A COMPARISON OF SIMULATION PROPERTIES OF NATIONAL ECONOMETRIC MODELS

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CONTENTS

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PREFACE

This paper provides a comparison of the simulation properties of sixteen economic models in active use in the national administrations of fourteen OECD countries. These models are used for a variety of tasks spanning short-run forecasting, medium-term planning, and the assessment of policy changes or economic shocks. As economic and institutional structures differ importantly, the response of individual country models to identical policy shocks differs widely. In particular, standard multiplier properties may differ for a number of reasons:

i) Differences in domestic savings rates and the size of the foreign trade sector;
ii) Wage and price-setting institutions;
iii) The structures of domestic monetary and financial systems;
iv) The purpose for which the model was built which will influence the relations that are emphasized;
v) The economic theory underlying the model's key behavioural characteristics.

These factors, aside from the first, may indeed be equally relevant for explaining differences in behaviour of models of the same country. in standard neo-Keynesian income-expenditure models the first set of factors (savings and import leakages) will be a dominant factor determining the size and profile of multipliers. They also provide an *a priori* basis for a cross-country ordinal ranking of multipliers. Wage/price blocks also play a key role in model properties, through the determination of the price-output split of nominal GDP growth over time. Specific national institutions can be expected to play an important role in this respect. As regards the structure and development of financial markets and institutions, these will influence the links between monetary and real sectors and the manner in which monetary shocks are transmitted. This is where model structures differ most, with some country models embodying market-determined interest rates while others allow for quantitative credit controls. The fourth consideration can also have a bearing. Different types of model may be required for alternative purposes. Hence, some medium-term planning models have rudimentary monetary sectors or indeed none at all, as the primary focus of attention is on physical resource constraints. Finally, the economic theory underlying key behavioural characteristics will be central. Such theory can be diverse as it is often difficult to discriminate between competing economic

explanations of history because of data and other limitations: nonetheless, different hypotheses may have different implications in counterfactual simulations.

Another complication in making comparisons among models is the difficulty of introducing policy shocks in a strictly comparable manner. Indeed, such limitations and ambiguities are not confined to cross-country comparisons. In a detailed analysis of the economic properties of nine econometric models of the Canadian economy, a not insignificant complication was the difficulty in standardizing policy shocks[1]. Further, a comparison of fiscal expenditure multipliers (with non-accommodating monetary policy) over five to seven years yielded simulations covering the entire policy spectrum, ranging from modest "crowding-out" to "crowding-in". Hence, in some circumstances comparisons of models for the same economy may be subject to as great a degree of ambiguity or range of estimates as inter-country comparisons of neo-Keynesian, income-expenditure type models.

Despite the limitations of cross-country comparisons, an examination of model properties subject to similar shocks provides an interesting framework for confronting theoretical issues of current policy relevance with available empirical evidence. These include ***inter alia*** the incidence of "crowding-out", the neutrality of money, the price/output split of nominal **GDP,** inflation-unemployment trade-offs and the comparative influences of monetary and fiscal policies under fixed and floating exchange-rate regimes. This survey of simulation properties of national models is presented with these economic issues in mind.

INTRODUCTION

This paper summarises the simulation properties of sixteen national models to a variety of policy shocks (Table **1).** The results were obtained in answer to a questionnaire and reflect the state of these models in late **1982** or early 1983[2]. They do not, of course, necessarily represent the views of national administrations, some of which specifically indicated that some of their models' properties should not be taken to represent the authorities' official position. The properties may be compared with the simulation results of a recent version of the OECD Secretariat's INTERLINK model[3].

Properties of the models are generally reported in the form of multipliers. Simulations were requested under alternative exchange-rate regimes with accommodating and non-accommodating monetary policies. Accommodating monetary policy here is taken to mean offsetting changes in money stock or other monetary

Table 1. National model-builders and models

United States	Division of International Finance, Board of Governors of the Federal Reserve System	MCM Model
Japan	Economic Planning Agency	World Model
Germany	Bundesbank	
France 1	INSEE	METRIC
France 2	Bureau de Politique Economique	COPAIN
United Kingdom	H.M. Treasury	
Canada 4	Bank of Canada	RDXF
Canada 2	Economic Council	CANDIDE
Australia	Reserve Bank	RBII
Austria	WIFO Institut fur Wirtschaftsforschung	JMX
Belgium	Bureau du Plan	MARIBEL
Denmark	Danmarks Statistik	ADAM
Finland	Bank of Finland	BOF3
Netherlands	Central Planning Bureau	FREIA
New Zealand	Reserve Bank	
Norway	Royal Ministry of Finance and Customs	MODIS IV

Note: These models have been developed in the institutions above, but should not be interpreted as necessarily reflecting their views.

policy instruments which leave nominal market-determined interest rates unchanged after a fiscal shock. To the extent that a simulated cut in government expenditures leads to lower interest rates, accommodating monetary policy in this sense involves a reduction in money stock and higher interest rates than non-accommodating policy. The course of real interest rates in the two cases depends on the inflation outcome and no generalization can be made about them.

The simulations requested were:

i) A decrease in government non-wage expenditure with non-accommodating monetary policy;
ii) As *(i)* but with accommodating monetary policy;
iii) Monetary shocks (a decrease in money supply or an increase in policy controlled interest rates);
iv) An increase in personal income tax;
v) An increase in oil prices;
vi) A decrease in wage rates.

The response to these requests varied with the economic and institutional structure of national models. Thus, in some cases, the multiplier properties are not directly comparable between models, as policy shocks differ from the standard list. In particular, few national authorities were able to report simulation properties under the floating exchange-rate regime.

Annex Table 1 lists the various simulations undertaken by national authorities. For the United States, the Dutch and one of the French models all six simulations were made under fixed and floating exchange-rate regimes. All six simulations were also performed for the New Zealand model with, however, the floating exchange-rate assumption being no change in real exchange rates, reflecting national experience of the 1979-82 period. The German model simulated only two shocks under floating exchange rates. Simulation results are reported for two Canadian models under floating and one under fixed exchange-rate regimes, but the policy shocks differ from the standard list. Results were requested for simulations over a seven-year period from the first quarter of 1976 to the last quarter of 1982[4]. Quarterly results were provided but only annual simulation results are reported – for the first three years and the seventh year. In the commentary below short and medium-term impacts refer to the effects over one and three years respectively. Seventh-year results are not necessarily indicative of long-run equilibrium properties as most national models tend to generate persistent cyclical behaviour.

The body of this paper comments not only on the simulation results but discusses the light they shed on certain issues of theoretical and current practical policy concern. While of interest in this context, the results should be regarded with some reserve; a number of national authorities have stressed that they do not

consider unaided simulation results can appropriately be used to support policy analysis or conclusions.

CUTS IN GOVERNMENT EXPENDITURE UNDER FIXED EXCHANGE RATES

This simulation considers a cut in real government non-wage expenditures equivalent to 0.5 per cent of real GDP in 1976 and held constant throughout a seven-year period[5]. The first set of multiplier results reported for eleven national models in Table 2 assumes that monetary policy is non-accommodating. The precise definition of non-accommodation varies with the institutional characteristics of the model. In general some instrument of monetary policy is held fixed. Usually this is the monetary base (e.g. the United States and the United Kingdom) and sometimes it is a policy-determined interest rate (e.g. France and Japan). Non-accommodating monetary policy forces market interest rates to respond to changes in real GDP and the rate of inflation following the fiscal impetus; see below.

The simulated response of real GDP to a cut in non-wage expenditure varies considerably between country models, with standardized first-year multipliers ranging from 0.3 in New Zealand to 1.7 in the France 2 model. (As the fiscal shock equals 0.5 per cent of real GDP, the values shown in Tables 2 to 7 and 14-16 are generally twice those shown in actual simulation results.) However, the simulations differ somewhat in nature. In the United States and the United Kingdom explicit assumptions concerning sterilisation of capital flows are made, while in other countries capital flows affect base money and interest rates[6]. The United States, Japanese and French models show quick, strong negative real GDP responses, This appears reasonable for the first two models, as these countries are less open than the typical OECD economy and consequently have lower trade "leakages" from the income/expenditure flow system. All national models indicate peak responses of real GDP within three years. However, in the seventh year, the French and Japanese models continue to reflect a strong impact on real GDP, while other countries' multipliers fall to about a half to a quarter of their maximum values. These multipliers imply nonetheless that a fiscal shock has lasting effects on the level of real GDP, despite offsetting effects through the influence of interest rates on wealth and expenditure and international competitiveness effects.

The inflation response to this shock differs even more widely among models and over time. The United Kingdom, Australian, Belgian, Dutch and New Zealand models show quick price responses to reduced aggregate demand, which build up over time. (In the United Kingdom model, this partly reflects the influence of lower

Table **2. A decrease in real government expenditure with non-accommodating monetary policy under fixed exchange rates**[a]

	Year	United States	Japan	France 1	France 2	United Kingdom	Canada 1	Australia	Belgium	Finland	Netherlands	New Zealand
GDPV/GNPV	1	−1.42	−1.32	−1.4	−1.70	−1.06	−0.92	−0.70	−0.71	−1.19	−0.86	−0.28
	2	−1.07	−1.68	−1.6	−1.62	−1.18	−0.66	−1.14	−0.90	−1.80	−0.75	−0.31
	3	−0.70	−1.66	−1.6	−1.10	−0.80	−0.46	−1.38	−0.18	−1.54	−0.57	−0.22
	7	−0.20	−0.98	−1.6	−1.22	−0.36	−0.26	−0.92	n.a.	−0.64	−0.05	n.a.
PGDP/PGNP	1	0.08	0.06	0.2	0.88	−0.32	−0.03	−0.38	−0.27	0.02	−0.31	−0.28
	2	−0.17	−0.20	0.2	0.84	−0.82	−0.40	−0.82	−0.69	−0.15	−0.67	−0.32
	3	−0.50	−0.42	0.0	0.10	−1.68	−0.69	−1.22	−0.73	−0.44	−0.89	−0.62
	7	−0.82	−1.26	−0.6	−0.84	−2.54	−1.22	−2.74	n.a.	−1.42	−1.50	n.a.
UNR[b]	1	0.64	0.04	0.2	0	0.28	0.36	0.16	n.a.	0.12	0.34	n.a.
	2	0.57	0.08	0.2	0	0.60	0.50	0.56		0.33	0.32	
	3	0.30	0.06	0.2	0	0.42	0.33	0.84		0.56	0.28	
	7	−0.10	−0.00	0.4	0	0.16	0.03	0.84		0.64	0.12	
IRS[b]	1	−0.80	−0.04	−0.0	−0.05	−0.96	−0.40	−0.78	−0.10	0.57	−0.06	−0.13
	2	−0.89	−0.26	−0.2	−0.04	−1.46	−0.89	−0.68	−0.16	−0.59	−0.11	−0.55
	3	−0.92	−0.36	−0.2	0.03	−1.78	−0.66	−1.02	−0.10	−0.94	−0.14	−0.83
	7	−0.82	−0.60	−0.4	−0.02	−3.64	−0.50	−1.12	n.a.	−1.64	−0.28	n.a.
MONEYS	1	0	−1.38	−0.2	0.08	−0.38	−0.23	−0.34	n.a.	−0.20	0.53	0.10
	2	0	−1.46	−0.0	0.00	−0.90	−0.10	0.38		−0.33	1.04	0.22
	3	0	−1.06	−0.2	−0.38	−1.02	−0.13	−0.08		0.26	0.64	−0.07
	7	0	0.12	−0.2	−1.38	−3.10	0.00	0.00		4.08	0.72	n.a.
CB[c]	1	4.93	1.44	7.13	8.66	0.52	1.52	n.a.	0.89	0.09	1.08	12.08
	2	6.14	2.77	8.28	7.83	0.87	2.71		1.79	0.20	1.70	22.28
	3	5.24	3.13	5.60	2.72	0.84	2.90		1.69	0.96	1.59	21.08
	7	8.90	2.00	10.31	9.24	2.18	5.48		n.a.	0.81	2.52	n.a.
CAPFLO[c]	1	−4.93	−2.71	0.45	1.67	−0.52	n.a.	−23	n.a.	−0.12	−0.94	n.a.
	2	−6.14	−4.03	−2.28	−0.13	−0.87		−85		−0.16	−1.55	
	3	−5.24	−7.20	−2.40	−1.03	−0.84		−108		−0.98	−1.40	
	7	−8.90	−3.88	−4.21	−0.91	−2.18		n.a.		−0.63	−2.31	

a) Deviation from baseline as percentage of baseline. Values shown in Tables 2-7 and 14-16 have been standardized to reflect multiplier properties for a 1 percentage point shock as the fiscal cut simulated equals 0.5 per cent of real GDP.
b) Deviation from baseline in percentage points.
c) Deviation from baseline, units: billions in national currency; in Australia and Mew Zealand millions; figures for Japan in dollars,
Notation of variables:
GDPV = real GDP; PGDP = GDP deflator; UNR = unemployment rate; IRS = short-term interest rate (tong-term in the Australian and Belgian models); MONEYS = money supply; CB = current balance; CAPFLO = capital flow; EXCH = exchange rate (per local currency).
0 = no change; data rounded to nearest significant tenth; n.a. = not available.

interest rates on prices via mortgage rates.) Lower inflation is also simulated in other national models in the third and seventh years. But in the short run, several models (the United States, Japan, France and Finland) simulate perverse price responses, with the adverse effects of lower capacity utilisation and consequently higher unit costs reflecting cyclically-depressed productivity offsetting the influence of lower aggregate demand[7].

