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An Examination of the Impact of Changes in the Prices of Fuels and Primary Metals on Nordic Countries Using a World Econometric Model

by

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AN EXAMINATION OF THE IMPACT OF CHANGES IN THE PRICES OF FUELS AND PRIMARY METALS ON NORDIC COUNTRIES USING A WORLD ECONOMETRIC MODEL

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* This study was carried out with the help of Dr. Peter Miovic who was the Director of the World Economic Forecasting Service at Wharton EFA at the time the work was carried out. The IBM affiliation is indicated only for purpose of identification. The views expressed are of the author.

I. INTRODUCTION

This paper deals with an analysis of the global aspects of (a) changes in the prices of fuels and primary metals, and (b) deterioration of inflationary conditions in the United States. The quantitative basis of this study is the world econometric model of the Wharton Econometric Forecasting Assiciates (WEFA).

This study was carried out during November 78- April 79. Since then there have been many revisions not only in the data but also in the specification of WEFA's world model itself. As the results shown here do not take account of these revisions they may be somewhat outdated. Nevertheless these results are presented here in the spirit of an on-going research program to study the effects of transmission of shocks on world-wide trade and economic activity.

The WEFA system consists of a set of national econometric models. These models are inter-connected by means of a linking mechanism. In the linking system there are two important channels which capture some of the interdependencies that exist among countries. The first is through flows of goods between different countries; the second through their associated prices. A description of the linkage mechanism is given in section II.

Section III consists of a discussion of how imported fuels influence domestic prices in the countries included in the model.

Section IV gives the details of the alternative scenarios under which the simulations were carried out.

Section V shows the main results of the simulation exercises. The results presented correspond to a selected set of key economic variables. Also the countries are aggregated into three major groups :

(1) world

(2) OECD countries

and (3) NORDIC countries

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*I am grateful to Professor Lawrence R. Klein for his advice and permission to use WEFA's World Econometric Model, to Dr. Peter Miovic for his help in running the WEFA model, to Professor Gunnar Eliasson for his suggestions in organizing this paper and to Dr. Roger Bird for his comments on the final draft.

Nordic countries include: Denmark,Finland,Iceland,Norway and Sweden. In the simulations involving petroleum prices, Nordic group excludes Norway which is a net exporter of petroleum. In all other simulations Nordic group includes Norway.

II. LINKAGE MECHANISM IN THE WEFA SYSTEM

The basic idea capturing the interdependence from the goods flow side can be expressed by the identity:

$$X_{it} = \sum_{j=0}^{n} a_{ijt} M_{jt} \tag{2.1}$$

In this identity X_{it} stands for the volume of exports by country i to the n countries or regions of the world in any period t. The M_{jt}'s are the the imports of the jth country or region from all its trading partners. The a_{ijt} 's are, therefore, the import market shares.i.e,

$$a_{ijt} = \frac{X_{ijt}}{M_{jt}} \tag{2.2}$$

X_{ijt} represents exports of ith country to jth country in period t. In simplest terms, equation (2.1), when aggregated across i, embodies the truism that total exports of the world must equal total imports-- whatever is exported by someone must be imported by someone else. This world identity must also hold in value terms:

$$\sum_{i=1}^{n} X_{it}\, PX_{it} = \sum_{j=1}^{n} M_{jt}\, PM_{jt} \tag{2.3}$$

where PX_{it} and PM_{jt} represent export and import prices of countries i and j, respectively. Using the above identities it can be shown that:

$$PM_{jt} = \sum_{i=1}^{n} a_{ijt}\, PX_{it} \tag{2.4}$$

This, in a way, is the dual to equation (2.1), expressing the fact that import prices are weighted averages of the jth country's trading partner's export prices. Equations (2.1) and (2.4) use the same import share coefficients matrix, but in (2.4) it is in its transposed form-- the summation in (2.4) is down a column instead of along a row as in (2.1) .

When applying equation (2.1) to the real world, a serious problem arises in generating a_{ijt}'s in the forecast period. One expects the a_{ij}'s to change in the

future, but it is difficult to know in what way. In the WEFA system, this has been handled by applying a version of the Linear Expenditure System(LES) to a set of equations based on (2.1). The advantage of the LES procedure is that it preserves the overall balancing identity (2.3) in the process of obtaining estimates of parameters in each individual indivudal export function.

The basic equation used is:

$$VX_{ijt} = x^0_{ijt} PX_{it} + b_{ij}\left[VM_{jt} - \sum_{k=1}^{n} x^0_{kjt} PX_{kt} \right] + dummies + lags + error \quad (2.5)$$

VX_{ijt} is the value of exports from ith country to jth country in period t. $\bar{VM}_{jt}$ is the total value of imports of jth country and b_{ij} is a regression coefficient. x_{ijt}^0 is an estimated volume of exports of ith country to jth country using a base year trade share matrix. In actual simulations, the above equation is summed over j, to get total value of exports (VX_{it}) of ith country. For ease of interpretation we have omitted the nonessential terms at the end the above equation. The corresponding linkage on the price side comes through the price of imports:

$$PM_{jt} = \sum_{i=1}^{n} a_{ij}\, PX_{it} \quad (2.6)$$

On the basis of some assumed, initial values for the VX_i's and the PM_j 's along with a full set of exogenous variable assumptions, each country's model is iterated to convergence. The set of variables obtained from this solution will contain the VM_j's and PX_i's for each country. These, along with sample period estimates of a_{ij} 's and b_{ij}'s are then entered into equations (2.5) and (2.6) to obtain a new set of VX_i's and PM_j's , probably different from the initially assumed values. The individual country models are now re-solved with the new values and the procedure is repeated until convergence is obtained among countries as well as within countries.

In the WEFA system used in the simulations reported in this paper, the above linkage procedure is applied only to trade in manufactured goods (SITC 5-9)*

For primary goods the procedure is more indirect. It is assumed that the SITC 0-4 group is but one commodity with a single world market. The price of this commodity is related to an exogenously asssumed set of prices of 10 important commodities all given relative to the overall commodity prices **

Volumes, on the other hand, are modeled on the import side and assumed to be exogenous (trended) on the export side. Disequilibrium between total world imports and total world exports is removed by adjusting the overall commodity price.

There is yet another set of international linkages in the system. A few equations, particularly those relating to the foreign trade sector -- volumes and prices of traded goods and capital flows-- contain "world" variables, converted to a common unit of account. Where this does not make sense (prices, interest rates), weighted averages of national variables are used. These "world" variables, to the extent that they are endogenous in the national models, can then be recomputed on each linkage ("among countries") iteration. Since equations within each country model would use the same "world" variable, this type of linkage is of a "pool" variety. All countries draw on the same world "pool".

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*Standard Industrial Trade Classification, categories 5 through 9. These cover basically the processed goods in contrast to primary goods (SITC 0-4) which are by and large in their raw form.

**Among the 10 are the prices of fuels and metals used in this study.

III. THE PRICE SECTOR

Since we are particularly interested in the impact of a change in fuel prices on the world economy, we found it convenient to respecify some of the equations in the price sector of the WEFA world model. In order to introduce the price of fuels directly into the price formation mechanism of each country, we respecified the equation for the domestic demand deflator as

$$PDD_t = A\left(\frac{YW}{GDP}\right)_t^{\alpha} \left(\frac{VMG}{GDP}\right)_t^{\beta} PDD_{t-1}^{\gamma}\, e^{ut} \qquad (3.1)$$

where PDD = domestic demand deflator

YW = total wage bill

GDP = gross domestic product

VMG = Value of imported goods

u = error term

The domestic demand deflator is thus related to unit labor costs, unit import costs, and to its own lag. The imports, VMG, are the sum of the imports of primary goods (VM04)and imports of manufactured goods (VM59) where each value in turn is the product of the appropriate volumes and prices. This brings the influence of import prices more directly to the heart of the price mechanism.

The particular form chosen may be justified on a number of grounds*
One way is to consider the identity:

$$VGDP = VD - VMG = YP + YW \qquad (3.2)$$

where VGDP = Value of gross domestic product

VD = Value of total demand for domestically produced goods.

D = Total demand for domestically produced goods,in constant prices.

(Consumption + Investment + Government + change in inventories + exports)

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* For references on this see papers by O. Eckstein and D. Wyss, L.R. Klein, and R.J. Ball and M. Duffy in Board of Governors of the Federal Reserve System, "The Econometrics of Price Determination", 1970.

VMG = Value of imports of goods

YW = total wage income

YP = total non-wage income (profits, rental income, etc.)

then VD = YP + YW + VMG

$$D \times PD = YP + YW + VMG \tag{3.3}$$

Assuming that non-wage income is a constant share of VD (YP = αVD), substituting and rearranging, equation (3.3) becomes

$$PD = (1-\alpha)\left(\frac{YW}{D} + \frac{VMG}{D}\right) \tag{3.4}$$

From here, the step to equation (3.1) which we used in estimation is obvious. The only addition is the introduction of an adjustment mehanism; in this case through a lagged dependent variable.

Once this central price is determined, it affects the model in a number of ways. Equations for implicit deflators for other end-use categories of GDP have it as an argument. The GDP deflator itself is computed as an identity and thus contains it implicitly. It enters the import demand equations as a relative price, plays a strong role in wage determination and can be found implicitly in several other equations in the system.

