-0.9	-0.6	-0.9
Total OECD	-0.5	-0.5	-0.4	-0.3	-0.3
<u>Effective exchange rate (% level)</u>					
US	0.0	0.0	-0.1	-0.2	-0.2
Japan	0.0	-0.1	-0.1	0.1	0.2
Germany	0.0	0.1	0.5	0.7	0.8
<u>Current balances (\$ US bn)</u>					
US	9	5	1	3	7
Japan	-3	-5	-5	-6	-7
Germany	-2	-4	-6	-8	-8
Total OECD	4	-1	-3	-1	1

Table 2.E

Simulation: 1% ex-ante reduction in OECD private consumption levels

Policy option E: Fixed real long-term rates

	deviations from baseline				
<u>Year</u>	1	2	3	4	5
<u>Real GNP (% level)</u>					
US	-0.8	-0.5	-0.2	-0.1	-0.1
Japan	-0.5	-0.6	-0.6	-0.4	-0.4
Germany	-0.7	-0.5	-0.3	-0.2	-0.2
Total OECD	-0.7	-0.6	-0.4	-0.4	-0.3
<u>GNP deflator (% level)</u>					
US	-0.4	-0.9	-1.5	-2.0	-2.7
Japan	-0.3	-0.9	-1.4	-1.9	-2.2
Germany	-0.5	-1.1	-1.7	-2.2	-2.8
Total OECD	-0.3	-0.8	-1.2	-1.8	-2.2
<u>Short-term rate (pts)</u>					
US	-1.2	-0.7	-0.7	-0.8	-0.8
Japan	-1.3	-1.2	-0.7	-0.4	-0.3
Germany	-2.4	-0.8	-0.7	-0.7	-0.9
Total OECD	-1.5	-0.7	-0.5	-0.5	-0.5
<u>Effective exchange rate (% level)</u>					
US	0.1	0.3	0.3	0.1	0.2
Japan	0.1	-0.5	-0.4	-0.1	-0.1
Germany	-0.4	-0.3	-0.1	0.1	0.1
<u>Current balances (\$ US bn)</u>					
US	5	3	2	3	6
Japan	-4	-5	-5	-6	-6
Germany	-3	-4	-4	-6	-7
Total OECD	0	1	-1	0	2

Table 3.A

Simulation: Reduction in US government real consumption (1% of GNP)

Policy option A: Fixed nominal interest rates

	deviations from baseline				
<u>Year</u>	1	2	3	4	5
<u>Real GNP</u> (% level)					
US	-1.6	-2.0	-1.8	-1.8	-2.1
Japan	-0.4	-0.9	-1.2	-1.5	-2.0
Germany	-0.4	-0.7	-0.7	-0.7	-1.0
Total OECD	-0.8	-1.1	-1.2	-1.3	-1.6
<u>GNP deflator</u> (% level)					
US	-0.6	-1.8	-3.4	-5.2	-7.4
Japan	-0.2	-0.8	-1.7	-2.8	-4.3
Germany	-0.2	-0.8	-1.6	-2.4	-3.4
<u>Short-term rate</u> (pts)					
US					
Japan					
Germany					
Total OECD					
<u>Effective exchange rate</u> (% level)					
US	0.3	1.2	2.2	3.4	4.9
Japan	-0.3	-1.6	-1.7	-2.1	-2.8
Germany	-0.1	-0.5	-0.9	-1.5	-2.1
<u>Current balances</u> (\$ US bn)					
US	22	25	24	30	40
Japan	-6	-11	-12	-14	-19
Germany	-3	-4	-6	-11	-14
Total OECD	7	4	0	-1	-1

Table 3.B

Simulation: Reduction in US government real consumption (1% of GNP)

Policy option B: Fixed monetary aggregates (broad)