The unemployment rate increases significantly in the short and medium run in almost all country models, implying a short-run tendency towards "stagflation" in some models (the United States, Japan, France 1 and Finland). In the seventh year, the United States, Japanese and France 2 models show negligible unemployment effects to fiscal shocks, presumably reflecting discouraged worker effects on labour force participation rates. By contrast, the United Kingdom and Australian models indicate a trade-off between inflation and the rate of unemployment even in the seventh year.

The effects on interest rates and money stock developments described below reflect standard monetary transmission mechanisms. As non-accommodating monetary policy is assumed, short-term interest rates (long-term in the Australian and Belgian models) fall significantly in all models, with deviations increasing over time. There is no clear pattern in ***ex post*** real interest rates (defined as the difference between interest rates and coincident rates of inflation). The response of money supply varies even more, as the definition of money and monetary institutions differs between models. With the exceptions of Finland and the Netherlands, all models simulate declining money supply in the third and usually in the seventh year. However, the Japanese and Dutch models generate slight increases in money supply in the seventh year. The dominant feature in most models is a reduction in interest rates and money stock in response to lower transactions demand accompanying decreased national income. In general, the offsetting effect of increased asset demand for money balances in response to lower interest rates is weak. Finally, in some national models (e.g. the Japanese), interest rates and money supply are affected by changes in base money accompanying changes in foreign reserves via shifts in the overall balance of payments. In the United States and United Kingdom models, changes in current account are assumed to be exactly offset by changes in capital account balances. Therefore changes in overall balance have no domestic monetary repercussions.

All country models show a tendency for an improvement in the current account of the balance of payments in response to lower real **GDP.** This largely reflects the fall in imports in response to lower domestic demand, as well as some improvement in export competitiveness. (Differences in simulated current-account balances also illustrate the role of structural factors, such as the commodity composition of exports.) Capital account developments differ more widely. As noted above, the United States and United Kingdom models assume offsetting capital and current account movements. For other countries, falling interest rates widen the differential

Table **3. A decrease in real government expenditure with accommodating monetary policy under fixed exchange rates"**

	Year	United States	Japan	France 1	United Kingdom	Canada 1	Australia	Austria	Denmark	Finland	Nether-lands	New Zealand	Norway
GDPV/GNPV	1	−1.56	−1.34	−1.4	−1.14	−0.99	−0.78	−1.6	−1.16	−1.18	−0.88	−0.32	−0.80
	2	−1.59	−1.74	−1.6	−1.30	−0.92	−1.90	−1.8	−1.40	−1.78	−0.84	−0.55	−0.80
	3	−1.24	−1.80	−1.6	−1.02	−0.79	−2.12	−1.6	−1.40	−2.28	−0.77	−0.62	−0.78
	7	−0.64	−1.38	−1.6	−0.82	−0.26	−1.60	−1.0	−0.70	−1.40	−0.74	n.a.	−0.74
PGDP/PGNP	1	0.08	0.06	0.2	−0.32	−0.03	−0.26	0.0	0.23	0.02	−0.31	−0.31	0
	2	−0.18	−0.20	0.2	−0.70	−0.46	−0.80	−0.4	0.23	−0.14	−0.65	−0.32	0
	3	−0.60	−0.44	0.2	−1.60	−0.86	−1.30	−0.8	0.00	−0.44	−0.85	−0.36	0
	7	**−1.34**	−1.26	−0.2	−1.92	−1.58	−2.40	−1.2	0.00	−1.34	−1.32	n.a.	0
UNR[b]	1	0.70	0.04	0.2	0.32	0.36	0.16	0.40	8.1	0.12	0.35	n.a.	n.a.
	2	0.82	0.08	0.4	0.64	0.59	0.68	0.66	13.3	0.33	0.34		
	3	0.56	0.06	**0.4**	0.56	0.53	1.18	0.74	12.1	0.56	0.32		
	7	−0.26	0.00	0.4	0.46	−0.03	0.90	0.62	5.1	0.84	0.27		
IRS[b]	1	0	0	0	**0**	**0**	**0**	n.a.	**0**	**0**	**0**	**0**	n.a.
	2	0	0	0	**0**	**0**	**0**		**0**	0	0	0	
	3	0	0	0	**0**	**0**	**0**		**0**	**0**	**0**	**0**	
	7	0	0	0	**0**	**0**	**0**		**0**	**0**	**0**	**0**	
MONEYS	1	−0.71	−1.40	−0.2	−1.06	−0.43	−0.92	n.a.	n.a.	−0.14	0.25	−1.18	n.a.
	2	−1.40	−2.02	−0.2	−1.92	−1.12	−1.72			−0.29	0.60	−1.67	
	3	−1.60	−2.36	−0.6	−2.00	−1.58	**−1.26**			−0.34	0.07	−1.57	
	7	−1.58	−2.58	−1.0	−3.08	−1.88	−1.02			−0.62	−0.87		
CB[c]	1	4.73	1.45	7.16	0.57	1.52	n.a.	3.10	−14.4	0.10	1.11	13.46	1.72
	2	7.18	2.91	8.66	0.95	2.87		4.90	−15.3	0.19	1.75	32.15	1.82
	3	7.24	3.63	6.46	0.94	3.47		5.33	−17.2	1.07	1.72	39.70	1.97
	7	8.88	3.24	12.16	2.08	5.35		7.81	−11.4	2.06	2.73	n.a.	2.51
CAPFLO[c]	1	−4.73	−2.37	0.56	−0.57	n.a.	−26	n.a.	n.a.	−0.13	0.21	n.a.	n.a.
	2	−7.18	−1.38	−1.59	−0.95		−134			−0.13	−0.10		
	3	−7.24	−1.33	−1.40	−0.94		−208			**−0.53**	**0.04**		
	7	−8.88	**0.59**	−0.42	−2.98		n.a.			0.33	0.35		

Note: Sixth year results are shown for Norway. Values shown are standardized to **reflect multiplier properties for a 1 percentage point fiscal shock. For other notes see Table 2.**

between domestic and unchanged foreign rates, thereby generating capital outflow. In the two French models, the resultant capital outflow does not offset the emerging current account improvement, while the opposite effect is simulated in the Japanese model.

The second simulation examines a cut in government real expenditures of the same magnitude, under fixed exchange rates, with accommodating monetary policy. Accommodating monetary policy implies that money supply and the stock of outstanding government bonds adjust to leave nominal interest rates unchanged. Results for twelve national models are reported in Table 3. The negative response of real GDP to the second shock is similar to the first, and as might be expected, somewhat more pronounced. This reflects the influence of unchanged nominal interest rates and thus higher real ***ex post*** interest rates on interest-sensitive final demand components. The impact on inflation, unemployment and the current account is similarly more pronounced. Hence, the negative impact of a fiscal cut on real economic variables and inflation is more pronounced under accommodating monetary policy. There is less effect by contrast on the capital account, as unchanged domestic interest rates mean there is no tendency for capital outflows to be generated by changed interest-rate differentials.

CROWDING OUT

The difference between fiscal multipliers under alternative assumptions concerning monetary policy can be taken as a measure of the crowding-out effect, whereby changes in government net spending, by altering interest rates, create offsetting movements in private expenditures, especially investment. This is so because the main difference between the two simulations is the response of interest rates[8]. The response of interest rates in a closed economy can be divided into two components: transactions demands and portfolio valuation influences. In the first simulation with non-accommodating monetary policy, interest rates tend to fall in response to reduced transactions demand for money balances. This reduces the restrictive impact of expenditure cuts to the extent that interest-sensitive final demand components respond positively to lower interest rates. This is usually termed the transactions demand effect. The second influence, the portfolio effect, can take a number of forms. A cut in government expenditure may reduce central government deficits and thereby the size of the public debt via reduced bond financing. A reduction in central government bond issues can influence interest rates, although in a theoretically indeterminate way depending on the substitutability of government bonds for other assets. The portfolio effect can either weaken or strengthen the restrictive impact of government fiscal cuts, depending on whether

interest rates fall or rise. The transactions demand and portfolio effects are not separately identified in national model simulation results, *so* the results reported in principle integrate both, but the former is generally dominant. In an open economy, however, there is a third mechanism, i.e. the influence of interest rates on capital flows and hence the domestic money supply. This mechanism can be seen in the Japanese, France 1, Finnish and Netherlands models, operating with different intensities depending on the scale of capital outflows. In other cases (especially the United States and United Kingdom models) the effect is assumed away; but an assumption of complete policy control over both exchange rates and monetary conditions is not, of course, realistic.

Orders of magnitude of the crowding-out phenomenon can be obtained from Table 4, where fiscal multipliers are compared under alternative monetary policy assumptions. With the exception of the France 1 model (and Finland in the short run), all national models simulate a crowding-out effect, albeit relatively weak. The lack of response in French interest rates (partly reflecting the importance of credit

Table 4. **Response of real GDP/GNP to a government expenditure cut with alternative monetary policy under fixed exchange rates"**

		1st year		2nd year		3rd year		7th year	
United States	**A**	−1.42	91	−1.07	67	−0.70	56	−0.20	31
	B	−1.56		−1.59		−1.24		−0.64	
Japan	**A**	−1.32	99	−1.68	**97**	−1.66	92	−0.98	71
	B	−1.34		−1.74		−1.80		−1.38	
France 1	**A**	−1.4	100	−1.6	100	−1.6	100	−1.6	100
	B	−1.4		−1.6		−1.6		−1.6	
United Kingdom	**A**	−1.06	93	−1.18	91	−0.80	78	−0.36	44
	B	−1.14		−1.30		−1.02		−0.82	
Canada 1	**A**	−0.92	93	−0.66	72	−0.46	58	−0.26	100
	B	−0.99		−0.92		−0.79		−0.26	
Australia	**A**	−0.70	90	−1.14	60	−1.38	65	−0.92	58
	B	−0.78		−1.90		−2.12		−1.60	
Finland	**A**	−1.19	103	−1.80	101	−1.54	68	−0.64	46
	B	−1.18		−1.78		−2.28		−1.40	
Netherlands	**A**	−0.86	98	−0.75	89	−0.57	74	−0.05	7
	B	−0.88		−0.84		−0.77		−0.74	
New Zealand	**A**	−0.28	88	−0.31	56	−0.22	35	n.a.	
	B	−0.32		−0.55		−0.62			

a) **Deviation from baseline as percentage of baseline. Values shown are standardized to reflect multiplier properties for a 1 percentage point fiscal shock.**
Note: A = non-accommodating monetary policy; B = accommodating monetary policy.

controls) and capital flows largely explains this country's result. The first year effects are quite small, but by the third year the decline in real GDP in response to non-accommodating monetary policy is about 10 to 60 per cent less than with accommodating monetary policy. In the seventh year, the United States, Japanese, United Kingdom, Australian and Dutch models show increasingly powerful (but not full) crowding-out effects. These are particularly pronounced in the United States and the last three models, where changes in interest rates offset one-half or more of the impact of restrictive fiscal policy. On the other hand, the crowding-out effects fall off from the third to seventh years in the Finnish model.

CUTS IN GOVERNMENT EXPENDITURE UNDER FLOATING EXCHANGE RATES

This set of simulations compares the effects of cuts in government expenditure of similar magnitude to the first two simulations, under floating exchange rates[9]. Table 5 summarises the simulated effects of a fiscal cut with non-accommodating monetary policy. The response of real GDP to the fiscal shock is of very similar magnitude to those under fixed exchange rates in the short run (cf. Table 2). However, there is a clear tendency for the impact to peter out or dissipate over time. This petering-out effect comes from essentially two sources: enhanced price stability and associated wealth effects on the private economies' propensity to consume and invest; and the influence of exchange-rate changes in improving competitive positions. (In the case of Germany there is even a ***positive*** GDP response by the seventh year with accommodating monetary policy; see below.)

The sole difference between these simulations is the response of the exchange rate and their simulated effects on other economic variables. Movements in exchange rates can be separated into two groups. The United Kingdom and the RDXF Canadian model simulate an exchange-rate depreciation. All other models simulate an appreciation (except for a marginal first-year depreciation in the United States model). In the latter group, a current account surplus position has a dominant influence on exchange markets. In the former group, the fall in domestic interest rates and the induced deterioration on capital account dominates. Another component of the balance of payments, influencing exchange rates is changes in official foreign reserves. The simulations do not treat these in a uniform way so that the results are not strictly comparable. Changes in foreign reserves are excluded (thereby assuming a cleanly floating exchange rate) in the United States, the United Kingdom, the two Canadian models[10], and implicitly in the Australian model. Yet intervention functions in other models imply a managed float.