The estimation results obtained for this central price of the system are quite satisfactory and are reported in Table III.1. The parameters reported correspond to those in equation (3.1). The tests, reported in parentheses below the coefficients, are always highly significant for A and α. For β, they are weak for Australia and Denmark. However, since they still had the correct sign, we retained them in the equation for the purposes of simulation. Parameter γ is not significant in a number of cases (Ireland, New Zealand, Switzerland, and Turkey). The equations have been re-estimated without it. The overall fits, as is common with price equations estimated in level form, are good as shown by the adjusted R^2's. Finally, we computed the long-term elasticity of price with respect to the

unit import cost and reported it in the ($\beta/1-\gamma$) column. In a number of cases this elasticity is considerably larger than its short-term counterpart, β.

TABLE III.1

Estimates of the Domestic Demand Deflator Equations

Country	A	α	β	γ	$\beta/(1-\gamma)$	R^2	DW
Australia	.2898	.5724	.0018	.4267	.0031	.999	1.5
	(7.3)	(12.4)	(0.1)*	(8.0)			
Austria	.4423	.2520	.2047	.4847	.3972	.998	1.4
	(4.7)	(2.5)	(3.8)	(3.4)			
Belgium	.3866	.6017	.0786	.1838	.0963	.999	1.8
	(13.5)	(7.8)	(2.8)	(2.2)			
Canada	.455	.245	.1788	.5173	.3704	.999	1.4
	(12.5)	(3.0)	(7.4)	(5.9)			
Denmark	.3226	.5903	.0254	.3296	.0379	.999	1.5
	(7.2)	(6.3)	(0.7)*	(3.3)			
Finland	.4836	.5499	.1131	.2996	.1615	1.0	1.6
	(15.0)	(9.7)	(5.3)	(4.8)			
France	.4685	.395	.1169	.4299	.2051	.999	2
	(11.4)	(5.6)	(5.3)	(5.9)			
Germany	.4384	.5087	.0792	.316	.3432	1.0	1.6
	(9.2)	(14.1)	(3.3)	(5.6)			
Greece	.5712	.4605	.2103	.3114	.3054	.993	1.0
	(3.8)	(1.6)	(1.9)	(1.2)			
Iceland	.6059	.2462	.3171	.4349	.5611	.999	1.7
	(8.8)	(2.5)	(6.7)	(3.7)			
Ireland	.411	.8088	.1087	..	..	.99	1.8
	(18.2)	(14.0)	(2.3)				
Italy	.4415	.2765	.1438	.518	.2983	.999	.
	(14.6)	(3.7)	(6.0)	(7.0)			
Japan	.3959	.3121	.0802	.5895	.1954	.996	.8
	(3.5)	(1.9)	(1.2)	(4.7)			

Nordic

TABLE III.1 (Cont'd)

Estimates of the Domestic Demand Deflator Equations

Country	A	α	β	γ	$\beta/(1-\gamma)$	R^2	DW
Netherlands	.3212	.3147	.1531	.5137	.3148	.999	1.6
	(8.0)	(5.7)	(3.5)	(7.0)			
New Zealand	.4925	.815	.0702	..	..	.993	.9
	(5.3)	(10.2)	(0.9)*				
Norway	.4195	.5429	.1255	.3123	.1825	.999	2.0
	(7.1)	(4.4)	(2.7)	(2.3)			
Portugal	.4335	.2872	.15	.5419	.3274	.995	1.4
	(5.5)	(2.8)	(2.5)	(3.7)			
South Africa	.3663	.3993	.0623	.5899	.1519	.99	2.
	(9.9)	(4.4)	(2.9)	(6.1)			
Spain	.34	.3718	.0812	.5515	.181	.999	2.1
	(9.4)	(8.2)	(4.7)	(9.3)			
Sweden	.3158	.232	.1091	.662	.3228	.999	1.3
	(6.9)	(2.3)	(4.3)	(5.9)			
Switzerland	.6482	.7402	.216	..	..	.998	1.2
	(22.5)	(20.4)	(6.3)				
Turkey	1.4507	.6504	.4009	..	..	.982	1.3
	(18.4)	(6.1)	(8.1)				
U.K.	.3769	.5508	.0644	.3814	.1041	.999	0.4
	(7.1)	(6.6)	(1.7)	(4.6)			
U.S	.4168	.4621	.0674	.4114	.1145	.999	1.
	(5.8)	(3.6)	(2.1)	(4.4)			
Yugoslavia (original equation)							

IV SCENARIOS

In order to get a quantitative assessment of the total effect of the simultaneous changes in the various economies and in the inter-country flows of goods, we constructed a baseline solution and then solved the model under six alternative scenarios. We took 1978 as the starting point and let the model run forward seven years through 1985.

A. BASE CASE:

This solution constituted, at the time the study was made, the best guess as to where the different industrialized countries, the developing countries and the centrally planned economies would be in each year in the period 1978-1985. The assumptions included a judgment that the price of internationally traded fuels* would rise on the average 10% from 1978 to 1979 and 8% in each year thereafter with the average prices of internationally traded goods rising at about 7-8% per annum, the assumption for the absolute price of fuels meant that, except for 1978-79, the average real price of fuels would remain roughly constant. Although events have overtaken us since then, the guesses did represent the expected price increases at the time the simulations were run. In any case, it is the multipliers and not he absolute values that are of most relevance in this type of a study.

B. ALTERNATIVes I, II and III

In these scenarios we wished to examine the impact of changes in fuel prices on various economies and groups of economies. Alternative I represented a situation in which the price of fuel was assumed to be 10% below that of the Base case for the entire period of simulation.

In effect that meant no increase in the price of fuels from 1978 to 1979 and 8 % per year thereafter.

Alternative II is, in a sense , the mirror image of Alternative I. Instead of dropping, we raised the price of fuels by 10% in relation to the Base Case. We were interested in seeing whether the effects were symmetric to those of Alterna-

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*Relative price of fuels = Price Index of fuels over world price index of primary commodities Fuels include crude petroleum, natural gas, coal and electricity. Primary commodities cover SITC 0-4. The indexes are based on 1970=1

tive I; i.e. whether the economies tended to adjust differently to upward than to downward shocks in prices.

In Alternative III we raised the price of fuels 50% in relation to that of the Base Case. We considered this to be significant shock and it was meant to test whether the system, as represented by the World Model , can withhold it and , if so, whether the effects are nonlinear in rlation to Alternative II. In a way we wanted to see if a 50% rise in fuel prices is 5 times worse than a 10% uptick.

C. ALTERNATIVE IV

The purpose of this scenario was to get an idea of the global repurcussions of a deterioration of inflationary conditions in the United States. In order to quantify both the dimensions and the speed of transmission of the U.S inflation on the other economies of the world, we solved the system by assuming that the demand deflator would be 3% above its Base Case values for the period 1979-85. Since this deflator is endogenous it was not possible to examine a shock of exactly 3%. Instead, we had to run a number of simulations until we found the adjustments which would keep the shock in a narrow band around 3%.

D. ALTERNATIVE V and VI

Finally, due to the importance of metals to some of the Nordic countries, we examined the impact of a 10% rise (Alternative V) and then of a 10% fall (Alternative VI) of the average price of metals in relation that of the base case. As before, the shock was administered in 1979 and kept steady through 1985.

The price shocks as well as the effects are mostly measured in percentage terms. This approach allows for inter-country comparability since multipliers are in effect elasticities and as such dimensionless.

To further facilitate inter-country and inter-country group comparisons, we constructed a set of what we call "Indices of Response" (IR). They are computed as

$$IR_i = \frac{X_i^a}{X_i^b} \tag{8}$$

where i refers to the country or country group in question. The superscripts stand for alternative and base cases-- b to the baseline and a to the alternative. X stands for the variable of interest. These indices are set to 1.0 in 1978 and vary thereafter in response to the shock in question.

V. INDICES OF RESPONSE FOR SELECTED ECONOMIC VARIABLES

In this section we will analyze the impacts of the changes in the various alternatives on each of a number of chosen variables. Indices of response for these variables are presented in the Diagrams for these major groups: the Nordic countries (Norway is excluded in Alternatives I,II and III) ,the OECD group and the World.

A. GROSS DOMESTIC PRODUCT (GDP)

Impacts of changes in fuel prices are presented in Diagrams 1/I, 1/II and 1/III. As might be expected, a drop in fuel prices is mildly stimulative for the world economy, while a rise in prices has the opposite effect.

Results for the subgroups of OECD and the Nordic countries are quite different, however. Gross Domestic Products of the OECD group responds more strongly than the average to lower fuel prices. An overwhelming portion of this is due to a strong response of the fuel- dependent Japanese economy. Other OECD countries also respond positively except for the U.K. But even there, the negative impact begins to take place only after 2-3 years, in line with Britain's recently acquired status of a net oil exporter.

The Nordic countries, on the other hand, react negatively to the drop in oil prices. This is due to the behavior of the Swedish economy but for what we consider to be quite different reasons. For Norway, a substantial oil producer and a net oil exporter, a drop in oil prices has a depressing effect on GDP. Infact it is not before 1982 that this effect bottoms out (relative to the Base Case) and that the rate of growth of GDP begins to move back towards the world average.