	deviations from baseline				
<u>Year</u>	1	2	3	4	5
<u>Real GNP</u> (% level)					
US	-1.5	-1.2	0.0	0.4	0.2
Japan	-0.3	-0.2	0.1	0.3	0.3
Germany	-0.3	-0.2	0.1	0.1	0.0
Total OECD	-0.7	-0.6	0.0	0.2	0.2
<u>GNP deflator</u> (% level)					
US	-0.5	-1.5	-2.2	-2.6	-3.1
Japan	-0.1	-0.4	-0.4	-0.2	0.1
Germany	-0.2	-0.4	-0.4	-0.4	-0.4
Total OECD	-0.3	-0.7	-1.0	-1.1	-1.3
<u>Short-term rate</u> (pts)					
US	-0.8	-1.4	-1.3	-1.2	-1.5
Japan	-0.5	-0.7	-0.2	0.4	0.6
Germany	-0.6	-0.8	-0.1	0.1	-0.4
Total OECD	-0.4	-0.6	-0.2	-0.4	-0.1
<u>Effective exchange rate</u> (% level)					
US	0.1	0.5	0.9	1.2	1.6
Japan	-0.1	-0.6	-0.9	-1.0	-1.2
Germany	-0.1	-0.4	-0.4	-0.6	-0.9
<u>Current balances</u> (\$ US bn)					
US	19	17	12	15	22
Japan	-5	-7	-4	-3	-3
Germany	-3	-4	-3	-3	-4
Total OECD	5	-2	6	1	1

Table 3.C

Simulation: Reduction in US government real consumption (1% of GNP)

Policy option C: US maintains fixed money aggregate
Germany and Japan target exchange rates

	deviations from baseline				
<u>Year</u>	1	2	3	4	5
<u>Real GNP (% level)</u>					
US	-1.5	-1.1	0.0	0.3	0.2
Japan	-0.3	-0.4	-0.3	-0.2	-0.3
Germany	-0.3	-0.4	-0.1	-0.1	-0.3
Total OECD	-0.7	-0.6	-0.2	0.0	-0.1
<u>GNP deflator (% level)</u>					
US	-0.5	-1.5	-2.1	-2.4	-2.9
Japan	-0.1	-0.5	-0.8	-0.9	-1.1
Germany	-0.2	-0.6	-0.9	-1.1	-1.4
Total OECD	-0.3	-0.7	-1.1	-1.3	-1.6
<u>Short-term rate (pts)</u>					
US	-0.7	-1.4	-1.2	-1.1	-1.4
Japan	-0.2	0.0	0.3	0.4	0.4
Germany	-0.2	-0.3	0.0	0.2	0.6
Total OECD	-0.3	-0.5	-0.2	-0.1	-0.3
<u>Effective exchange rate (% level)</u>					
US					
Japan				unchanged	
Germany					
<u>Current balances (\$ US bn)</u>					
US	19	17	12	15	21
Japan	-5	-5	-2	-1	-1
Germany	-2	-3	-3	-4	-4
Total OECD	4	1	2	0	1

Table 3.D

Simulation: Reduction in US government real consumption (1% of GNP)

Policy option D: Fixed short-term real interest rates

	deviations from baseline				
<u>Year</u>	1	2	3	4	5
<u>Real GNP</u> (% level)					
US	-1.4	-1.2	-0.5	-0.3	-0.4
Japan	-0.3	-0.4	-0.3	-0.2	-0.2
Germany	-0.3	-0.4	-0.1	-0.1	-0.2
Total OECD	-0.7	-0.6	-0.3	-0.2	-0.3
<u>GNP deflator</u> (% level)					
US	-0.5	-1.5	-2.3	-3.1	-4.1
Japan	-0.1	-0.5	-0.7	-0.9	-1.1
Germany	-0.2	-0.6	-0.9	-1.0	-1.3
Total OECD	-0.2	-0.7	-1.1	-1.5	-2.0
<u>Short-term rate</u> (pts)					
US	-0.8	-1.0	-0.8	-0.9	-1.1
Japan	-0.2	-0.3	-0.2	-0.2	-0.2
Germany	-0.3	-0.4	-0.2	-0.2	-0.4
Total OECD	-0.4	-0.5	-0.3	-0.3	-0.4
<u>Effective exchange rate</u> (% level)					
US	0.0	0.4	0.9	1.5	2.2
Japan	0.0	-0.4	-0.9	-1.2	-2.0
Germany	0.0	-0.2	-0.4	-0.7	-1.1
<u>Current balances</u> (\$ US bn)					
US	19	18	16	20	27
Japan	-5	-7	-6	-7	-9
Germany	-2	-3	-4	-6	-7
Total OECD	4	0	0	0	1

Table 3.E

Simulation: Reduction in US government real consumption (1% of GNP)