A comparison of the impact on unemployment under fixed versus floating exchange rates reveals small differences. Price performance, however, differs more

Table 5. A decrease in real government expenditure with non-accommodating monetary policy under floating exchange rates'

	Year	United States	Japan	France 1	United Kingdom	Canada 1	Canada 2	Australia	Netherlands	New Zealand
GDPV/GNPV	1	−1.39	−1.46	−1.4	−1.04	−0.92	−1.82	−0.70	−0.88	−0.27
	2	−1.05	−2.40	−1.8	−1.16	−0.66	−2.05	−1.36	−0.77	−0.30
	3	−0.88	−2.88	−2.0	−0.80	−0.43	−1.98	−2.38	−0.60	−0.19
	7	−0.24	−2.66	−1.6	−0.22	−0.20	−1.12	−0.76	−0.10	n.a.
PGDP/PGNP	1	0.08	0.02	0.2	−0.30	−0.03	0.17	−0.40	−0.37	−0.30
	2	−0.16	−0.58	0.0	−0.66	−0.36	−0.00	−0.88	−0.90	−0.40
	3	−0.54	−1.18	−0.4	−1.58	−0.63	−0.46	−1.32	−1.32	−0.80
	7	−1.46	−2.78	−2.4	−2.14	−1.42	−1.72	−4.14	−2.41	n.a.
UNR[b]	1	0.63	0.04	0.2	0.28	0.36	0.83	0.16	0.35	n.a.
	2	0.57	0.10	0.4	0.58	0.50	1.09	0.64	0.33	
	3	0.38	0.10	0.4	0.42	0.30	1.22	1.14	0.29	
	7	−0.20	0.02	0.4	0.08	0.00	0.69	0.76	0.12	
IRS[b]	1	−0.76	−0.08	−0.2	−0.92	−0.33	−0.56	−0.74	−0.07	−0.14
	2	−0.90	−0.32	−0.4	−1.38	−0.86	−0.79	−0.16	−0.12	−0.59
	3	−1.16	−0.22	−0.4	−1.72	−0.59	−0.99	−1.28	−0.13	−0.94
	7	−1.50	−0.22	−0.6	−3.46	−0.59	−2.48	−1.78	−0.27	n.a.
MONEYS	1	0	−1.52	−0.2	−0.38	−0.20	0.00	−0.30	0.49	0.10
	2	0	−2.58	−0.2	−0.92	−0.10	0.00	0.50	0.95	0.50
	3	0	−3.52	−0.6	−1.06	0.13	0.00	−0.46	0.49	−0.07
	7	0	−4.72	−1.4	−3.04	0.00	−0.03	−0.94	0.33	n.a.
CB[c]	1	5.03	1.38	8.79	0.47	1.52	2.28	n.a.	1.07	11.43
	2	6.44	1.89	10.26	0.92	2.87	2.95		1.60	21.32
	3	4.74	0.28	4.31	0.88	3.01	3.07		1.44	18.05
	7	−0.58	0.48	9.12	2.30	4.92	3.94		2.25	n.a.
CAPFLO[c]	1	−5.03	−3.15	−2.72	−0.47	−0.03	−0.30	−40	−0.93	n.a.
	2	−6.44	−3.55	−5.43	−0.92	−0.03	−0.21	−292	−1.46	
	3	−4.74	−6.02	−4.83	−0.88	−0.03	−0.17	−373	−1.28	
	7	0.58	−0.35	−10.03	−2.30	−0.03	−0.12	n.a.	2.07	
EXCH	1	−0.38	1.30	1.4	−0.52	−0.07	0.83	1.14	0.32	n.a.
	2	0.38	5.82	3.0	−0.12	−0.36	0.99	7.54	0.55	
	3	1.48	7.72	3.4	0.12	−0.30	0.99	4.20	0.82	
	7	2.46	5.66	4.6	−1.08	0.79	1.12	2.00	1.33	

Note: In the Canadian models, capital flow means only long-term capital, Values shown are standardized to reflect multiplier properties for a 1 percentage point fiscal shock. For other notes see Table 2.

Table 6. A decrease in real government expenditure with accommodating monetary policy under floating exchange rates"

	Year	United States	Japan	Germany	France 1	United Kingdom	Australia	Netherlands	New Zealand
GDPV/GNPV	1	−1.57	−1.48	−1.02	−1.4	−1.34	−0.78	−0.98	−0.32
	2	−1.74	−2.66	−0.80	−2.0	−1.60	−2.06	−0.91	−0.57
	3	−1.78	−3.42	−0.30	−2.2	−1.70	−2.58	−0.87	−0.66
	7	−2.42	−2.68	0.22	−2.4	−0.30	−3.08	−0.87	n.a.
PGDP/PGNP	1	0.07	0.02	−0.60	0.4	−0.40	−0.28	−0.75	−0.35
	2	−0.23	−0.64	−0.96	0.2	−1.88	−0.96	−2.26	−0.46
	3	−0.82	−1.40	−1.24	−0.2	−3.88	−1.24	−3.61	−0.64
	7	−3.24	−2.72	−1.22	−2.4	−7.42	−4.76	−8.10	n.a.
UNR[b]	1	0.70	0.04	0.24	0.2	0.36	0.16	0.38	n.a.
	2	0.88	0.12	0.46	0.4	0.82	0.78	0.38	
	3	0.78	0.12	0.34	0.6	0.92	1.40	0.37	
	7	0.14	0.02	−0.20	0.6	0.04	1.34	0.24	
IRS[b]	1	0	0	−0.04	0	0	0	0	0.00
	2	0	0	−0.06	0	0	0	0	−0.02
	3	0	0	−0.04	0	0	0	0	−0.02
	7	0	0	−0.08	0	0	0	0	n.a.
MONEYS	1	−0.71	−1.60	−0.66	−0.2	−1.32	−0.86	0.11	−1.27
	2	−1.56	−3.68	−0.82	−0.4	−2.68	−1.00	0.17	−2.01
	3	−2.18	−5.76	−0.52	−1.0	−3.32	0.06	−0.74	−2.20
	7	−2.70	−5.50	0.18	−3.0	−3.34	−4.44	−3.23	n.a.
CB[c]	1	4.71	1.40	4.34	8.84	0.88	n.a.	1.04	12.61
	2	6.72	1.95	4.70	11.06	0.83		1.09	31.45
	3	5.06	0.15	2.00	6.12	0.70		0.83	39.35
	7	−12.22	0.89	−2.32	13.10	0.89		0.45	n.a.
CAPFLO[c]	1	−4.71	−2.63	−4.34	−2.61	−0.88	−57	0.40	n.a.
	2	−6.72	−1.48	−4.70	−4.90	−0.83	−358	0.03	
	3	−5.06	−4.36	−2.00	−4.54	−0.70	−591	0.12	
	7	12.22	0.89	2.32	−9.87	−0.89	n.a.	1.08	
EXCH	1	0.13	1.42	0.16	1.4	3.58	1.18	2.25	n.a.
	2	1.39	7.20	0.30	3.2	4.86	9.18	3.73	
	3	3.06	10.40	0.32	4.2	6.90	7.88	4.88	
	7	6.42	7.48	0.10	7.6	6.68	7.22	9.80	

For notes see Table 2. Values shown are standardized to reflect multiplier properties for a 1 percentage point fiscal shock.

markedly, as the exchange rate acts as a strong transmission mechanism, with appreciation (depreciation) tending to decrease (increase) domestic inflation via tradeable goods prices.

The fourth simulation considers a decrease in real government expenditure, with floating exchange rates and *accommodating* monetary policy. Simulation results are reported for eight national models (Table 6). As in the earlier simulations under fixed rates, the negative response of GDP is more pronounced on account of higher ***ex post*** real interest rates.

EXCHANGE RATE CROWDING IN OR OUT?

Should the response of economic activity to a negative fiscal shock be greater under a fixed or under a floating exchange-rate regime? According to the Mundell-Fleming assignment theorem[11], with floating exchange rates and perfect capital mobility, fiscal policy with non-accommodating monetary policy has no permanent effect on national income levels, though monetary policy has. With fixed exchange rates the opposite conclusions hold. These results follow because a decrease in government expenditures induces an incipient decline in domestic interest rates. Under fixed exchange rates, however, this prompts a capital outflow which prevents domestic interest rates from falling, as the loss of reserves leads to an endogenous Contraction of money supply. Hence, the restrictive effects of a decrease in government expenditure is strengthened by an induced contraction of the domestic money stock and a tightening of credit conditions. Under a purely *floating* exchange-rate regime, the incipient capital outflows lead (in this model) to an exchange-rate depreciation. Thus, the effects of a decrease in government expenditure on real economic activity will be offset in time by an emergent surplus on current account following increased international competitiveness. This result can be called complete "exchange-rate crowding out" as it entails changes in net exports fully offsetting the activity effects of fiscal policy[12].

Table 7 compares the response of real GDP to a cut in government non-wage expenditure under alternative exchange-rate regimes. Contrary to the Mundell-Fleming theorem the models do not simulate exchange-rate crowding out in the short and medium run. Indeed, almost all national models show slightly larger effects on real GDP under floating exchange rates in the medium run[13]. By the seventh year, however, only the United States, Japanese and Dutch models have a stronger real GDP response under floating rates. In this example, the difference between third and seventh-year responses might come from the price effects generated by exchange-rate appreciation. In the medium run, the effects of restrictive policy are strengthened by lower net exports. These forces continue into the seventh year. But

Table 7. Response of real GDP to a government expenditure cut with non-accommodating monetary policy under alternative exchange rates[a]

			1st year		2nd year		3rd year		7th year	
United States	A	A/B	−1.39	98	−1.65	98	−0.88	126	−0.24	120
	B		−1.42		−1.07		−0.70		−0.20	
Japan	A	A/B	−1.46	111	−2.40	143	−2.88	173	−2.66	271
	B		−1.32		−1.68		−1.66		−0.98	
France 1	A	A/B	−1.4	100	−1.8	113	−2.0	125	−1.6	100
	B		−1.4		−1.6		−1.6		−1.6	
United Kingdom	A	A/B	−1.04	98	−1.16	98	−0.80	100	−0.22	61
	B		−1.06		−1.18		−0.80		−0.36	
Canada 1	A	A/B	−0.92	100	−0.66	100	−0.43	93	−0.20	77
	B		−0.92		−0.66		−0.46		−0.26	
Australia	A	A/B	−0.70	100	−1.36	119	−2.38	172	−0.76	83
	B		−0.70		−1.14		−1.38		−0.92	
Netherlands	A	A/B	−0.88	102	−0.77	103	−0.60	105	−0.10	200
	B		−0.86		−0.75		−0.57		−0.05	
New Zealand	A	A/B	−0.27	96	−0.30	97	−0.19	86	n.a.	
	B		−0.28		−0.31		−0.22			

a) Deviation from baseline as percentage of baseline. Values shown are standardised to reflect multiplier properties for a 1 percentage point fiscal shock.
Note: A = floating; B = fixed.

they may be offset by the influence of lower prices on private wealth and the influence of lower interest rates on interest-sensitive private expenditure, thereby weakening the impact of restrictive fiscal policy. Presumably this explains the seventh-year crowding-out effects found in the United Kingdom, Canadian and Australian models.