Diagram 1/I

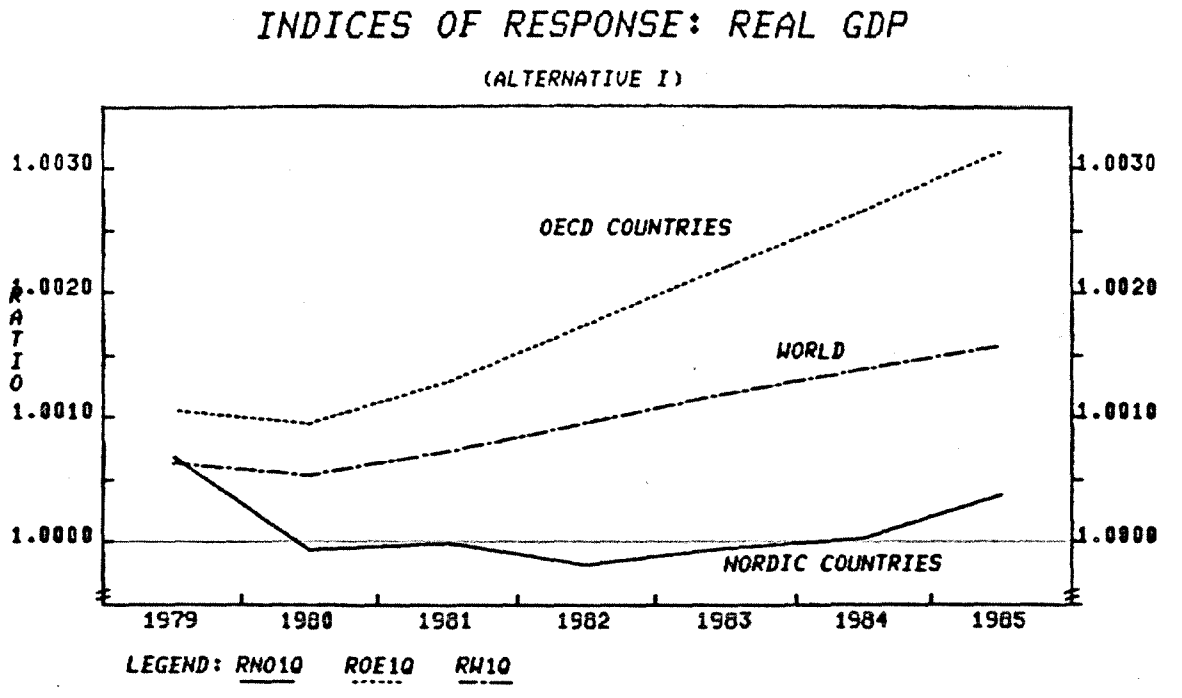

INDICES OF RESPONSE: REAL GDP
(ALTERNATIVE I)
1.0030
1.0020
1.0010
1.0000
RATIO
OECD COUNTRIES
WORLD
NORDIC COUNTRIES
1979
1980
1981
1982
1983
1984
1985
LEGEND: RNO1Q ROE1Q RW1Q

Diagram 1/II

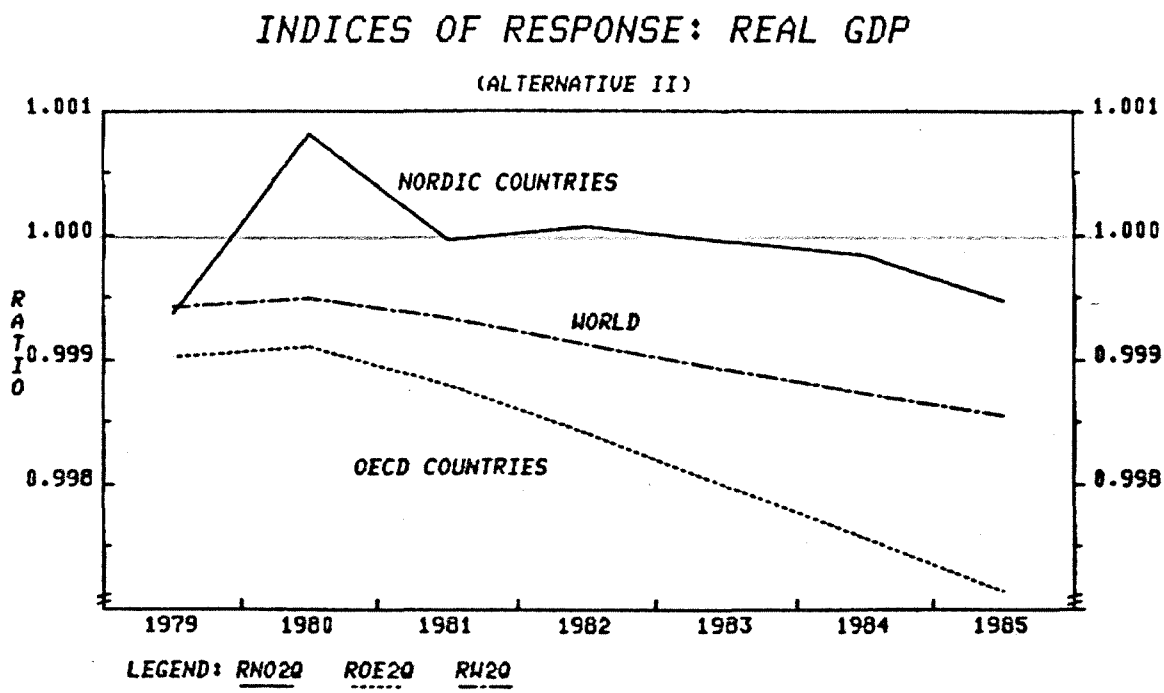
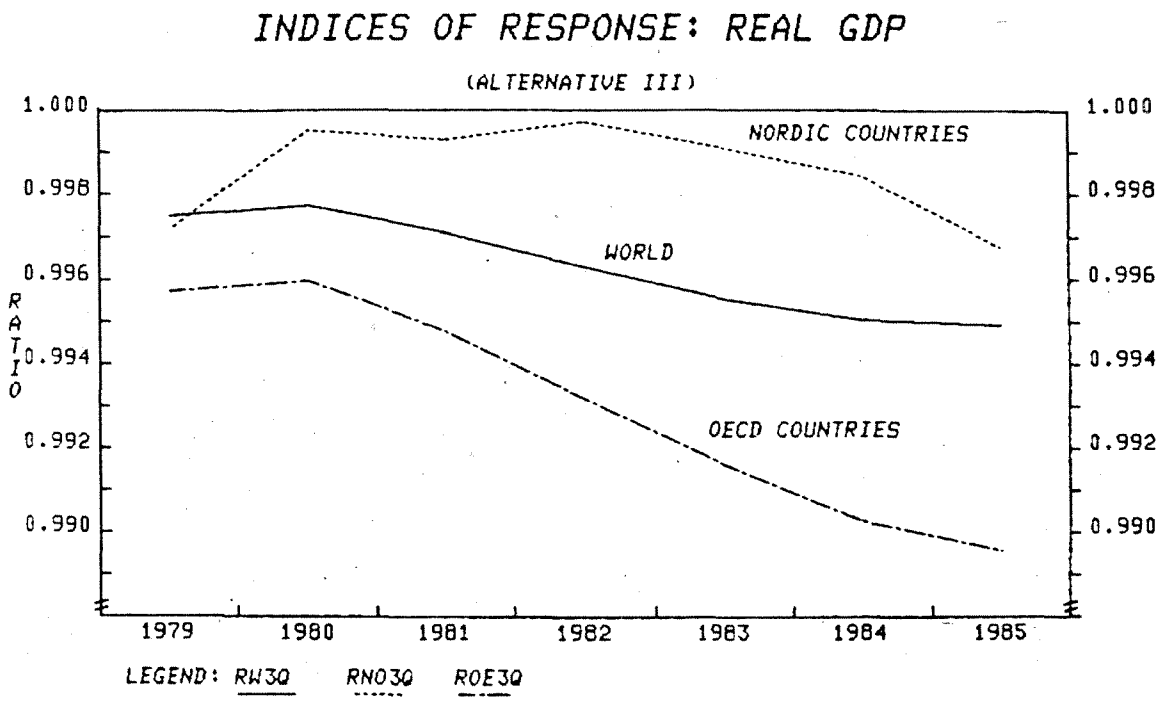

INDICES OF RESPONSE: REAL GDP
(ALTERNATIVE II)
1.001
1.000
0.999
0.998
RATIO
NORDIC COUNTRIES
WORLD
OECD COUNTRIES
1979
1980
1981
1982
1983
1984
1985
LEGEND: RNO2Q ROE2Q RW2Q

Diagram 1/III



To explain the behaviour of the Swedish economy (a relatively strong negative effect on GDP from a drop in fuel prices) one has to look at a number of factors. Total impact of a chnge in fuel prices on GDP (and other variables in the model) is a combination of a variety of responses whose importance varies from country to country. There are country -to- country differences in import and export price elasticities; varied impacts of the inflow of international reserves on total reserves and hence on the creation of money; different degrees of dependence on imported oil; different degrees of openness of the various economies ; and, finally, differences in the way productivity influences the formation of wages and prices with the resultant impact on volumes and composition of demand.

In the case of Sweden, when fuel prices are decreased by 10%, imports rise substantially while exports change only slightly. Volume effect outweighs the terms of trade effect resulting in a strong deterioration on the balance on current

account. While this is offset somewhat by a counter in-flow of capital, the net result is still a decrease in reserves. This decrease has a negative impact on money supply despite the usual attemptts by monetary authorities to sterilize the outflow of foreign reserves through an increase in the domestic reserve base.