Policy option E: Fixed long-term real interest rates

	deviations from baseline				
<u>Year</u>	1	2	3	4	5
<u>Real GNP</u> (% level)					
US	-1.0	-0.7	-0.4	-0.4	-0.3
Japan	-0.1	-0.2	-0.1	-0.1	-0.1
Germany	-0.2	-0.1	-0.1	-0.1	-0.1
Total OECD	-0.5	-0.4	-0.2	-0.2	-0.2
<u>GNP deflator</u> (% level)					
US	-0.4	-1.0	-1.6	-2.3	-3.1
Japan	-0.1	-0.2	-0.3	-0.4	-0.5
Germany	-0.1	-0.3	-0.4	-0.6	-0.8
Total OECD	-0.2	-0.5	-0.8	-1.1	-1.5
<u>Short-term rate</u> (pts)					
US	-1.4	-0.7	-0.8	-1.0	-1.1
Japan	-0.3	-0.2	-0.1	-0.1	-0.1
Germany	-0.7	-0.1	-0.2	-0.3	-0.4
Total OECD	-0.7	-0.4	-0.4	-0.4	-0.5
<u>Effective exchange rate</u> (% level)					
US	-0.5	0.2	0.7	1.1	1.7
Japan	0.5	-0.2	-0.6	-1.0	-1.5
Germany	0.2	-0.1	-0.4	-0.6	-0.9
<u>Current balances</u> (\$ US bn)					
US	15	16	16	19	24
Japan	-3	-5	-5	-6	-7
Germany	-2	-2	-3	-4	-6
Total OECD	3	0	1	1	0

Table 4.A

Simulation: 2% ex ante increase in OECD wage rates

Policy option A: Fixed nominal interest rates

	deviations from baseline				
<u>Year</u>	1	2	3	4	5
<u>Real GNP</u> (% level)					
US	0.0	0.8	1.0	0.8	0.5
Japan	-0.1	0.1	0.5	0.8	0.9
Germany	-0.2	-0.4	0.4	0.8	0.9
Total OECD	0.0	0.4	0.7	0.9	1.0
<u>GNP deflator</u> (% level)					
US	0.8	2.0	3.0	4.0	5.0
Japan	2.0	4.6	6.8	8.9	10.7
Germany	1.9	4.9	8.3	12.1	15.9
Total OECD	1.3	3.0	4.4	5.8	7.1
<u>Short-term rate</u> (pts)					
US	unchanged				
Japan					
Germany					
Total OECD					
<u>Effective exchange rate</u> (% level)					
US	0.7	1.8	3.1	4.4	5.7
Japan	-0.8	-2.0	-3.0	-3.7	-4.3
Germany	-0.5	-1.8	-3.4	-5.3	-7.2
<u>Current balances</u> (\$ US bn)					
US	-2	-14	-17	-17	-20
Japan	1	4	5	5	5
Germany	3	7	7	8	12
Total OECD	1	-4	-6	-5	-6

Table 4.B

Simulation: 2% ex ante increase in OECD wage rates

Policy option B: Fixed monetary aggregates (broad)

	deviations from baseline				
<u>Year</u>	1	2	3	4	5
<u>Real GNP (% level)</u>					
US	0.3	0.5	-0.3	-1.0	-1.3
Japan	-0.5	-1.3	-2.0	-2.4	-2.2
Germany	-0.8	-2.0	-1.8	-2.0	-2.4
Total OECD	-0.1	-0.4	-0.9	-1.3	-1.4
<u>GNP deflator (% level)</u>					
US	1.0	2.3	3.0	3.3	3.2
Japan	1.9	3.5	3.9	3.5	2.8
Germany	1.6	3.3	4.4	5.3	5.6
Total OECD	1.3	2.7	3.4	3.6	3.5
<u>Short-term rate (pts)</u>					
US	0.4	1.4	1.5	1.3	1.1
Japan	2.8	2.4	1.0	-0.4	-1.1
Germany	3.2	2.6	2.4	2.4	1.1
Total OECD	1.7	1.7	1.6	1.1	0.4
<u>Effective exchange rate (% level)</u>					
US	-0.9	-0.5	0.0	0.2	0.8
Japan	0.6	0.2	-0.7	-1.3	-1.4
Germany	1.0	0.4	-0.2	-0.5	-1.2
<u>Current balances (\$ US bn)</u>					
US	-2	-10	-4	-1	-4
Japan	4	8	5	2	-2
Germany	6	11	6	4	5
Total OECD	12	11	7	0	10