MONETARY SHOCKS UNDER FIXED EXCHANGE RATES

The third set of simulations covers two types of monetary shock. The first is a 1 percentage point increase in policy-controlled interest rates. The second is a 5 per cent decrease from baseline of total bank reserves or the money supply. The former shock is simulated by ten models, while the latter is performed for just two national models (Tables 8 and 9). Only the United States model simulated both shocks. Here, the basic impacts on key economic variables are quite similar, when the effect of a

Table **8. An increase in interest rates under fixed exchange rates'**

	Year	United States	Japan	France 1	France 2	United Kingdom	Belgium	Denmark	Finland	Netherlands	New Zealand
GDPV/GNPV	1	−0.11	−0.13	−0.1	−0.21	−0.08	0.09	0.0	−0.10	−0.02	−0.02
	2	−0.23	−0.24	−0.4	−0.36	−0.07	0.06	−0.1	−0.36	−0.05	−0.06
	3	−0.18	−0.27	−0.3	−0.46	−0.14	−0.01	−0.1	−0.48	−0.02	−0.13
	7	−0.17	−0.24	−0.2	−0.52	−0.14	n.a.	0.0	−0.21	−0.10	n.a.
PGDP/PGNP	1	0.00	−0.01	0.0	0.25	0.02	0.02	0	0.13	−0.00	−0.02
	2	−0.01	−0.03	0.0	0.44	0.11	0.05	0	0.28	−0.00	0.03
	3	−0.07	−0.04	−0.1	0.60	0.11	0.05	0	0.30	0.02	0.04
	7	−0.16	−0.05	0.0	0.55	0.27	n.a.	0	0.26	0.07	n.a.
UNR[b]	1	0.05	0.00	0.0	0	0.04	n.a.	0.1	0.00	0.00	n.a.
	2	0.12	0.01	0.1	0	0.03		0.6	0.02	0.01	
	3	0.08	0.01	0.0	0	0.11		0.8	0.05	−0.00	
	7	−0.05	0.00	0.1	0	0.08		0.2	0.02	−0.01	
IRS[b]	1	0.46	0.74	0.3	0.54	1.0	0.72	n.a.	1.0	0.23	0.06
	2	0.30	0.61	0.3	0.78	1.0	0.97		1.0	0.23	0.14
	3	0.29	0.50	0.2	0.92	1.0	1.07		1.0	0.23	0.22
	7	0.24	0.38	0.1	0.97	1.0	n.a.		1.0	0.19	n.a.
MONEYS	1	−0.46	−1.00	−0.4	−0.36	−0.87	n.a.	n.a.	0.29	0.15	−0.50
	2	−0.56	−2.37	−0.8	−0.79	−0.80			0.47	0.62	−0.35
	3	−0.54	−2.69	−1.0	−1.28	−0.30			0.68	0.41	−1.22
	7	−0.48	−1.80	−1.4	−4.04	0.70			1.15	0.24	n.a.
CB[c]	1	−0.07	0.20	1.30	2.01	0.05	−0.01	−0.7	0.02	0.01	0.24
	2	0.63	0.49	2.99	3.09	0.03	0.04	−1.1	0.06	−0.02	2.89
	3	0.70	0.66	3.20	3.42	0.06	0.08	−1.6	0.32	−0.23	5.21
	7	−0.94	0.55	2.46	2.60	0.14	n.a.	−0.6	0.29	−0.05	n.a.
CAPFLO[c]	1	0.07	4.24	2.75	0.39	−0.05	n.a.	n.a.	0.01	0.99	n.a.
	2	−0.63	4.16	0.52	0.20	−0.03			−0.05	−0.18	
	3	−0.70	6.68	−0.56	0.02	−0.06			−0.21	0.56	
	7	0.94	0.37	−0.28	−0.28	−0.14			−0.02	0.18	

For notes see **Table** 2.

Table 9. Reduction of money supply under fixed exchange rates[a]

	Year	United States	Australia
GDPV/GNPV	1	−0.67	−0.97
	2	−2.31	−3.26
	3	−1.79	−2.28
	7	−1.06	−3.13
PGDP/PGNP	1	0.00	0.75
	2	−0.02	−1.02
	3	−0.51	0.58
	7	−1.47	0.15
UNR[b]	1	0.27	0.10
	2	1.12	0.87
	3	0.85	0.82
	7	−0.66	0.57
IRS[b]	1	3.79	4.56
	2	2.77	−0.51
	3	2.70	3.78
	7	2.86	4.79
MONEYS	1	−3.13	−5.29
	2	−5.00	−4.43
	3	−5.00	−7.10
	7	−5.00	−5.37
CB[c]	1	−0.94	n.a.
	2	5.49	
	3	7.85	
	7	10.47	
CAPFLO[c]	1	0.94	−35
	2	−5.49	−252
	3	−7.85	−268
	7	−10.47	n.a.

For notes see Table 2.

drop in money supply on United States economic activity is normalized by changes in market-determined short-run interest rates.

First, as regards the impact of higher interest rates, the expected negative impact on real economic activity is generally observed. The exception is the Belgian model in the short run, but this anomaly is corrected in the medium run. A striking feature is the meagre influence of tighter monetary policy on inflation. There is a slight tendency for the price levels in the Japanese model to fall in response to higher interest rates, but in all other models there is little short or medium-run influence. In the United States model, a perceptible impact on inflation emerges only by the seventh year. Thus, a short-run trade-off between unemployment and inflation is found only in the Japanese model. For the United Kingdom and Finnish models there is a counter-intuitive combination of higher inflation and lower unemployment[14].

Table **10. An increase in interest rates under floating exchange rates"**

	Year	United States	Japan	Germany	France 1	United Kingdom	Canada 1	Canada 2	Netherlands	New Zealand
GDPV/GNPV	1	–0.15	–0.31	–0.13	–0.1	–0.15	–0.27	0.00	–0.12	–0.02
	2	–0.31	–0.73	–0.20	–0.5	–0.28	–0.53	–0.13	0.00	–0.06
	3	–0.24	–1.01	–0.21	–0.6	–0.49	–0.55	–0.25	–0.10	–0.14
	7	–0.02	–1.04	0.09	–0.3	0.20	–0.54	–0.42	–0.12	n.a.
PGDP/PGNP	1	–0.01	–0.08	–0.02	–0.0	–0.04	–0.12	–0.20	–0.47	–0.02
	2	–0.05	–0.35	–0.12	–0.0	–0.57	–0.49	–0.38	–1.30	0.01
	3	–0.14	–0.55	–0.24	–0.2	–1.07	–0.87	–0.43	–1.52	0.03
	7	–0.29	–0.76	–0.30	–1.5	–1.95	–3.11	–0.42	–2.31	n.a.
UNR[b]	1	0.06	0.01	0.02	0.0	0.06	0.09	0.02	0.04	n.a
	2	0.15	0.03	0.08	0.1	0.15	0.31	0.04	0.00	
	3	0.10	0.03	0.11	0.1	0.31	0.38	0.01	0.03	
	7	–0.14	0.01	–0.22	0.0	–0.15	0.21	–0.01	–0.04	
IRS[b]	1	0.44	0.74	0.81	0.3	1.00	1.00	1.00	0.16	0.06
	2	0.26	0.68	0.78	0.2	1.00	1.00	1.00	0.28	0.14
	3	0.22	0.72	0.72	0.1	1.00	1.00	1.00	0.25	0.22
	7	0.18	0.68	0.88	0.0	1.00	1.00	1.00	0.27	n.a.
MONEYS	1	–0.49	–1.27	0.12	–0.4	–1.14	–1.20	–1.21	–0.09	–0.52
	2	–0.61	–3.37	–0.25	–0.8	–1.22	–2.17	–1.68	0.17	–0.38
	3	–0.60	–4.58	–0.43	–1.1	–0.95	–3.30	–2.07	–0.17	–1.26
	7	–0.47	–4.51	0.51	–2.2	0.62	–6.75	–1.63	–0.94	n.a.
CB[c]	1	–0.17	0.07	0.48	1.84	0.23	–0.18	–0.38	–0.04	0.08
	2	0.26	–0.24	0.93	5.00	–0.03	–0.03	–0.86	–0.65	3.01
	3	0.13	–1.11	1.14	2.60	–0.07	–0.04	–1.01	–0.49	5.13
	7	–0.60	0.22	–2.21	0.91	–0.63	–0.34	–0.71	–0.71	n.a.
CAPFLO[c]	1	0.17	2.30	–0.48	1.46	–0.23	0.00	0.32	1.06	n.a.
	2	–0.26	1.78	–0.93	–1.72	0.03	–0.01	0.53	0.33	
	3	–0.13	3.03	–1.14	–2.23	0.07	–0.02	0.74	0.80	
	7	0.60	1.21	2.21	–2.91	0.63	–0.05	–0.77	0.73	
EXCH	1	0.38	1.77	0.62	0.5	2.13	0.85	0.81	2.42	n.a.
	2	0.36	3.56	0.95	1.6	2.49	1.65	1.27	1.77	
	3	0.46	4.25	0.98	2.2	3.51	2.18	1.12	2.35	
	7	0.25	3.45	0.94	2.6	2.24	4.25	0.92	2.93	

For notes see Tables 2 and 5.

As regards the balance of payments there is a clear improvement in both current and capital accounts in response to the deflationary impact on activity of higher interest rates and induced capital inflows. (Exceptions are the Danish and Dutch current accounts and that of the United States in the seventh year.) Over time, however, surpluses in the overall balance of payments result in increased domestic money creation and a consequent weakening of restrictive policy action. This transmission mechanism is excluded in the United States and United Kingdom models, due to the explicit assumption of complete domestic monetary sterilisation.

MONETARY SHOCKS UNDER FLOATING EXCHANGE RATES

Similar monetary shocks (an increase in interest rates **of 1** percentage point and a reduction in money supply) under floating rates were also simulated. The first is simulated by nine and the second by four models (Tables **10** and **11).** Both simulations are performed for two Canadian models. Comparing the effects under alternative exchange-rate regimes, there is a strong tendency for exchange rates to appreciate in response to tight monetary policy. This obviously strengthens the restrictive impact of monetary policy on economic activity. Further, the modest tendency for domestic inflation to fall is reinforced by yet more depressed domestic demand and an improvement in the terms of trade. In some country models there is a reversal (the United Kingdom and to a lesser extent Germany) or a negligible impact (the United States) of restrictive monetary policies on economic activity by the seventh year. There is also a concomitant seventh-year drop in the unemployment rate. These results arise from the wealth effects stemming from improved price stability. Under floating exchange rates, a trade-off between the rate of inflation and the unemployment rate is more likely than in the fixed exchange-rate simulation. But it persists into the seventh year only in the Japanese, France **1** and Canada **1** models. In other models, after three or more years of trade-off a situation emerges where both inflation and unemployment are improved.

The response of current accounts under floating exchange rates is more complicated owing to offsetting influences. Depressed national income tends to generate a current account surplus; however, the tendency for the exchange rate to appreciate works against this, although there can be complicated dynamics related to the J-curve effect. Different assumptions about official reserve intervention also cloud the picture, and no standard current account response to tight monetary policy emerges.

To illustrate the importance of alternative exchange-rate regimes to monetary shocks, Table **12** summarises the simulated impact on real GDP of tighter monetary

Table 11. Reduction in money supply under floating exchange rates[a]

	Year	United States	Canada 1	Canada 2	Australia
GDPV/GNPV	1	–0.85	–0.22	0.01	–0.98
	2	–2.74	–0.41	–0.12	–3.56
	3	–2.17	–0.13	–0.17	–4.36
	7	–0.80	–0.02	–0.29	–1.36
PGDP/PGNP	1	–0.06	–0.05	–0.21	0.74
	2	–0.31	–0.26	–0.43	–1.17
	3	–1.02	–0.42	–0.50	0.74
	7	–2.60	–0.69	–0.42	–0.81
UNR[b]	1	0.34	0.06	0.02	0.10
	2	1.31	0.24	0.06	0.98
	3	0.97	0.17	0.01	1.48
	7	–0.88	–0.03	0.02	0.31
IRS[b]	1	3.48	0.82	0.99	4.57
	2	2.13	0.35	0.53	0.29
	3	1.82	0.02	0.71	4.09
	7	1.90	0.09	0.81	7.62
MONEYS	1	–3.13	–0.71	–1.00	–5.28
	2	–5.00	–1.28	–1.00	–4.08
	3	–5.00	–0.99	–1.00	–8.59
	7	–5.00	–1.00	–1.00	–5.53
CB'	1	–1.46	–0.14	–0.40	n.a.
	2	2.42	0.14	–0.80	
	3	1.84	0.19	–1.06	
	7	–4.32	–1.01	–1.05	
CAPFLO[c]	1	1.46	–0.00	0.31	–42
	2	–2.42	–0.01	0.45	–543
	3	–1.84	–0.01	0.19	–943
	7	4.32	–0.01	–0.73	n.a.
EXCH	1	2.47	0.65	0.80	0.64
	2	3.32	0.99	1.42	14.02
	3	3.87	0.63	1.21	6.88
	7	3.53	0.75	0.97	17.43

For notes see Tables 2 and 5.

policy. The Mundell-Fleming result for monetary policy is supported by the simulation results of almost all national models in the first three years. As noted above, flexible exchange-rate movements tend to strengthen the restrictive impact of monetary policy on aggregate demand. Under fixed exchange rates, the restrictive effects of monetary policy tend to dissipate through capital inflows and compensatory increases in domestic money in the absence of complete sterilisation.

Table 12. Response of real GDP to tight monetary policy under alternative exchange rates"

			1st year		2nd year		3rd year		7th year	
United States[b]	A	A/B	–0.15	136	–0.31	135	–0.24	133	–0.02	12
	B		–0.1 1		–0.23		–0.18		–0.17	
United States[c]	A	A/B	–0.85	127	–2.74	119	–2.17	121	–0.80	75
	B		–0.67		–2.31		– 1.79		– 1.06	
Japan[b]	A	A/B	–0.31	238	–0.73	304	–1.01	374	–1.04	433
	B		–0.13		–0.24		–0.27		–0.24	
France 1[b]	A	A/B	–0.1	100	–0.5	125	–0.6	200	–0.3	150
	B		–0.1		–0.4		–0.3		–0.2	
United Kingdom[b]	A	A/B	–0.15	188	–0.28	400	–0.49	**350**	0.20	– 142
	B		– 0.08		–0.07		–0.14		–0.14	
Australia[c]	A	A/B	–0.98	101	–3.56	109	–4.36	191	– 1.36	43
	B		–0.97		–3.26		– 2.28		–3.13	
Netherlands[b]	A	A/B	–0.12	600	**0.00**	**0**	–0.10	67	–0.12	25
	B		**–0.02**		–0.05		–0.15		–0.48	
New Zealand[b]	A	A/B	–0.02	100	–0.06	100	–0.14	108	n.a.	
	B		–0.02		–0.06		–0.13			

a) Deviation from baseline as percentage of baseline.
b) An increase in policy-controlled interest rates.
c) A reduction of money supply.
Note: A = floating; B = fixed exchange rates.