The decrease in foreign reserves also decreases the reserve-import ratio which for some countries has a negative effect on investment and hence growth. The decrease in the money supply decreases domestic credit on the one hand and on the other causes an increase in the short and eventually in long term interest rates. These two have a negative effect on the real side of the model. Interest rates usually affect capital formation through the user cost of capital while domestic credit enters directly as a financial variable in both consumption and investment functions. In both cases the effect on the rate of growth and on employment is negative.

There also seems to be an unusually strong dampening effect from the income side. Once GDP is negatively affected through the channels described above, capacity utilization falls which holds down prices. At the same time, the rise in productivity is slowed as Swedish firms do not slow down their employment in step with the reduced growth in GDP. The productivity effects tend to slow down increases in wages and total incomes and ultimately have an adverse impact on consumption. If to this one adds a slow-down in government transfer payments which seem to be quite responsive to the wage and price trends, it seems that in Sweden all forces combine to give a somewhat atypical and unexpected response for an oil-importing nation.

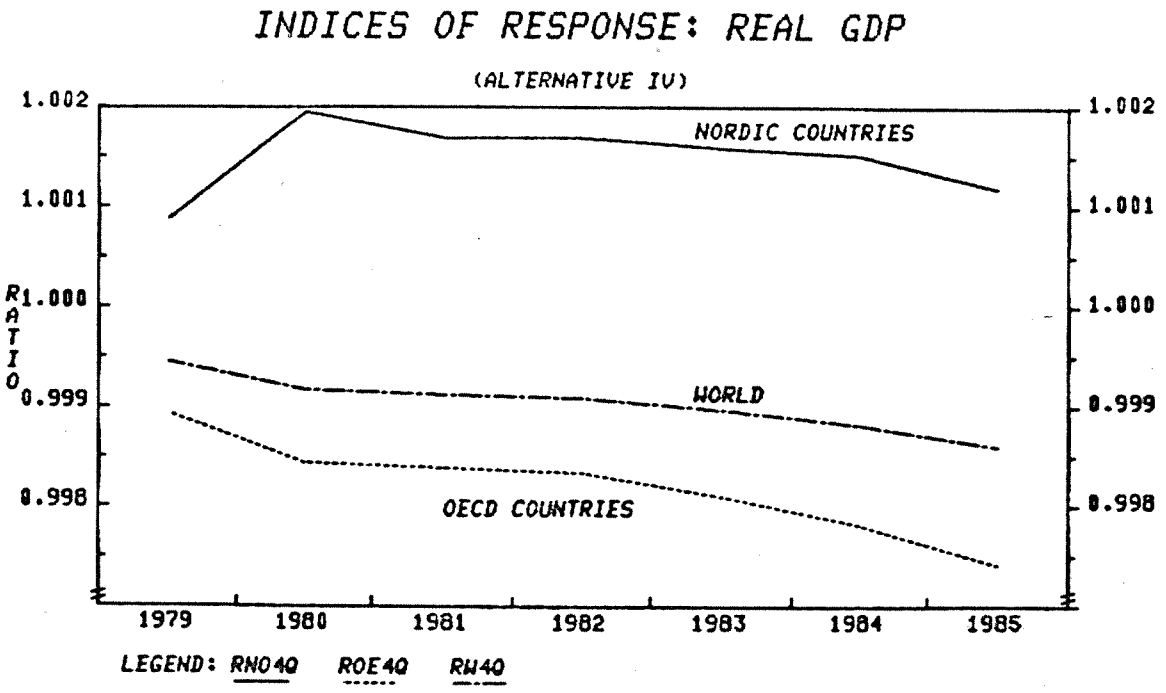
There is yet another reason for the unusual results for Sweden. One only has to look at the Swedish growth pattern in the last 5-6 years. When the oil prices quadrupled in 1973-74, GDP growth in most countries slowed down and by 1975 just about all OECD countries (except Sweden, Norway, Australia and New Zealand) experienced at least one year of negative growth rates. Yet, during 1976-77 when most other countries were on recovery paths from the recession, Sweden slumped, recovering only in 1978. Since most models build into their

projections the behavior of the past, it should not be surprising to find the unusual results for Sweden.

Results of Alternative II suggest a certain symmetry in comparison to Alternative I. Country-by-country (Table I in Appendix) effects are almost completely symmetric as far as GDP is concerned, an impression which is dispelled when one looks at a wider assortment of variables. It is quite clear, however, from Diagram 1/III that whatever the case is on symmetry, when the shock is quintupled, the effect on even the aggregates is nonlinear. The OECD group and the world as a whole, after a sharp slide in the first 5 years begin to catch themselves.

Diagram 1/IV shows the repercussions of accelerated increases in the U.S. domestic prices. What starts as a domestic deterioration in the inflationary conditions in the U.S. ,leads quickly to a loss in the competitive position of U.S. exports and a corresponding gain in the exports of its competitors. As a result, the U.S. GDP falls in relation to the Base Case while the GDP of all other countries rises.

Diagram 1/IV



Finally, we turn to the results of alternatives V and VI. In general, due to the small weight of metals in total primary goods trade, variations of 10% in the metal prices has relatively little effect when compared to similar variations in fuel prices. It is interesting, however, that the Nordic countries seem considerably more sensitive to such variations than either the OECD or the world. At the same time, readers should be cautioned , that the Diagrams overemphasize this difference since the scale of the Diagram is set by the sensitivity of the Nordic countries' results rather than by the responsiveness of the rest of the world.

Diagram 1/V

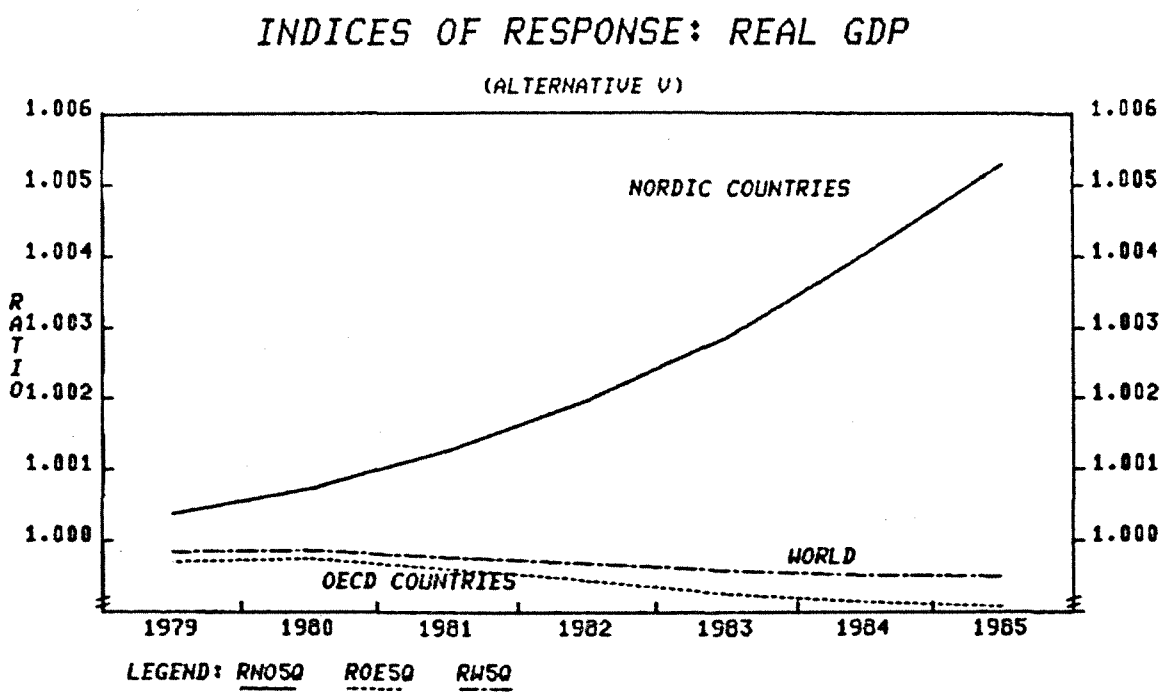
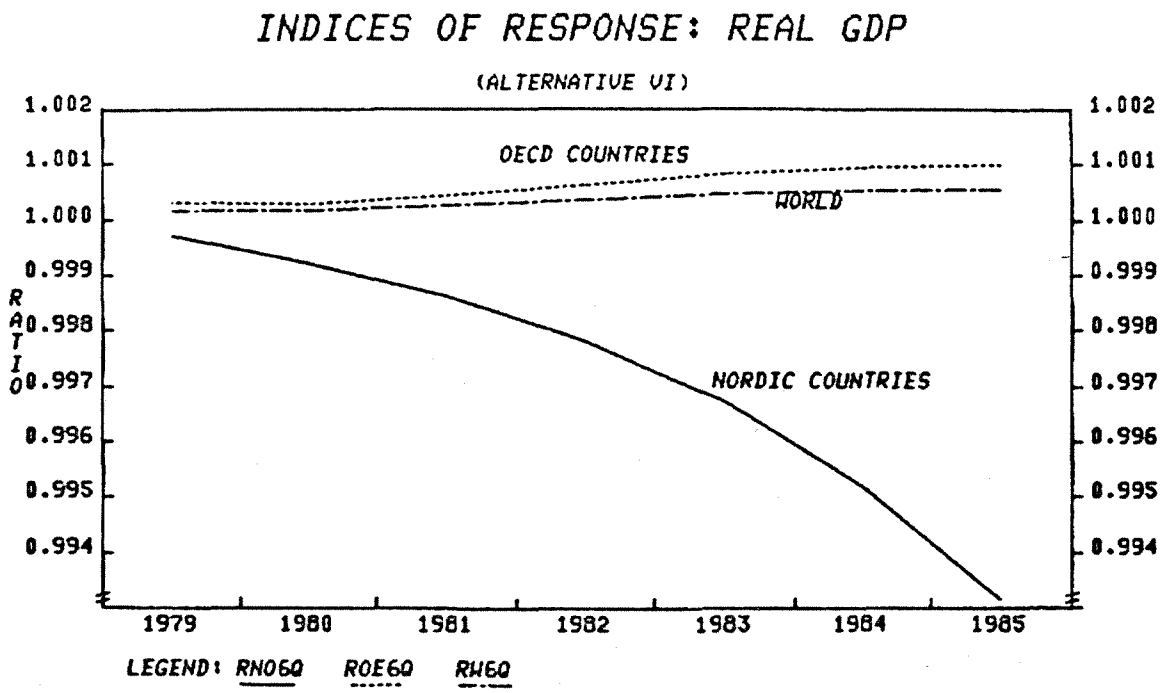