Table 4.C

Simulation: 2% ex ante increase in OECD wage ratesPolicy option C: US maintains monetary aggregate
Germany and Japan target exchange rates

	deviations from baseline				
<u>Year</u>	1	2	3	4	5
<u>Real GNP</u> (% level)					
US	0.1	0.6	-0.1	-0.8	-1.1
Japan	-0.3	-1.0	-1.9	-2.8	-3.0
Germany	-0.4	-1.4	-1.9	-2.2	-2.5
Total OECD	-0.1	-0.1	-0.6	-1.2	-1.5
<u>GNP deflator</u> (% level)					
US	0.9	2.1	2.8	3.1	3.1
Japan	2.0	3.8	4.3	3.6	2.1
Germany	1.8	4.2	5.5	6.1	5.9
Total OECD	1.3	2.8	3.7	4.0	3.8
<u>Short-term rate</u> (pts)					
US	0.3	1.3	1.5	1.3	1.1
Japan	1.8	3.0	2.6	0.9	-0.8
Germany	1.3	3.1	3.4	3.2	2.6
Total OECD	0.7	1.6	1.7	1.3	0.8
<u>Effective exchange rate</u> (% level)					
US	unchanged				
Japan	unchanged				
Germany	unchanged				
<u>Current balances</u> (\$ US bn)					
US	-2	-9	-6	0	-2
Japan	3	8	8	7	4
Germany	4	11	11	9	9
Total OECD	6	12	13	10	2

Table 4.D

Simulation: 2% ex ante increase in OECD wage rates

Policy option D: Unchanged real short-term rates

	deviations from baseline				
<u>Year</u>	1	2	3	4	5
<u>Real GNP (% level)</u>					
US	-0.1	-0.1	-0.1	0.0	-0.2
Japan	-0.6	-1.2	-1.4	-1.4	-1.3
Germany	-0.7	-1.8	-1.4	-1.0	-1.3
Total OECD	-0.3	-0.5	-0.5	-0.4	-0.4
<u>GNP deflator (% level)</u>					
US	0.8	1.8	2.2	2.7	3.2
Japan	1.8	3.5	4.2	4.4	4.4
Germany	1.7	3.6	5.1	6.8	8.2
Total OECD	1.3	2.5	3.2	3.8	4.2
<u>Short-term rate (pts)</u>					
US	1.1	0.7	0.5	0.5	0.4
Japan	2.3	1.4	0.6	0.2	-0.1
Germany	2.3	1.7	1.6	1.7	1.1
Total OECD	1.6	1.0	0.5	0.2	-0.2
<u>Effective exchange rate (% level)</u>					
US	0.1	0.6	1.2	1.8	2.3
Japan	0.0	-0.8	-1.4	-1.5	-1.2
Germany	-0.1	-0.3	-0.9	-1.7	-2.6
<u>Current balances (\$ US bn)</u>					
US	1	-8	-9	-9	-11
Japan	2	4	5	5	5
Germany	4	9	6	5	9
Total OECD	11	3	-2	-2	-3

Table 4.E

Simulation: 2% ex ante increase in OECD wage rates

Policy option E: Unchanged real long-term rates

	deviations from baseline				
<u>Year</u>	1	2	3	4	5
<u>Real GNP</u> (% level)					
US	-0.6	-0.6	0.3	0.0	-0.2
Japan	-1.3	-2.0	-1.9	-1.5	-1.0
Germany	-1.7	-2.6	-1.4	-1.6	-1.7
Total OECD	-0.8	-1.1	-0.7	-0.6	-0.6
<u>GNP deflator</u> (% level)					
US	0.7	1.3	1.9	2.5	3.0
Japan	1.5	2.3	2.6	2.9	3.2
Germany	1.3	2.0	3.2	4.6	5.5
Total OECD	1.1	2.0	2.6	3.1	3.5
<u>Short-term rate</u> (pts)					
US	1.6	-0.5	1.9	0.6	0.3
Japan	4.8	0.0	-0.4	-0.2	0.1
Germany	4.9	0.0	3.5	1.0	0.1
Total OECD	3.5	0.1	1.8	0.2	0.2
<u>Effective exchange rate</u> (% level)					
US	-0.9	-0.4	0.5	0.7	1.2
Japan	1.0	0.1	-1.8	-1.2	-0.3
Germany	1.2	0.4	0.5	-0.1	-1.3
<u>Current balances</u> (\$ US bn)					
US	5	-8	-6	-8	-9
Japan	2	4	3	5	5
Germany	6	7	5	6	7
Total OECD	20	-6	4	-2	-4

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