NEUTRALITY OF MONEY

One definition of "money neutrality" is that, in the long run, a change in money supply[15] should have no effect on real activity, but only on the price level. Table 13 shows the simulated response of real GDP and the price level to a decrease in money supply, along with the elasticity of real GDP and the price level to changes in the money stock. Full neutrality of money would imply that the elasticities of money supply to real GDP and prices are zero and unity respectively. Full neutrality of money is not found under fixed exchange rates in any of the country models (left-hand side)[16]. Indeed, none of the models even show weak neutrality between the money stock and nominal GNP by the seventh year. Under floating exchange rates, the United States and the Canada 1 model simulate seventh-year elasticities of real GDP

Table **13. Neutrality of money**[a]

				Fixed exchange rates						Floating exchange rates					
				1st year		3rd year		7th year		1st year		3rd year		7th year	
United States	GDPV	A	A/C	–0.11	0.24	–0.18	0.33	–0.17	0.35	–0.15	0.31	–0.24	0.40	–0.02	0.04
	PGDP	B	B/C	0.00	0.00	–0.07	0.13	–0.16	0.33	–0.01	0.02	–0.14	0.23	–0.29	0.62
	MONEYS	C		–0.46		–0.54		–0.48		–0.49		–0.60		–0.47	
Japan	GDPV	A	A/C	–0.13	0.13	–0.27	0.10	–0.24	0.13	–0.31	0.24	–1.01	0.22	–1.04	0.23
	PGDP	B	B/C	–0.01	0.01	–0.04	0.01	–0.05	0.03	–0.08	0.06	–0.55	0.12	–0.76	0.17
	MONEYS	C		–1.00		–2.69		–1.80		–1.27		–4.58		–4.51	
Germany	GDPV	A	A/C	n.a.		n.a.		n.a.		–0.13	–1.08	–0.21	0.49	0.09	0.18
	PGDP	B	B/C							–0.02	–0.17	–0.24	0.56	–0.30	0.59
	MONEYS	C								0.12		–0.43		0.51	
France 1	GDPV	A	A/C	–0.1	0.25	–0.3	0.30	–0.2	0.14	–0.1	0.25	–0.6	0.55	–0.3	0.14
	PGDP	B	B/C	0.0	0.00	–0.1	0.10	0.0	0.00	–0.0	0.00	–0.2	0.18	–1.5	0.68
	MONEYS	C		–0.4		–1.0		–1.4		–0.4		–1.1		–2.2	
France 2	GDPV	A	A/C	–0.21	0.58	–0.46	0.36	–0.52	0.13	n.a.		n.a.		n.a.	
	PGDP	B	B/C	0.25	–0.69	0.60	–0.47	0.55	–0.14						
	MONEYS	C		–0.36		–1.28		–4.04							
United Kingdom	GDPV	A	A/C	–0.08	0.09	–0.14	0.47	–0.14	–0.20	–0.15	0.13	–0.49	0.52	0.20	0.32
	PGDP	B	B/C	0.02	–0.02	0.11	–0.37	0.27	0.39	–0.04	0.04	–1.07	1.13	–1.95	–3.15
	MONEYS	C		–0.87		–0.30		0.70		–1.14		–0.95		0.62	
Canada 1	GDPV	A	A/C	n.a.		n.a.		n.a.		–0.27	0.23	–0.55	0.17	–0.54	0.08
	PGDP	B	B/C							–0.12	0.10	–0.87	0.26	–3.11	0.46
	MONEYS	C								–1.20		–3.30		–6.75	
Canada 2	GDPV	A	A/C	n.a.		n.a.		n.a.		0.00	0.00	–0.25	0.12	–0.42	0.26
	PGDP	B	B/C							–0.20	0.17	–0.43	0.21	–0.42	0.26
	MONEYS	C								–1.21		–2.07		–1.63	
Australia[b]	GDPV	A	A/C	–0.97	0.18	–2.28	0.32	–3.13	0.58	–0.98	0.19	–4.36	0.51	–1.36	0.25
	PGDP	B	B/C	0.75	–0.14	0.58	–0.08	0.15	–0.03	0.74	–0.14	0.74	–0.09	–0.81	0.15
	MONEYS	C		–5.29		–7.10		–5.37		–5.28		–8.59		–5.53	
Finland	GDPV	A	A/C	–0.10	–0.34	–0.48	–0.71	–0.21	–0.18	n.a.		n.a.			
	PGDP	B	B/C	0.13	0.45	0.30	0.52	0.26	0.23						
	MONEYS	C		0.29		0.68		1.15						n.a.	
Netherlands	GDPV	A	A/C	–0.02	–0.13	–0.02	–0.05	–0.10	–0.42	–0.12	1.33	–0.10	0.59	–0.12	0.13
	PGDP	B	B/C	–0.00	0.00	0.02	0.05	0.07	0.29	–0.47	5.22	–1.52	8.94	–2.31	2.46
	MONEYS	C		0.15		0.41		0.24		–0.09		–0.17		–0.94	
New Zealand	GDPV	A	A/C	–0.02	0.04	–0.13	0.11	n.a.		–0.02	0.04	–0.14	0.11	n.a.	
	PGDP	B	B/C	–0.02	0.04	0.04	0.03			–0.02	0.04	0.03	–0.02		
	MONEYS	C		–0.50		–1.22				–0.52		–1.26			

a) Deviation from baseline as percentage of baseline.
b) An increase in policy-controlled interest rates and a *5* per cent reduction of money supply in the case of Australia.

Table **14. An increase in personal income tax under fixed exchange rates"**

	Year	United States	Japan	France 1	France 2	United Kingdom	Australia	Austria	Belgium	Denmark	Finland	Nether-lands	New Zealand	Norway
GDPV/GNPV	1	–1.11	–0.52	–0.2	–0.40	–0.50	–0.30	–0.4	–0.38	–0.50	–0.51	–0.48	–0.11	–0.58
	2	–0.95	–0.96	–0.6	–0.86	–0.78	–0.56	–0.6	–0.30	–0.75	–1.14	–0.53	–0.17	–0.58
	3	–0.28	–1.10	–0.8	–0.70	–0.98	–0.76	–0.6	–0.16	–1.00	–1.56	–0.35	–0.07	–0.56
	7	0.06	–0.48	–0.6	–0.78	–0.20	0.64	–0.4	n.a.	–0.25	–0.48	0.33	n.a.	–0.54
PGDP/PGNP	1	0.07	0.08	0	0.16	0.10	–0.50	0.0	–0.14	–0.00	–0.01	–0.20	–0.17	0
	2	–0.13	0.08	0	0.26	0.76	–1.80	0.0	–0.28	–0.00	–0.10	–0.48	–0.42	0
	3	–0.44	–0.16	0	–0.12	0.96	–2.66	–0.2	–0.30	0.00	–0.30	–0.69	–0.89	0
	7	–0.52	–1.06	0	–0.92	–2.36	–5.28	–0.4	n.a.	0.00	–0.96	–1.17	n.a.	0
UNR[b]	1	0.50	0.02	0.0	0	0.14	0.06	0.12	n.a.	3.25	0.04	0.19	n.a.	n.a.
	2	0.55	0.04	0.1	0	0.42	0.32	0.24		6.50	0.16	0.23		
	3	0.16	0.04	0.1	0	0.52	0.56	0.30		7.00	0.32	0.18		
	7	–0.04	–0.00	0.1	0	0.11	0.46	0.26		1.00	0.48	–0.01		
IRS[b]	1	–0.70	0.00	0	–0.01	–0.80	–1.52	n.a.	0.00	n.a.	–0.07	–0.05	–0.16	n.a.
	2	–0.95	–0.08	0	0.01	–1.18	–2.56		0.02		–0.35	–0.11	–0.77	
	3	–0.76	–0.18	0	0.02	–1.72	–2.74		0.06		–0.68	–0.16	–1.24	
	7	–0.52	–0.42	0	–0.02	–5.02	–3.20		n.a.		–1.62	–0.34	n.a.	
MONEYS	1	0	–0.50	–0.2	–0.76	–0.02	–0.86	n.a.	n.a.	n.a.	0.01	0.14	0.10	n.a.
	2	0	–0.54	–0.4	–0.92	–0.42	0.22				0.11	0.56	0.23	
	3	0	–0.48	–0.4	–1.18	–1.72	0.50				0.60	0.43	–0.07	
	7	0	0.22	–0.4	–1.88	–5.02	0.00				4.30	0.69	n.a.	
CB[c]	1	3.79	0.48	1.29	3.46	0.45	n.a.	1.95	–0.50	--6.50	0.06	1.13	4.91	1.33
	2	5.73	1.30	4.91	7.87	0.82		3.64	0.74	–9.25	0.16	1.96	12.80	1.51
	3	3.12	2.22	5.05	6.00	1.07		4.33	0.86	–10.75	0.91	2.10	15.36	1.55
	7	4.44	1.48	4.53	11.69	1.59		5.91	n.a.	–4.50	0.92	2.91	n.a.	1.96
CAPFLO[c]	1	–3.79	–0.61	0.28	0.65	–0.45	–4.54	n.a.	n.a.	n.a.	–0.07	–1.02	n.a.	n.a.
	2	–5.73	–1.79	–0.06	0.87	–0.82	–31.36				–0.16	–1.84		
	3	–3.12	–5.13	–1.46	–0.38	–1.07	–31.78				–0.86	–1.89		
	7	–4.44	–3.09	–0.08	–0.19	–1.59	n.a.				–1.09	–2.68		

For notes see Table **2.** Values shown are standardized to reflect multiplier properties for a **1** percentage point fiscal shock.

Table 15. An increase in personal income tax under floating exchange rates'

	Year	United States	Japan	France 1	United Kingdom	Canada 1	Canada 2	Australia	Netherlands	New Zealand
GDPVJGNPV	1	−1.09	−0.56	−0.2	−0.50	−0.59	−0.89	−0.54	−0.49	−0.10
	2	−1.91	−1.26	−0.8	−0.72	−0.76	−0.99	−0.72	−0.54	−0.17
	3	−0.42	−1.68	−1.0	−0.92	−0.56	−1.25	−1.54	−0.37	−0.05
	7	0.12	−2.16	−0.6	−0.10	−0.36	−0.86	0.72	**0.26**	n.a.
PGDP/PGNP	1	0.08	0.08	0.0	0.10	−0.03	0.03	−0.50	−0.26	−0.19
	2	−0.10	−0.08	0.0	0.86	−0.26	−0.20	−1.86	−0.68	−0.50
	3	−0.46	−0.48	0.0	1.26	−0.50	−0.53	−2.70	−1.09	−1.15
	7	−0.92	−2.28	−0.0	−0.84	−1.55	−2.05	−6.60	−2.21	n.a.
UNR[b]	1	0.48	0.02	0.0	0.14	0.20	0.40	0.06	0.19	n.a.
	2	0.53	0.06	0.2	0.40	0.43	0.43	0.38	0.23	
	3	0.22	0.04	0.2	0.48	0.36	0.56	0.80	0.19	
	7	−0.16	0.02	0.2	0.05	0.10	0.63	0.50	−0.00	
IRS[b]	1	−0.66	0.00	0.0	−0.74	−0.20	−0.59	−1.50	−0.06	−0.08
	2	−0.92	−0.10	0.0	−1.06	−0.73	−1.09	−2.20	−0.12	−0.81
	3	−0.92	−0.12	−0.2	−1.56	−0.63	−1.58	−2.84	−0.16	−1.37
	7	−0.86	−0.18	−0.2	−4.26	−0.69	−3.73	−3.54	−0.32	n.a.
MONEYS	1	0	−0.56	−0.4	0.00	−0.13	0.00	−0.82	0.11	0.10
	2	0	−1.02	−0.8	−0.40	−0.17	0.00	0.62	0.48	0.22
	3	0	−1.60	−1.0	−1.14	0.10	0.00	−0.90	0.30	−0.07
	7	0	−3.70	−1.4	−4.50	0.00	−0.00	−1.18	0.27	n.a.
CB[c]	1	3.86	0.47	1.54	0.40	1.22	1.56	n.a.	1.13	4.40
	2	6.08	0.89	6.09	0.83	2.90	2.07		1.88	11.34
	3	2.92	0.82	5.31	1.08	3.47	2.95		1.98	10.89
	7	−1.56	0.03	3.42	2.12	6.34	5.56		2.60	n.a.
CAPFLO[c]	1	−3.86	−1.09	−0.32	−0.40	0.00	0.28	−12.6	−1.01	n.a.
	2	−6.08	−1.74	−2.49	−0.83	0.00	0.33	−165.9	−1.77	
	3	−2.92	−4.55	−3.77	−1.08	−0.03	0.32	−259.8	−1.78	
	7	1.56	−2.30	−3.96	−2.12	−0.03	−0.08	n.a.	−2.39	
EXCH	1	−0.34	0.46	0.2	−0.52	0.03	0.59	0.6	0.27	n.a.
	2	0.24	2.48	1.2	−0.64	−0.20	0.73	5.6	0.49	
	3	1.28	3.80	2.2	−0.62	−0.23	0.99	3.7	0.84	
	7	1.14	5.40	2.8	−2.32	0.79	1.58	2.9	1.55	

For notes see Tables 2 and 5. Values shown are standardized to reflect multiplier properties for a 1 percentage point fiscal shock.