INDICES OF RESPONSE: REAL GDP
(ALTERNATIVE V)
1.006
1.005
1.004
RATIO 1.003
1.002
1.001
1.000
NORDIC COUNTRIES
WORLD
OECD COUNTRIES
1979
1980
1981
1982
1983
1984
1985
LEGEND: RNO5Q ROE5Q RW5Q

Diagram 1/VI


INDICES OF RESPONSE: REAL GDP
(ALTERNATIVE VI)
1.002
1.001
1.000
0.999
0.998
0.997
0.996
0.995
0.994
RATIO
OECD COUNTRIES
WORLD
NORDIC COUNTRIES
1979
1980
1981
1982
1983
1984
1985
LEGEND: RNO6Q ROE6Q RW6Q

2. GROSS DOMESTIC PRODUCT DEFLATOR (PGDP)

A change in the cost of imported fuels works its way through the domestic production sectors and affects various segments of the Final demand deflator. Changes in final demand prices often induce movemnts in wage rates and prices of other factors of production. The simulations presented here captured both the direct effects as well as the induced effects of fuel price changes on PGDP through the central price equation presented in the previous section and through the other price and wage equations of the model. The limitations of PGDP as an indicator or general price movements should, however, be kept in mind when interpreting the results.

A 10% decline in fuel prices has an initial effect of reducing the average rate of inflation in the world by 0.2% from the base case; the drop in the inflation rate for the OECD group is much smaller - less than 0.1%.(Diagram 2/I). A 10% decline in fuel prices initially results in a slight increase in PGDP for Nordic countries. This result is due to the unusual response of Sweden to changes in fuel prices. When fuel prices decrease by 10% swedish imports rise substantially resulting in a slightly higher unit import costs. Also a decline in fuel prices has an initial adverse impact on swedish GDP through the channels described earlier in this paper. The negative impact on real GDP is accompanied by a slow-down in productivity growth contributing to a rise in the general price level. However, in the long-run the response of PGDP in nordic countries is in the expected direction (Diagram 2/I,2/II and 2/III).

The time profile of PGDP under alternative III is quite different from that under Alternative II (Diagram 2/II). The effect of a 50% rise in imported fuel prices on world inflation seems to wear off by 1983, except for the nordic group. Also PGDP simulations under Alternative III do not seem to bear any linear relation with those under Alternative II over a period of time.

Diagram 2/I

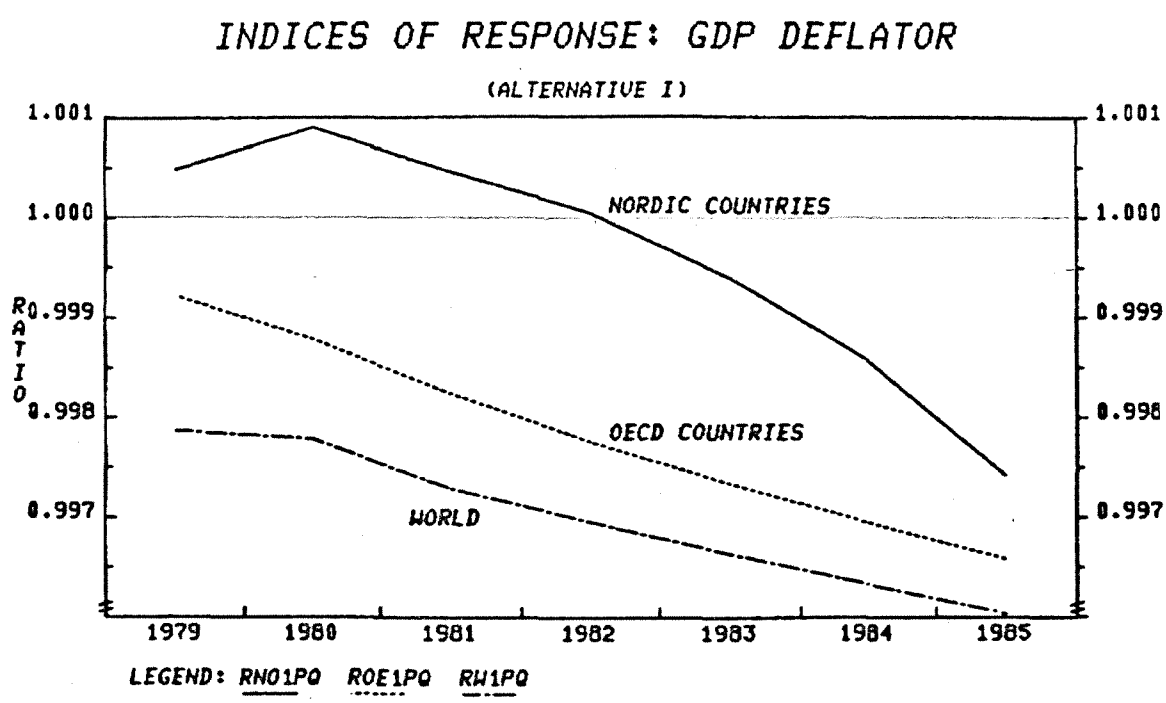

INDICES OF RESPONSE: GDP DEFLATOR
(ALTERNATIVE I)
1.001
1.000
0.999
0.998
0.997
RATIO
NORDIC COUNTRIES
OECD COUNTRIES
WORLD
1979
1980
1981
1982
1983
1984
1985
LEGEND: RNO1PQ ROE1PQ RW1PQ

Diagram 2/II

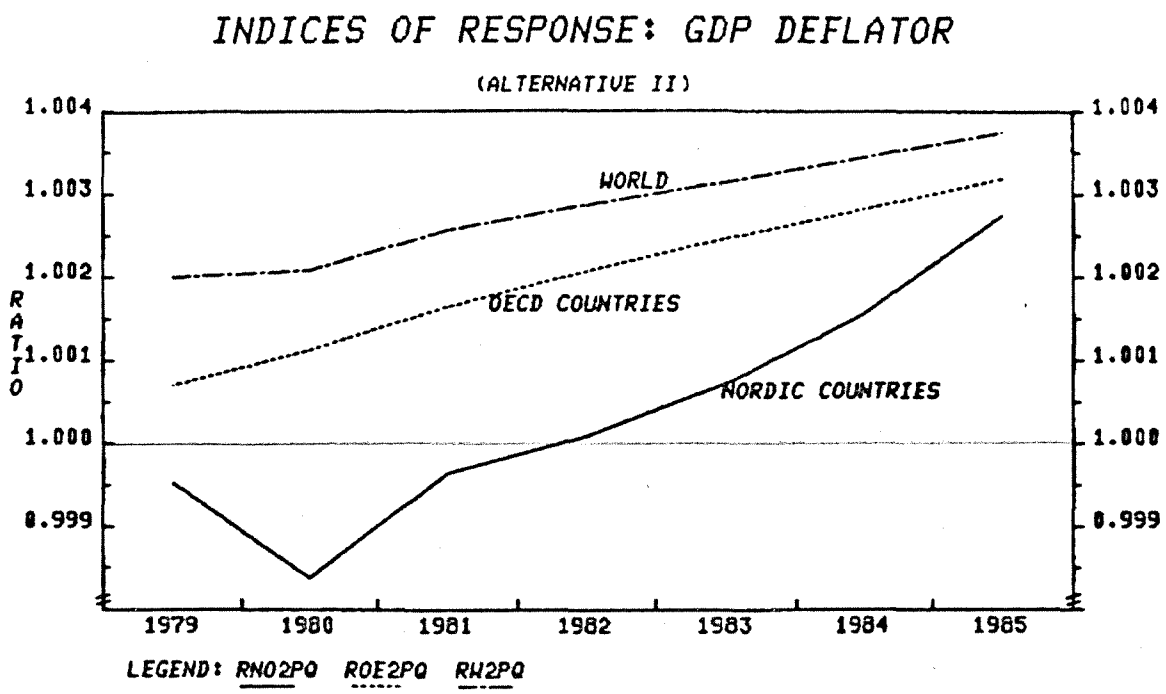
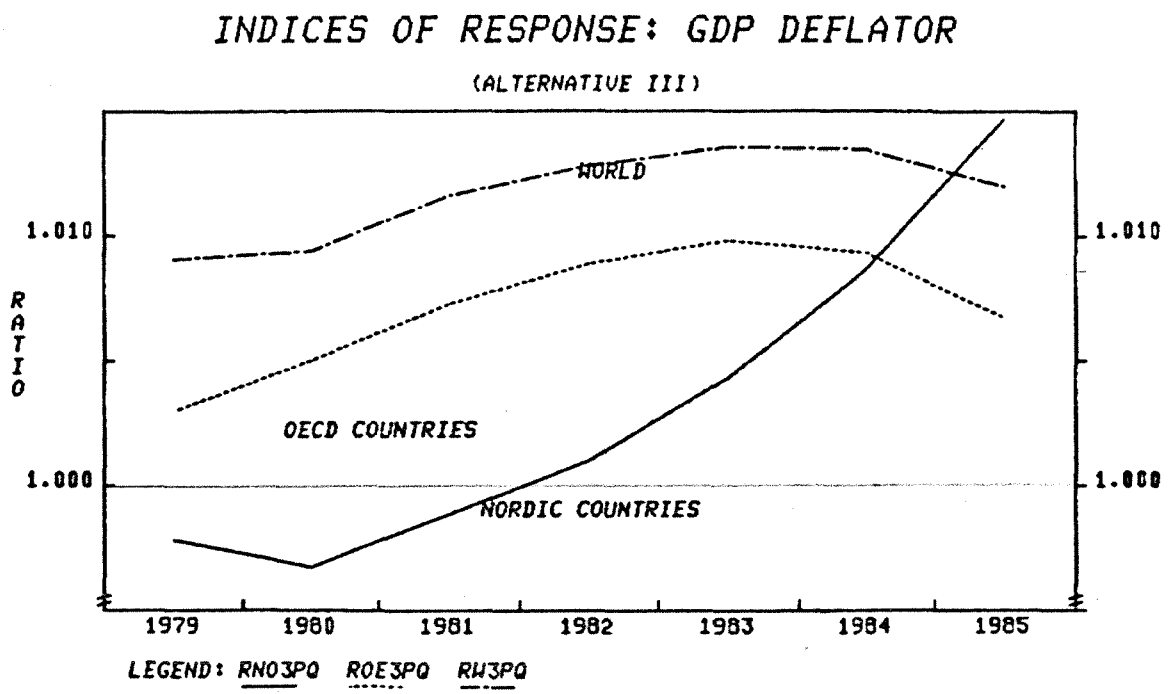