Table **16. The response of interest rates to a decrease in government expenditure (A) and a tax increase (B)[a]**

		Fixed exchange rates				Floating exchange rates			
		1st year	2nd year	3rd year	7th year	1st year	2nd year	3rd year	7th year
United States	A	−0.80	−0.89	−0.92	−0.82	−0.76	−0.90	−1.16	−1.50
	B	−0.70	−0.95	−0.76	−0.52	−0.66	−0.92	−0.92	−0.86
Japan	A	−0.04	−0.26	−0.36	−0.60	−0.08	−0.32	−0.22	−0.22
	B	−0.00	−0.08	−0.18	−0.42	0.00	−0.10	−0.12	−0.18
France 1	A	−0.00	−0.20	−0.20	−0.40	−0.20	−0.40	−0.40	−0.60
	B	0.00	0.00	0.00	0.00	0.00	0.00	−0.20	−0.20
France 2	A	−0.05	−0.04	0.03	−0.02	n.a.	n.a.	n.a.	n.a.
	B	−0.01	0.01	0.02	−0.02				
United Kingdom	A	−0.96	−1.46	−1.78	−3.64	−0.92	−1.38	−1.72	−3.46
	B	−0.80	−1.18	−1.72	−5.02	−0.74	−1.06	−1.56	−4.26
Canada 1	A	n.a.	n.a.	n.a.	n.a.	−0.33	−0.86	−0.59	−0.59
	B					−0.20	−0.73	−0.63	−0.69
Canada 2	A	n.a.	n.a.	n.a.	n.a.	−0.56	−0.79	−0.99	−2.48
	B					−0.59	−1.09	−1.58	−3.73
Australia	A	−0.78	−0.68	−1.02	−1.12	−0.74	−0.16	−1.28	−1.78
	B	−1.52	−2.56	−2.74	−3.20	−1.50	−2.20	−2.84	−3.54
Finland	A	0.57	−0.59	−0.94	−1.64	n.a.	n.a.	n.a.	n.a.
	B	−0.07	−0.35	−0.68	−1.62				
Netherlands	A	−0.06	−0.11	−0.14	−0.28	−0.07	−0.12	−0.13	−0.27
	B	−0.05	−0.11	−0.16	−0.34	−0.06	−0.12	−0.16	−0.32
New Zealand	A	−0.13	−0.55	−0.83	n.a.	−0.14	−0.59	−0.94	n.a.
	B	−0.16	−0.77	−1.24		−0.08	−0.81	−1.37	

o) Deviation from baseline in percentage points. Values shown are standardized to reflect multiplier properties for a 1 percentage point fiscal shock.

Table 17. **An increase in oil prices under fixed exchange rates'**

	Year	United States	France 1	France 2	Austria	Denmark	Finland	Netherlands	New Zealand	Norway
GDPV/GNPV	1	−0.11	−0.1	−0.42	−0.10	−0.3	0.01	−0.04	−0.05	−0.05
	2	−0.27	−0.2	−0.62	−0.20	−0.6	−0.16	−0.20	−0.09	−0.05
	3	−0.33	−0.3	−0.45	−0.30	−0.6	−0.26	−0.26	−0.09	−0.05
	7	−0.06	−0.8	−0.75	−0.50	−1.2	−0.66	−0.49	n.a.	−0.04
PGDP/PGNP	1	0.15	−0.2	0.09	0.20	−0.1	−0.17	−0.01	0.09	1.30
	2	0.28	0.2	0.27	0.40	0.1	−0.18	0.38	0.18	1.19
	3	0.29	0.5	−0.04	0.40	0.1	−0.14	0.52	0.16	1.17
	7	−0.15	1.4	−0.50	0.50	0.2	−0.42	0.87	n.a.	1.08
UNR[b]	1	0.06	0.0	0	0.02	1.9	−0.01	0.04	n.a.	n.a.
	2	0.18	0.0	0	0.06	4.4	−0.01	0.10		
	3	0.26	0.1	0	0.10	5.0	0.01	0.12		
	7	0.00	0.2	0	0.23	7.0	0.12	0.28		
IRS[b]	1	0.23	0.1	0.00	n.a.	n.a.	1.18	0.01	0.01	n.a.
	2	0.18	0.2	−0.00			−0.06	0.00	−0.07	
	3	0.09	0.1	0.01			−0.82	−0.01	−0.16	
	7	−0.16	0.1	0.10			0.21	−0.03	n.a.	
MONEYS	1	0	−0.2	0.00	n.a.	n.a.	−0.40	−0.06	0.05	n.a.
	2	0	−0.1	0.07			−0.92	0.10	0.11	
	3	0	0.1	−0.17			−1.02	0.11	−0.04	
	7	0	**0.5**	−0.95			**−1.44**	0.04	n.a.	
CB[c]	1	−1.53	−6.37	−3.56	−1.76	6.7	−0.09	−0.32	−6.68	4.10
	2	−1.87	−4.92	−3.24	−1.84	6.6	−0.01	0.44	−9.26	4.41
	3	−1.61	−3.98	−5.34	−1.62	7.2	0.06	0.43	−8.69	4.65
	7	−3.44	−11.69	−11.98	−3.53	10.4	0.40	0.84	n.a.	5.84
CAPFLO[c]	1	1.53	0.27	−0.42	n.a.	n.a.	0.08	0.27	n.a.	n.a.
	2	1.87	1.24	0.17			0.04	−0.40		
	3	1.61	0.70	−0.39			−0.12	−0.40		
	7	3.44	2.53	−0.71			−0.17	−0.79		

For notes see Table 2.

approaching zero; however, the elasticities of prices are significantly less than one (right-hand side). In other national models, the elasticities of prices and real GDP show astonishing diversity, largely reflecting institutional factors. However, there is little evidence of the neutrality properties of money in any of these simulations.

INCREASED PERSONAL INCOME TAX

The policy change considered here is an increase in personal income tax equal to **0.5** per cent of GDP in **1976,** held constant throughout the simulation period[17]. Results for thirteen models under fixed exchange rates (Table **14)** and nine under floating rates (Table **15)** are reported. As might be expected the short-run results give qualitatively similar effects to the simulated cut in government expenditure (cf. Table 2). As regards real economic activity, the response to higher taxation is somewhat slower and weaker, largely reflecting the short-run cushioning role of savings out of lower net incomes[18]. In many national models the decline in interest rates is more pronounced than in the simulation concerning cuts in government expenditure (Table **16).** This results from an improvement in government financial balances between the two simulations. Initially, a cut in government expenditure or a tax increase of equal size has the same impact on government finances. However, the less pronounced decline in GDP in response to a tax increase results in a greater improvement in government finances, assuming that tax revenues decline in proportion to decreased national income. This largely explains the greater tendency for interest rates to fall.

Comparing the results of a tax increase with flexible exchange rates (Table **15),** the same patterns emerge as those concerning a cut in government expenditure (cf. Table **5).** As a consequence earlier observations concerning the efficacy of fiscal policy and exchange-rate crowding out are equally relevant here. As noted earlier, in many national models, a simulated appreciation of the exchange-rate increases the response of real GDP to a negative fiscal shock.

AN INCREASE IN OIL PRICES

The last set of simulations considers the effects of shifts in prices of inputs into the production process. The first shock simulates an increase in oil import prices of **10** per cent. Results for nine models under fixed exchange rates and four national models under floating rates are reported in Tables **17** and **18.** Under fixed exchange

Table 18. **An increase in oil prices under floating exchange rates"**

	Year	United States	France 1	Netherlands	New Zealand
GDPV/GNPV	1	−0.08	−0.0	−0.04	−0.06
	2	−0.19	0.0	−0.20	−0.11
	3	−0.25	0.0	−0.26	−0.14
	7	−0.04	−0.5	−0.50	n.a.
PGDP/PGNP	1	0.16	−0.3	0.01	0.15
	2	0.32	0.3	0.43	0.34
	3	0.38	0.8	0.53	0.46
	7	0.03	3.0	0.83	n.a.
UNR[b]	1	0.05	0.0	0.04	n.a.
	2	0.15	*0.0*	0.10	
	3	0.23	*0.0*	0.12	
	7	0.02	0.1	0.28	
IRS[b]	1	0.27	0.1	0.02	0.03
	2	0.29	0.3	−0.00	0.04
	3	0.25	0.3	−0.10	0.07
	7	0.03	0.3	−0.03	n.a.
MONEYS	1	*0*	−0.2	−0.05	0.05
	2	*0*	0.0	0.11	0.11
	3	*0*	0.3	0.12	−0.04
	7	*0*	1.5	0.04	n.a.
CB[c]	1	−1.47	−7.84	−0.31	−5.28
	2	−1.43	−6.02	0.47	−7.57
	3	−0.57	−3.35	0.43	−5.15
	7	−0.58	−12.51	0.82	n.a.
CAPFLO[c]	1	1.47	2.73	0.27	n.a.
	2	1.43	3.01	−0.42	
	3	0.57	3.01	−0.39	
	7	0.58	10.22	−0.78	
EXCH	1	−0.34	−1.3	−0.10	n.a.
	2	−0.65	−1.9	−0.01	
	3	−0.63	−2.4	0.05	
	7	−0.63	−4.4	0.11	

For notes see Table 2.

rates, there is a clear tendency towards stagflation with falling real GDP and rising inflation. In the first year the France 1, Danish and Finnish models generate a drop in the price level. In the Finnish model, unemployment falls during the first two years, but increases in the seventh year. Other national models simulate a more intuitively plausible tendency for a decline in real GDP and rising unemployment. There is a tendency for current accounts to deteriorate, with the notable exceptions of countries with large exports of energy. This simulation generally illustrates the proposition that an imported factor-price shock is one cause of simultaneously rising

inflation and unemployment. While this conclusion is robust, the partial nature of these simulation results is worth noting. The effect on competitor countries' incomes and prices and the largely opposite effects on the income of oil exporters and the overall effects on world demand are not, of course, captured in the single-country model results reported here'[9].

The increase in import prices, larger current account deficits[20] and rising inflation in the national simulations, generate a clear tendency towards rising interest rates. The response of money supply varies markedly between countries. In general, an induced capital inflow is insufficient to offset the current account deficit (except in the United States by assumption). Shifts in overall balance, therefore, generate decreases in base money and yet higher interest rates in some national models.

Under floating exchange rates only a small deflationary impact on real GDP is found for the four national models making this simulation. This result stems from the currency depreciation accompanying a deficit in the current account, and induced improvement in net exports. As a consequence, under floating exchange rates the deflationary impact of higher oil import prices is partly insulated by exchange-rate movements[21]. This holds only with respect to real GDP. All other economic variables tend to respond in the same direction as in the fixed rate simulation[22].

WAGE REDUCTION

The last simulation considers an exogenous one-time 2 percentage point decrease in the growth rate of basic wage rates. This shock is performed on thirteen models under fixed exchange rates and eight under floating exchange rates (Tables **19** and 20). Given differing wage shares in national income, marked disparity in real wage rigidity and widely varying propensities to spend out of non-wage incomes, the impact on real GDP varies considerably across countries. In many country models (the United States, France 2, the United Kingdom, Denmark, Finland and New Zealand) an improvement in international competitiveness, higher profits and lower interest rates provide sufficient stimulus to final demand to offset the fall in private consumption resulting from falling real wage incomes, even in the short run. The France **1,** Austrian and Norwegian models simulate opposite results. By the seventh year, the United States, France **1,** Dutch and Australian models simulate a sign reversal on real GDP. The long-run results for the United States and France **1** seem more intuitively reasonable than those for the shorter-run and in general it is difficult to make sense of a cross-country comparison. In view of the United States and the United Kingdom results, for example, the Norwegian result appears inexplicable in the absence of a detailed examination of underlying model structures[23].

Table **19. A decrease in wage rates under fixed exchange rates'**

	Year	United States	Japan	France 1	France 2	United Kingdom	Australia	Austria	Belgium	Denmark	Finland	Nether-lands	New Zeeland	Norway
GDPV/GNPV	1	0.20	−0.02	−0.5	0.35	0.07	−0.01	−0.2	0.09	0.2	0.09	−0.05	0.02	−0.14
	2	0.85	0.03	−0.8	0.28	0.37	0.05	−0.0	0.18	0.4	0.07	−0.03	0.04	−0.14
	3	1.65	0.06	−0.4	0.29	0.59	0.39	0.1	0.14	0.5	0.25	0.15	0.03	−0.14
	7	−0.64	0.10	0.1	0.23	0.52	1.25	0.3	n.a.	0.4	0.24	0.54	n.a.	−0.15
PGDPIPGNP	1	−1.06	−0.11	−0.3	−1.08	−0.84	−0.17	−1.1	−0.15	−1.2	−0.87	−1.20	−0.20	−0.58
	2	−2.36	−0.16	−0.8	−1.71	−1.28	−0.57	−1.6	−0.24	−1.4	−0.94	−1.58	−0.03	−0.59
	3	−2.80	−0.16	−1.1	−1.86	−1.30	−0.94	−1.7	−0.20	−1.4	−0.73	−1.71	0.00	−0.59
	7	0.85	−0.17	−1.7	−1.62	−1.37	−1.68	−1.6	n.a.	−1.3	0.18	−1.49	n.a.	−0.57
UNR[b]	1	−0.26	0.00	0.0	−0.01	−0.09	−0.02	0.06	n.a.	−2.1	−0.04	−0.07	n.a.	n.a
	2	−0.97	0.00	0.1	0.00	−0.20	−0.07	0.03		−4.9	−0.06	−0.15		
	3	−1.77	−0.01	0.0	0.00	−0.36	−0.20	−0.10		−5.7	−0.08	−0.27		
	7	0.61	0.00	−0.2	−0.01	−0.36	**−0.56**	−0.13		−3.6	−0.28	**−0.54**		
IRS[b]	1	−1.10	−0.02	−0.1	0.01	−0.50	0.00	n.a.	0.00	n.a.	0.79	−0.01	0.00	n.a.
	2	−1.57	−0.01	−0.3	0.04	−0.42	−0.05		0.03		−0.21	−0.03	−0.01	
	3	−1.28	0.00	−0.2	0.02	−0.38	−0.19		0.03		−0.83	−0.05	0.00	
	7	0.57	0.01	−0.1	−0.04	−1.21	−0.75		n.a.		0.14	−0.12	n.a.	
MONEYS	1	0	−0.11	−04	1.17	0.11	0.00	n.a.	n.a.	n.a.	−0.27	−0.16	0.05	n.a.
	2	0	−0.11	−1.0	1.55	0.03	−0.25				−0.63	0.00	0.11	
	3	0	−0.10	−1.0	1.86	0.04	**−0.50**				−0.30	−0.06	−0.04	
	7	0	−0.02	−0.9	1.80	−0.94	0.00				**0.06**	**−0.14**	n.a.	
CB[c]	1	0.30	0.02	3.94	1.76	−59	n.a.	2.05	0.14	0.2	0.02	0.18	2.09	0.31
	2	0.74	−0.01	6.41	0.52	−143		2.46	0.12	−1.7	0.05	0.67	1.71	0.34
	3	0.05	−0.03	2.75	1.19	−182		2.53	0.14	−3.1	0.08	0.77	−0.85	0.38
	7	6.14	0.05	4.27	5.45	147		2.82	n.a.	−3.6	−0.02	0.64	n.a.	0.51
CAPFLO[c]	1	−0.30	−0.28	−0.12	3.14	59	−1	n.a.	n.a.	n.a.	**−0.04**	−0.14	n.a.	n.a.
	2	−0.74	0.06	−2.69	0.44	143	−8				−0.01	−0.67		
	3	−0.05	0.18	−1.94	0.19	182	**−13**				−0.12	−0.67		
	7	−6.14	0.01	−0.66	0.19	−147	n.a.				**−0.01**	−0.65		

For notes see Table 2.

Table **20. A decrease in wage rates under floating exchange rates**[a]

	Year	United States	Japan	France 1	United Kingdom	Canada 1	Australia	Netherlands	New Zealand
GDPV/GNPV	1	0.13	–0.02	–0.6	0.07	–0.79	–0.01	–0.06	–0.02
	2	0.59	0.03	–0.9	0.38	–0.74	0.03	–0.03	0.04
	3	1.38	0.06	–0.5	0.61	–0.94	0.34	0.14	0.04
	7	–0.57	0.13	0.3	0.60	–1.31	1.60	0.51	n.a.
PGDP/PGNP	1	–1.08	–0.11	–0.3	–0.84	–0.82	–0.17	–1.22	–0.22
	2	–2.49	–0.15	–0.8	–1.25	–1.12	–0.57	–1.63	–0.07
	3	–3.10	–0.15	–1.2	–1.28	–1.28	–0.94	–1.82	–0.06
	7	1.24	–0.09	–1.9	–1.24	–1.45	–1.59	–1.97	n.a.
UNR[b]	1	–0.24	**0.00**	0.0	–0.10	–0.10	–0.02	–0.07	n.a.
	2	–0.86	**0.00**	0.1	–0.21	–0.35	–0.06	–0.15	
	3	–1.67	**0.00**	0.1	–0.37	–0.45	–0.18	–0.27	
	7	0.63	**0.00**	–0.1	–0.41	–0.19	–0.67	–0.53	
IRS[b]	1	–1.20	–0.02	–0.1	–0.49	–0.68	0.00	–0.01	–0.01
	2	–1.90	–0.01	–0.3	–0.41	–0.84	–0.02	–0.03	–0.04
	3	–1.76	–0.01	–0.3	–0.37	–0.44	–0.24	–0.05	–0.06
	7	1.17	0.01	–0.1	–1.15	–0.45	–0.69	–0.11	n.a.
MONEYS	1	0	–0.10	–0.4	0.11	–0.37	0.00	–0.17	0.05
	2	0	–0.09	–1.0	0.04	0.14	–0.01	–0.02	0.10
	3	0	–0.08	–1.0	0.05	0.09	–0.10	–0.09	–0.04
	7	0	0.06	–1.1	–0.93	0.00	–0.03	–0.31	n.a.
CB[c]	1	0.10	0.02	4.85	–69	0.66	n.a.	0.17	1.54
	2	–0.50	0.00	7.12	–138	0.73		0.64	1.43
	3	–3.01	–0.04	0.89	–170	0.41		0.74	–1.44
	7	10.87	–0.02	3.31	214	1.57		0.49	n.a.
CAPFLO[c]	1	–0.10	–0.17	–1.83	69	n.a.	–0	–0.13	n.a.
	2	0.56	0.16	–4.56	138		–8	–0.65	
	3	3.01	0.22	–1.92	170		20	–0.65	
	7	–10.87	–0.30	–1.57	–214		n.a.	–0.51	
EXCH	1	0.88	0.06	0.7	–0.12	–0.26	0.06	0.10	n.a.
	2	2.23	0.02	1.8	–0.10	–0.45	0.50	0.10	
	3	1.74	–0.04	1.5	–0.07	0.02	–0.46	0.26	
	7	–1.82	0.05	0.9	–0.63	0.73	–1.84	0.61	

For notes see Table 2.

There is a distinct and marked tendency for prices to fall in response to wage cuts in all models. In general, it is difficult to find full wage/price homogeneity, even by the seventh year, as might be expected under adaptive expectations. Given the positive GNP response simulated for some countries, many of these models also generate falling unemployment. The Japanese and French models, however, show little employment response to changes in factor prices.

The decline in national income and lower inflation generates a clear drop in interest rates in most models. The effects on money supply are more complicated, the outcome depending on the net influences of lower interest rates and national income in money demand and supply functions. In some country models, falling GDP (and improved competitiveness) lead to a current-account surplus (France 1, Austria, the Netherlands and Norway). In other models, the increase in imports accompanying higher GDP offsets the favourable movement in competitiveness and exports that largely brought about the GDP expansion.

As regards the impact of wage cuts under floating exchange rates, the models for which comparisons are possible illustrate quite similar developments in terms of real GDP, inflation and unemployment. Movements in exchange rates are largely dominated by current account developments which seem chiefly to respond to changes in total absorption, as GDP alters much as in the fixed-exchange-rate case, rather than to relative-price or competitiveness effects. Thus, wage cuts leading to increases in GDP bring about depreciation in the United Kingdom and falls in GDP result in appreciation in France 1. Capital flows generally play a secondary role. The exception is the United States where, despite a short-run current account deficit, an appreciation of the exchange rate is simulated. In most national models (except the United States) exchange-rate movements reinforce the response of real GDP to wage cuts.

SUMMARY AND CONCLUSIONS

This paper summarises the simulation properties of sixteen economic models in active use in the national administrations of fourteen countries. From the wide menu of unlinked simulations to alternative policy shocks and exchange-rate regimes, a number of key model properties can be discerned. Firstly, at the risk of over-simplification, the main behavioural properties in these models are eclectic-Keynesian in inspiration. The monetary transmission mechanisms and associated expectations processes appear to be relatively simple and are not dominating. Principal model characteristics can be identified under five broad headings.

i) *Crowding out:* The majority of national models show comparatively weak crowding out in the short and medium run in response to fiscal

policy. By the seventh year, a number of models simulate relatively strong but not full crowding-out effects. Fiscal policy shocks generally are simulated to affect real economic activity beyond the medium run for the cases studied here.

ii) *Inflation-unemployment trade-off:* Depending on the policy shock simulated, a short-run trade-off appears, especially under floating rates. In a few cases a trade-off is simulated into the seventh year.

iii) *Neutrality of money:* This feature is not found in any of the national model simulations. Changes in money supply are simulated to affect real economic activity and not only prices, even beyond the medium run, as postulated under strict money neutrality. Indeed, none of the models even has weak form neutrality – a unitary elasticity of nominal GNP with respect to money supply – under fixed or especially under floating exchange rates.

iv) *Relative efficiency of monetary and fiscal policies:* According to the Mundell-Fleming assignment theorem, under fixed exchange rates, fiscal policy (with non-accommodating monetary policy) can influence national income levels, but monetary policy cannot. By contrast, under floating exchange rates, monetary policy can influence national income levels, but fiscal policy with non-accommodating monetary policy does not. (These conclusions, of course, depend on "small country" assumptions with respect to international capital markets, which do not appear too inappropriate a premise for many countries.) Table 21 summarises real GDP responses to fiscal and monetary shocks under alternative exchange-rate regimes. The main implication arising from a comparison of simulations is that the simple'assignment theorem is not supported in the case of fiscal policy. Fiscal policy affects real GDP in these models under both exchange-rate regimes: there is little sign of exchange-rate crowding-out effects under floating rates. In other words, capital flows do not in general offset simulated developments on current account. On the other hand, the simulations of monetary policy do support this theorem. Monetary policy, under floating rates, has powerful effects on both output and prices, but relatively weak effects under fixed rates. The effect on prices, in particular, in the latter case is often nugatory.

v) *Price/output split:* Table 22 summarises the split of nominal GNP (equal to 100) into output and prices to alternative policy shocks. A general observation is that the response of prices to fiscal and monetary policy shocks is quite slow compared to that of real output. The sluggish nature of the inflation response appears to reflect backward-looking or adaptive expectations assumed in wage/price behaviour. This appears to

Table 21. **Comparison of real GDP response to alternative policy shocks**[a]

	Shocks	Fixed exchange rates			Floating exchange rates		
		1st year	3rd year	7th year	1st year	3rd year	7th year
United States	Fiscal	–0.71	–0.35	–0.10	–0.70	–0.44	–0.12
	Monetary 1	–0.11	–0.18	–0.17	–0.15	–0.24	–0.02
	Monetary 2	–0.67	–1.79	–1.06	–0.85	–2.17	–0.80
Japan	Fiscal	–0.66	–0.83	–0.49	–0.73	–1.44	–1.33
	Monetary 1	–0.13	–0.27	–0.24	–0.31	–1.01	–1.04
France 1	Fiscal	–0.7	–0.8	–0.8	–0.7	–1.0	–0.8
	Monetary 1	–0.1	–0.3	–0.2	–0.1	–0.6	–0.3
United Kingdom	Fiscal	–0.53	–0.40	–0.18	–0.52	–0.40	–0.1 1
	Monetary 1	–0.08	–0.14	–0.14	–0.15	–0.49	0.20
Australia	Fiscal	–0.35	–0.69	–0.46	–0.35	–1.19	–0.38
	Monetary 2	–0.97	–2.28	–3.13	–0.98	–4.36	–1.36
Netherlands	Fiscal	–0.43	–0.29	–0.03	–0.44	–0.30	–0.05
	Monetary 1	–0.02	–0.02	–0.10	–0.12	–0.10	–0.12
New Zealand	Fiscal	–0.14	–0.11	n.a.	–0.14	–0.09	n.a.
	Monetary 1	–0.02	–0.13		–0.02	–0.14	

Comparison of price response to alternative policy shocks[a]

United States	Fiscal	0.04	–0.25	–0.41	0.04	–0.27	–0.73
	Monetary 1	0.00	–0.07	–0.16	–0.01	–0.14	–0.29
	Monetary 2	0.00	–0.51	–1.47	–0.06	–1.02	–2.60
Japan	Fiscal	0.03	–0.21	–0.63	0.01	–0.59	–1.39
	Monetary 1	–0.01	–0.04	–0.05	–0.08	–0.55	–0.76
France 1	Fiscal	0.1	0.0	–0.3	0.1	–0.2	–1.2
	Monetary 1	0.0	–0.1	0.0	–0.0	–0.2	–1.5
United Kingdom	Fiscal	–0.16	–0.84	–1.27	–0.15	–0.79	–1.07
	Monetary 1	0.02	0.11	0.27	–0.04	–1.07	–1.95
Australia	Fiscal	–0.19	–0.61	–1.37	–0.20	–0.66	–2.07
	Monetary 2	0.75	0.58	0.15	0.74	0.74	–0.81
Netherlands	Fiscal	–0.16	–0.44	–0.75	–0.18	–0.66	–1.21
	Monetary 1	–0.00	0.02	0.07	–0.47	–1.52	–2.31
New Zealand	Fiscal	–0.14	–0.31	n.a.	–0.15	–0.40	n.a.
	Monetary 1	–0.02	0.04		–0.02	0.03	

a) Deviation from baseline as per cent of baseline.
Note: Fiscal shock is a decrease in government expenditure equal to 0.5 per cent of real GDP. Monetary shock 1 is an increase in interest rates. Monetary shock 2 is a reduction of money supply.