INDICES OF RESPONSE: GDP DEFLATOR
(ALTERNATIVE II)
1.004
1.003
1.002
1.001
1.000
0.999
RATIO
WORLD
OECD COUNTRIES
NORDIC COUNTRIES
1979
1980
1981
1982
1983
1984
1985
LEGEND: RNO2PQ ROE2PQ RW2PQ

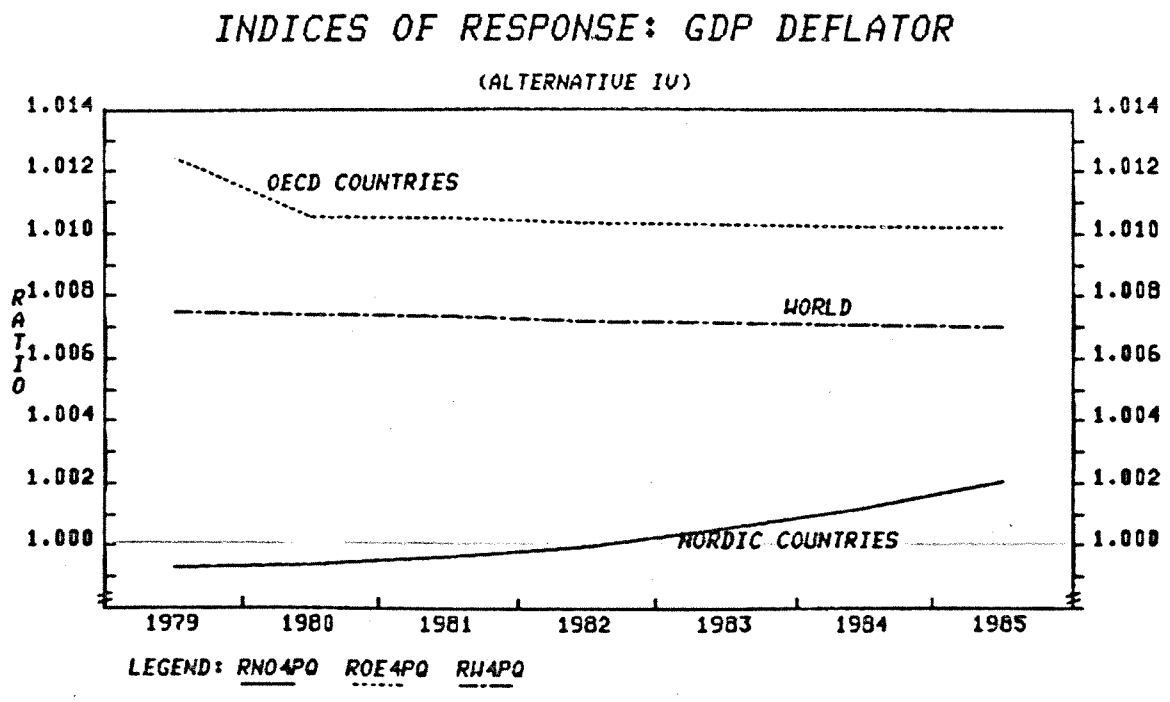
Diagram 2/III



A 3% rise in U. S. domestic prices (Alternative IV) results in an increase of only 0.7% in world inflation over the base case (Diagram 2/IV). Acceleration in domestic inflation in U.S. leads to a loss of its competitive position in world trade and a corresponding gain in the real exports of its competitors. In some countries gains in real exports are often accompanied by favorable growth in real GDP and productivity and hence in a downward pressure on prices. The adverse effects of acceleration of U.S. inflation on OECD countries is thus mitigated by the favorable impacts of a rise in their real exports.

The negative impact of accelerated U.S inflation on nordic countries is felt gradually over a period of time. Initially Nordic PGDP is below the base line ; but it soon starts to climb upwards and by 1982 it crosses the base line.

Diagram 2/IV



The effect of a 10% rise in metal prices (Alternative V) is to increase world inflation by less than 0.1% (Diagram 2/V). Increase in metal prices results in higher export earnings for Nordic countries. Under Alternative V the nordic countries show a rise in real GDP and productivity and a slow down of domestic inflation. The opposite effects are seen under Alternative VI (a decline of 10% in metal prices). See Diagram 2/VI.

Diagram 2/V

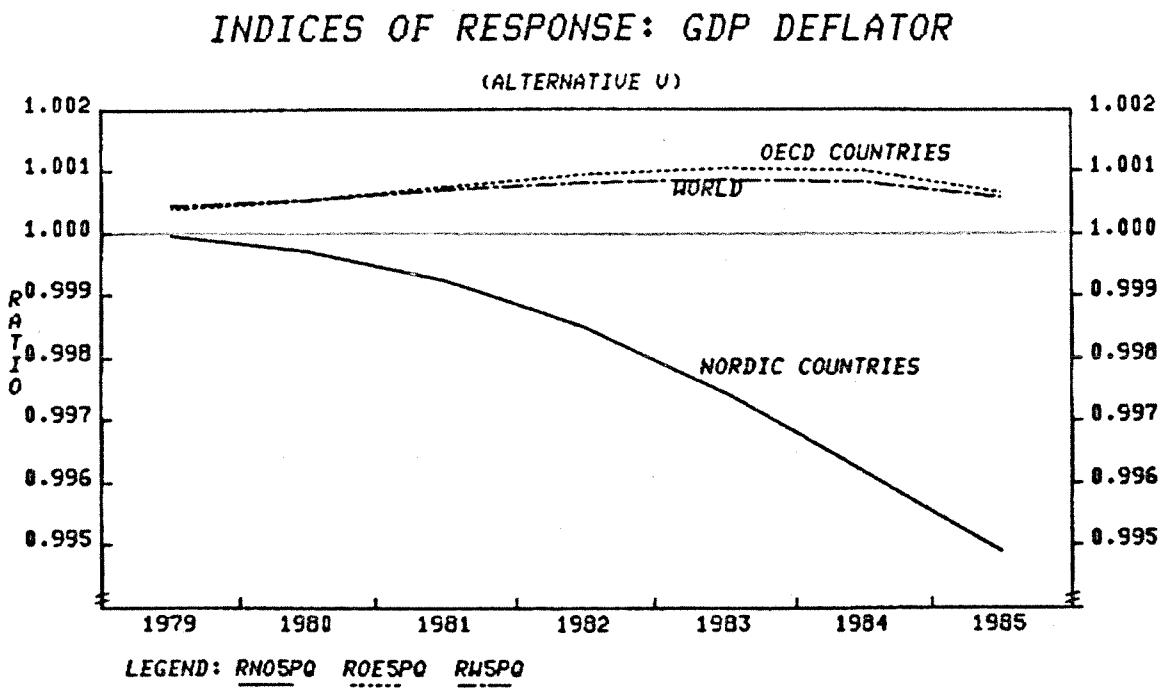
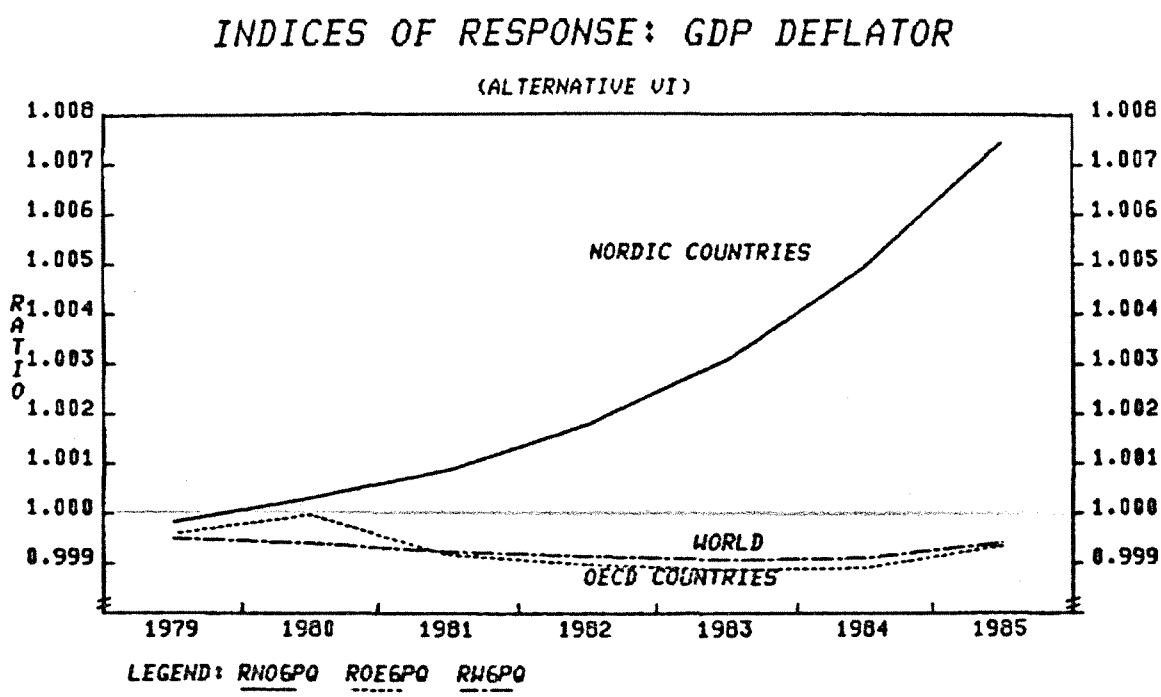