Table 22. **Nominal GDP split into output and prices**

	Shocks		Fixed exchange rates			Floating exchange rates		
			1st year	3rd year	7th year	1st year	3rd year	7th year
United States	**Fiscal**	GDPV	106	58	20	106	62	14
		PGDP	−6	42	80	−6	38	86
		GDP	100	100	100	100	100	100
	Monetary 1	GDPV	100	72	52	94	63	6
		PGDP	0	28	48	6	37	94
		GDP	100	100	100	100	100	100
	Monetary 2	GDPV	100	78	42	93	68	24
		PGDP	0	22	58	7	32	76
		GDP	100	100	100	100	100	100
Japan	**Fiscal**	GDPV	105	80	44	101	71	49
		PGDP	−5	20	56	−1	29	51
		GDP	100	100	100	100	100	100
	Monetary 1	GDPV	93	87	83	79	65	58
		PGDP	7	13	17	21	35	42
		GDP	100	100	100	100	100	100
France 1	**Fiscal**	GDPV	116	100	73	116	83	40
		PGDP	−16	0	27	−16	17	60
		GDP	100	100	100	100	100	100
	Monetary 1	GDPV	100	75	100	100	75	17
		PGDP	0	25	0	0	25	83
		GDP	100	100	100	100	100	100
United Kingdom	**Fiscal**	GDPV	77	32	12	78	34	9
		PGDP	23	68	88	22	66	91
		GDP	100	100	100	100	100	100
	Monetary 1	GDPV	133	467	108	79	31	−11
		PGDP	−33	−367	−208	21	69	111
		GDP	100	100	−100	100	100	100
Australia	**Fiscal**	GDPV	65	53	25	64	64	16
		PGDP	35	47	75	36	36	84
		GDP	100	100	100	100	100	100
	Monetary 2	GDPV	441	134	105	408	120	63
		PGDP	−341	−34	−5	−308	−20	37
		GDP	100	100	100	100	100	100
Netherlands	**Fiscal**	GDPV	73	40	4	71	31	4
		PGDP	27	60	96	29	69	96
		GDP	100	100	100	100	100	100
	Monetary 1	GDPV	100	n.a.	333	20	6	5
		PGDP	0		−233	80	94	95
		GDP	100		100	100	100	100
New Zealand	**Fiscal**	GDPV	50	26	n.a.	48	18	n.a.
		PGDP	50	74		52	82	
		GDP	100	100		100	100	
	Monetary 1	GDPV	50	144	n.a.	50	127	n.a.
		PGDP	50	−44		50	−27	
		GDP	100	100		100	100	

For notes see Table 21.

be borne out when the substantially quicker inflation response simulated by factor price shocks are compared. It is difficult to find full wage/price homogeneity, even by the seventh year, as might be expected under adaptive expectations.

Despite these generalisations, the structures of national economic models show considerable differences, often reflecting differences in the economies themselves or in their financial and/or policy institutions. While most models remain broadly income/expenditure systems of a fundamentally Keynesian inspiration, few other generalisations about their behavioural characteristics suggest themselves. However, few embody fully-specified stock or wealth effects in expenditure functions. And none seems to embody the latest theoretical thinking on expectations or supply-side effects.

Considerations such as these may serve to limit the contribution that economic models can make to policy analysis at the present time. National economic models surveyed sometimes embody few of the long-run economic properties implicit in the current approach to policy in a number *of* countries. In part, the present state *of* the model-building art reflects shortcomings and controversy with respect to the competing economic theories being tested. Further, structural shifts and data limitations make their quantification or even corroboration difficult. The paramount role of expectations is a specific case in point. On the other hand, all *of* the economic models reviewed here are in a continual state *of* development and evolution. In a number of cases, modifications are being experimented with or have already been introduced, embodying new economic hypotheses, more sophisticated channels of transmission and analytical frameworks consistent with more recent data and experience. Finally, the integration of desirable economic properties into a full model framework is often complicated. In some cases, because of the difficulties *of* identifying structural relations or transmission channels, theoretically appropriate reduced form or block-specific properties may not be maintained in full structural models.

ANNEX

QUESTIONNAIRE FOR STANDARDIZED SIMULATIONS

I. General Considerations and Assumptions

a) ***Start date*** for simulations should be 1976 and continue a minimum of seven years (1982); results should be reported for the first eight quarters (for quarterly models) and annually thereafter.

b) ***Government*** non-wage expenditure on goods and services should be exogenous in real terms; government employment should be exogenous but government wages should be endogenous.

c) Non-accommodating ***monetary*** policy should be assumed and it should be specified precisely how this assumption is implemented in terms of the instruments of monetary policy.

d) Import prices should be exogenous and export volumes should be endogenous (foreign demand and prices being exogenous).

II. Simulations

a) With exogenous exchange rate:

1. A sustained decrease in real government expenditure on non-wage goods and services equal to 0.5 per cent of real GDP/GNP in 1976; report the multiplier, i.e., the change in real GDP/GNP divided by the (constant) change in government expenditure.
2. As No. 1 but with all nominal interest rates exogenous. (Over-rides general assumption I.C.)
3. Depending on the institutional operation of monetary policy, either:
   - a 5 per cent decrease in the baseline path of total bank reserves or the money supply;
   - or a 1 percentage point increase in policy controlled interest rates.
4. A sustained increase in personal taxes equal to 0.5 per cent of GDP/GNP in 1976.
5. An increase in oil import prices of 10 per cent (specify assumptions made about sympathetic increases in domestic energy prices).
6. An exogenous one-time decrease in the growth rate of the "basic" wage rate(s) of 2 per cent.

b) The same simulations with endogenous exchange rates.

Annex Table 1. **Summary of simulations**

		Decrease in government expenditure		Monetary shocks		Increase in personal tax	Increase in oil price	Decrease in wages
		Non-accommodating	Accommodating	Interest rates	Money supply			
United States	Fixed	*	*			*		*
	Floating	*	*	*	*	*	*	
Japan	Fixed	*	*	*	*			*
	Floating	*	*	*		*		*
Germany	Fixed			*		*		*
	Floating		*					
France 1[a]	Fixed	*						
	Floating		*	*		*	*	*
France 2[a]	Fixed	*	*	*		*	*	*
	Floating	*		*		*	*	
United Kingdom	Fixed	*						*
	Floating		*	*		*		*
Canada 1[a]	Fixed	*	*	*		*		*
	Floating	*			*			
Canada 2[a]	Fixed				*	*		*
	Floating			*				
Australia	Fixed	*	*			*		
	Floating	*			*	*		*
Austria	Fixed		*		*			*
	Floating		*			*	*	*
Belgium	Fixed							
	Floating	*		*		*		*
Denmark	Fixed		*				*	*
	Floating			*		*		
Finland	Fixed			*			*	*
	Floating	*	*			*		
Netherlands	Fixed						*	
	Floating	*	*	*		*	*	*
New Zealand	Fixed	*	*			*	*	*
	Floating[b]	*	*	*		*	*	
Norway	Fixed		*				*	*
	Floating					*		*

a) France 1 = INSEE METRIC; France 2 = BPE COPAIN; Canada 1 = RDXF; Canada 2 = CANDIDE.
b) In New Zealand floating exchange rates mean constant real exchange rates.

NOTES

1. See O'Reilly er al., 1983.
2. A copy of the questionnaire is appended in Annex I with a list of the simulations performed.
3. The simulation properties of the then-standard OECD INTERLINK model are reported in Larsen er al., 1983.
4. A number of countries used different time periods. The United Kingdom simulations covered the period from 1977Q1; New Zealand from 1976Q1 to 1979Q1 and 1972Q1 to 1979Q1; Canada from 1982 to 1992; and Norway from 1982 to 1987.
5. In some cases, national authorities simulated the effects of an increase in real government expenditures. These results are reported with opposite signs on the assumption that model properties are approximatively linear.
6. The differences are not large, however, as capital flows in the latter countries do not fully offset changes in domestic money supply.
7. The simulation for Finland is a typical example of the results for the Scandinavian two-sector, small, open economy model, which ties domestic prices strongly to world prices (in domestic currency).
8. Strictly speaking this taxonomy ignores second-order wealth and portfolio effects. These effects arise because changes in price levels have wealth effects in some national models and changes in foreign balance can also affect money supply and hence domestic portfolio balance.
9. The simulations made for the German and Canadian models differ slightly from the standard set. The German model simulates a cut equivalent to 0.5 per cent of nominal GDP throughout, while the Canadian model uses a shock of 1 billion Canadian dollars, equivalent to approximately 0.3 per cent of 1982 GNP.
10. Only long-term capital flows are reported in the Canadian model simulations. Hence, the fact that the current and capital accounts are not fully offsetting does not imply changes in official reserves or a managed float.
11. See Fleming, J.M. 1962 and Mundell, R.A., 1968.
12. There are a number of theoretical limitations to the assignment theorem. The first is the small-country assumption reflected in the fixed price characteristics of the theorem. Second, there is no direct response of exchange rates to current-account developments. Finally, the role of expectations on exchange-rate determination is ignored. The last factor is very difficult to model. However, the first two factors are generally modelled and are the principal reasons for differences between national model results and the Mundell-Fleming theorem noted below.
13. One possible exception is the Canadian RDXF model where, in the medium run, a cut in government expenditure leads to a currency depreciation.
14. The Finnish results highlight the importance of model structure. In the higher interest-rate simulation there is an improvement in labour demand and hence lower unemployment stemming from capital/labour substitution via the putty/putty supply block. The decrease in productivity also shows up as an increase in the price level.
15. The definition of money supply differs between countries; M_1 in Canada, M_1B in the United States; M_2 in Finland, Germany and Japan: M_3 in Australia, France, the Netherlands, New Zealand and the United Kingdom.

16. Non-neutrality holds even when capital flows are allowed to partly offset domestic money changes, e.g. the Japanese model.

17. A number of models begin the simulations at different periods, see note 2, while the Canadian models simulate a tax increase of 1 billion Canadian dollars.

18. This is in conformity with conventional views that the balanced budget multiplier is positive; but in contrast with much of current supply-side theorising.

19. For simulations reporting results from a world model see Larsen *et al., op. cit.*

20. An exception is Finland where a current accounts surplus is simulated reflecting the importance of bilateral trade with the USSR, its main supplier of oil.

21 For a global increase in oil prices, the currency depreciation simulated would generally be much smaller than shown in the single-country case.

22. Here, the limitation of the single-country simulation is again apparent as logically the depreciation observed would be the consequence of only the country concerned suffering the imported-oil price increase. A global increase would not generally have such a consequence.

23. Such marked differences in simulation properties are an example of the importance of model structures. For example, the Norwegian model is largely used for medium-term planning and has no monetary block. Hence, unlike the U.S. and U.K. models, wealth and stock-adjustment effects to lower inflation are never reflected for lack of a transmission mechanism.

BIBLIOGRAPHY

Fleming, J.h M., "Domestic Financial Policies under Fixed and Floating Exchange Rates", *IMF Staff Papers* No. 9, 1962, pp. 369-79.

Larsen, F., Llewellyn, J. and Potter, S., "International Economic Linkages", *OECD Economic Studies,* Autumn 1983, pp. 43-91.

Mundell, R.A., *International Economics.* Macmillan Press, New York, 1968.

O'Reilly, 8., Paulin, G. and Smith, P., "Responses of Various Econometric, Models to Selected Policy Shocks", *Bank of Canada Technical Reports,* No. *38,* July 1983.