Diagram 2/VI


INDICES OF RESPONSE: GDP DEFLATOR
(ALTERNATIVE VI)
RATIO
1.008
1.007
1.006
1.005
1.004
1.003
1.002
1.001
1.000
0.999
NORDIC COUNTRIES
WORLD
OECD COUNTRIES
1979
1980
1981
1982
1983
1984
1985
LEGEND: RNO6PQ ROE6PQ RW6PQ

3. MANUFACTURED GOODS EXPORTS DEFLATOR (PX)

Diagrams 3/I, 3/II and 3/III show the effect of changes in fuel prices on manufactured goods export deflators.

A 10% change in fuel prices (Alternatives I and II) does not produce any significant changes in the export prices of manufactured goods (Diagrams 3/I and 3/II). The impact of a 50% rise in fuel prices on the world price of manufactured exports reaches its peak by 1983.

However there are wide variations in the impact of a 50% rise in fuel prices on the price of exports among various countries.These variations are shown in Diagram 3A. Diagram 3A shows the percentage increase in Px under Alternative III compared to the base case for a selected number of countries. For example, the response of Swedish export prices to an increase in fuel prices is relatively slow. As a result, Sweden enjoys a slight competitive edge in its exports over other countries under Alternative III.

Diagram 3A

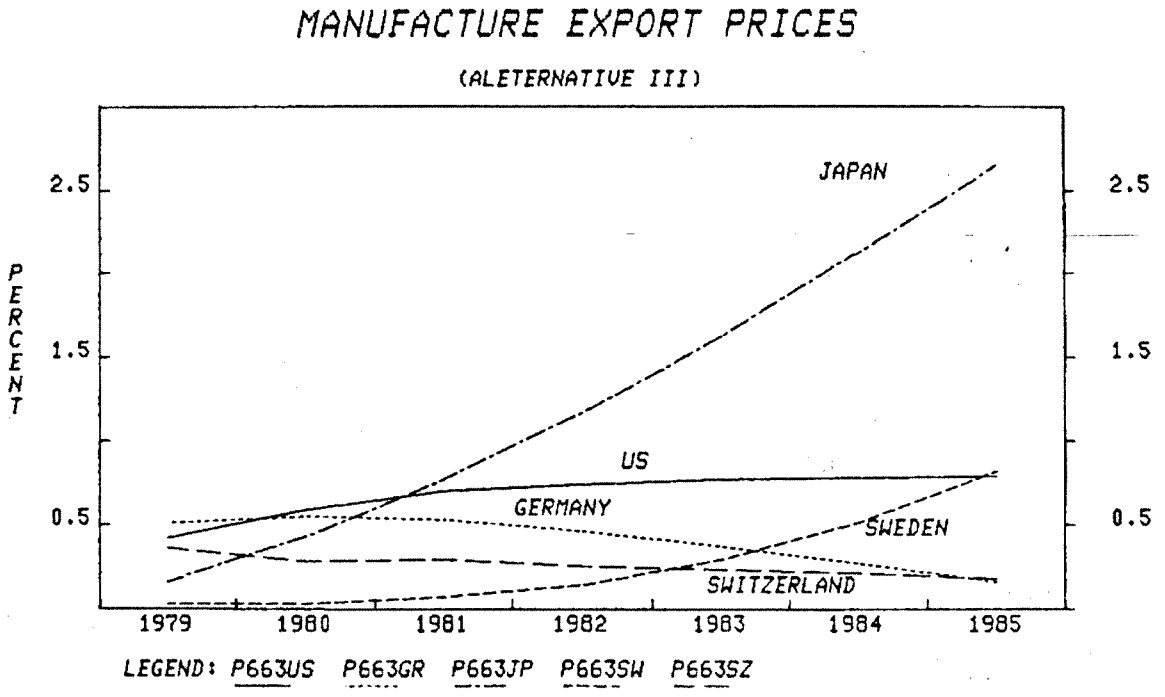

MANUFACTURE EXPORT PRICES
(ALETERNATIVE III)
PERCENT
2.5
1.5
0.5
JAPAN
US
GERMANY
SWEDEN
SWITZERLAND
1979
1980
1981
1982
1983
1984
1985
LEGEND: P663US P663GR P663JP P663SW P663SZ

Diagram 3/I

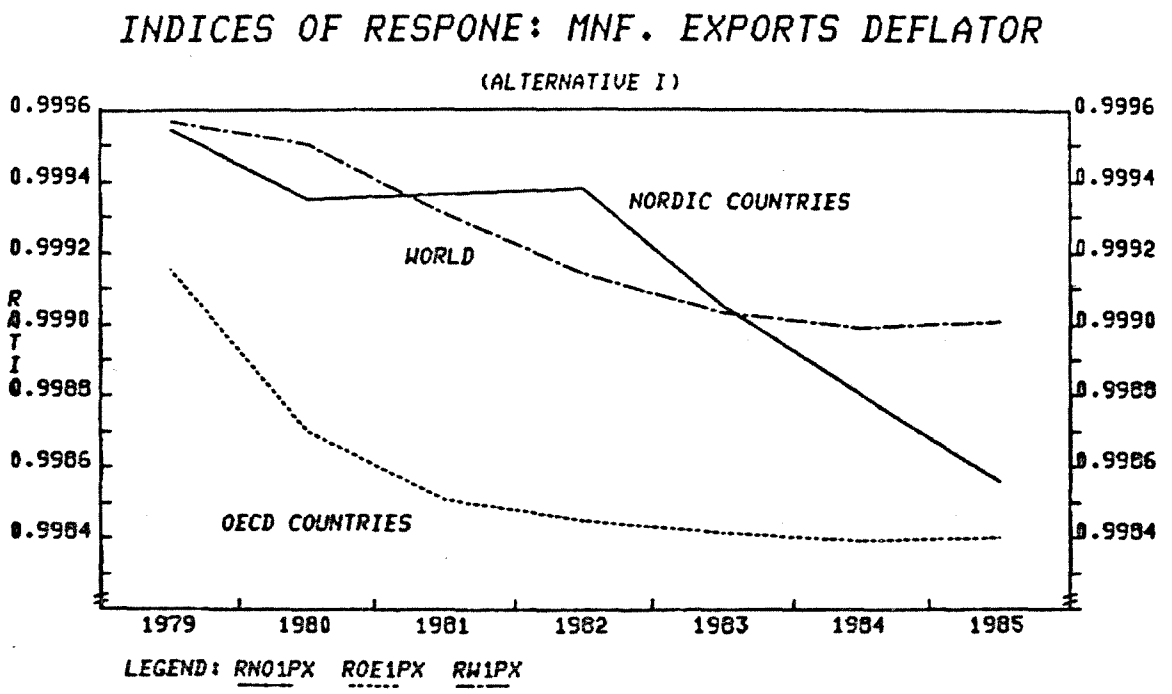

INDICES OF RESPONE: MNF. EXPORTS DEFLATOR
(ALTERNATIVE I)
0.9996
0.9994
0.9992
RATI
0.9990
0.9988
0.9986
0.9984
NORDIC COUNTRIES
WORLD
OECD COUNTRIES
1979
1980
1981
1982
1983
1984
1985
LEGEND: RNO1PX ROE1PX RW1PX

Diagram 3/II

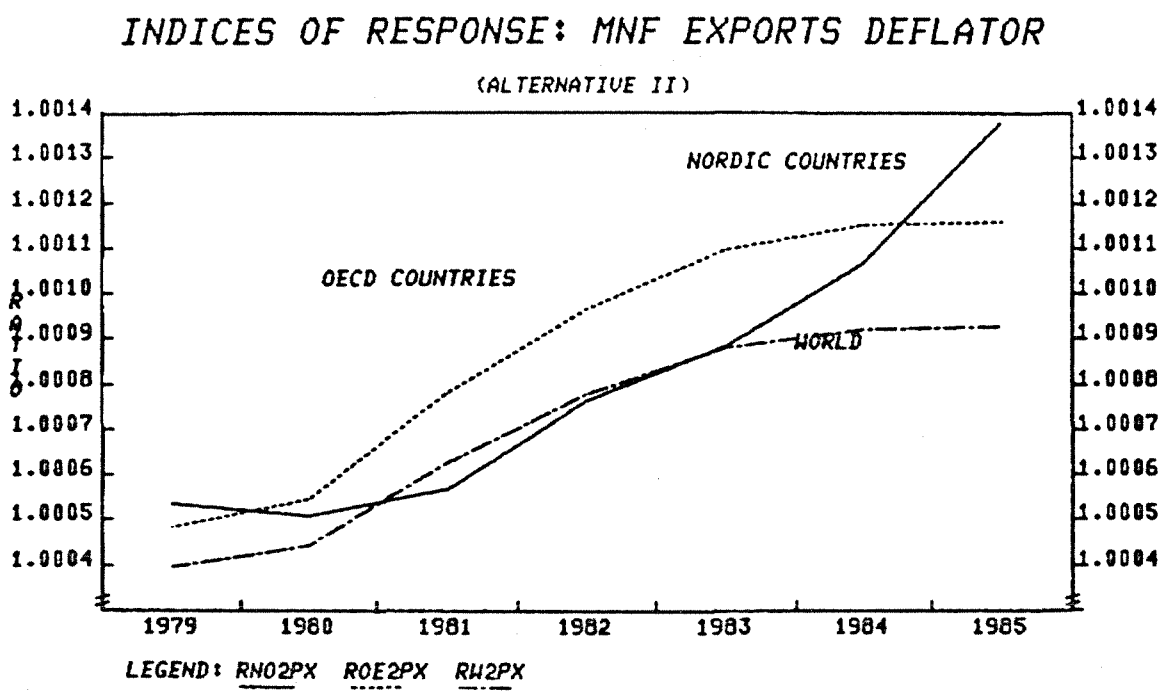
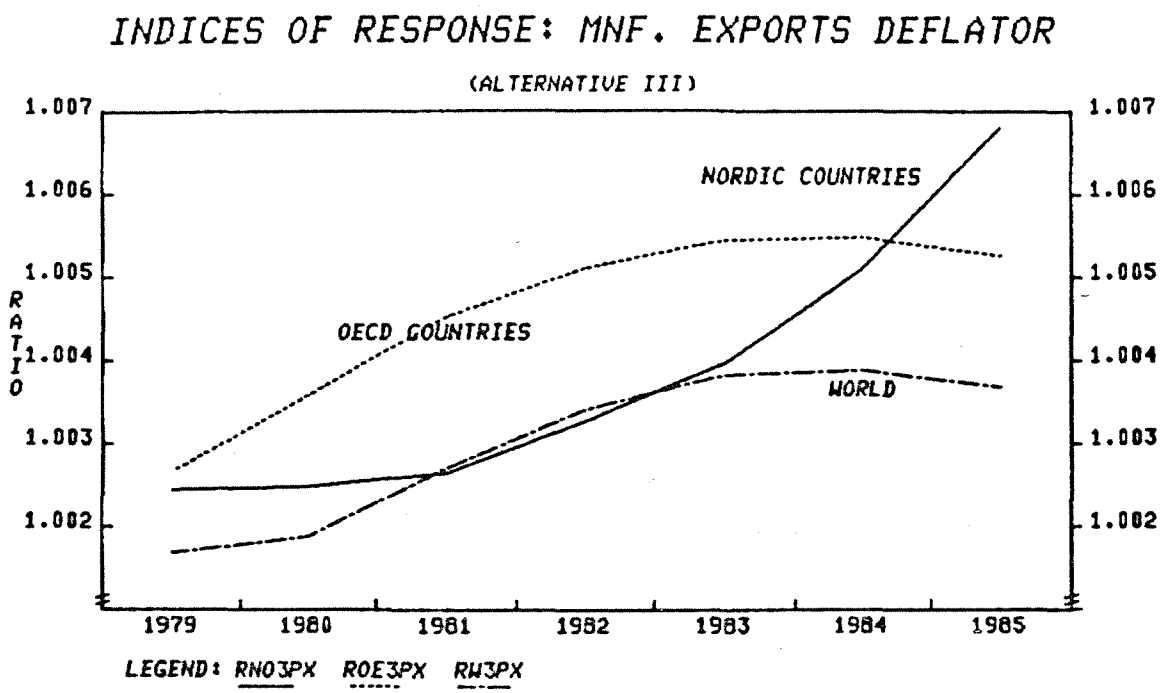

INDICES OF RESPONSE: MNF EXPORTS DEFLATOR
(ALTERNATIVE II)
1.0014
1.0013
1.0012
1.0011
1.0010
1.0009
1.0008
1.0007
1.0006
1.0005
1.0004
RATIO
NORDIC COUNTRIES
OECD COUNTRIES
WORLD
1979
1980
1981
1982
1983
1984
1985
LEGEND: RNO2PX ROE2PX RW2PX

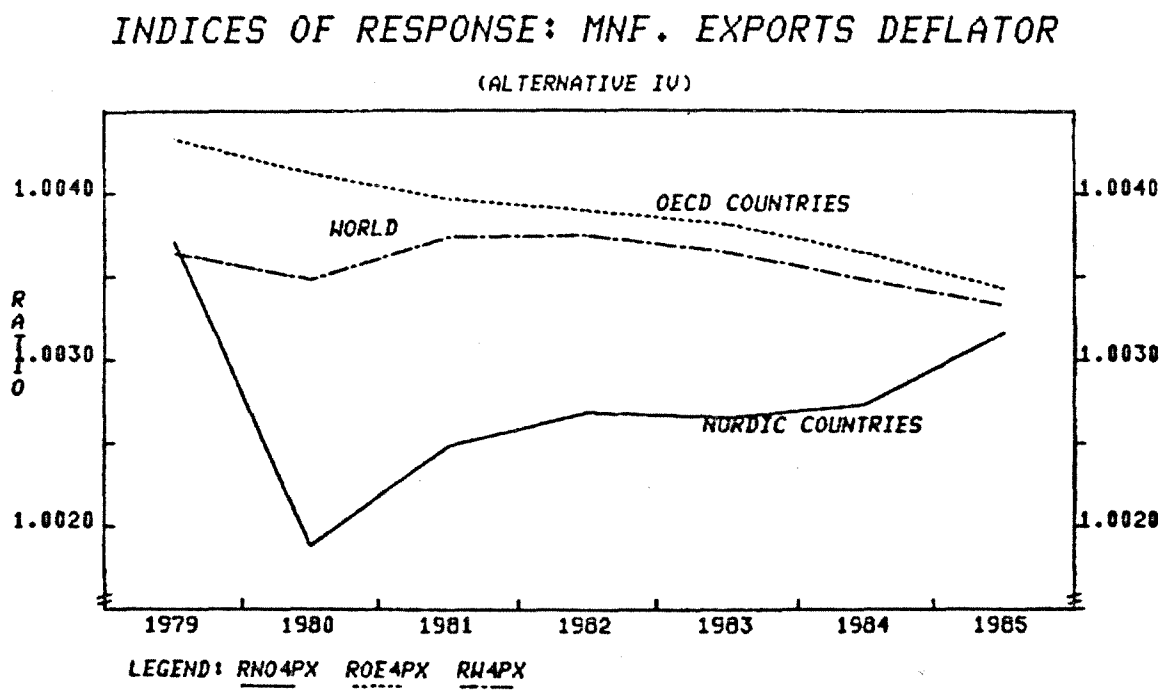
Diagram 3/III



A 3% increase in domestic inflation in the United States (Alternativer IV) prodces a 0.45% increase in Px of OECD countries as a whole; This implies that OECD excluding the united states experiences much smaller rise in Px under Alternative IV compared to the base case.

A 1.84% rise in Px for the United States with very little increase in the Px of other OECD members, means a substantial improvement in the competitive position of most of the OECD members countries. A more favorable competitive position of the other OECD countries relative to the United States results in an expansion of their real exports of manufactured goods.

Diagram 3/IV



A 10% increase in metal prices seem to have a favorable impact on the productivity in the nordic countries. As a result, Px for the nordic countries is lower under Alternative V compared to the base case. However, the decline is negligible.

Rest of the world experiences an increase in Px under alternative V, and the opposite effect occurres for a 10% decline in metal prices (Alternative VI).

Diagram 3/V

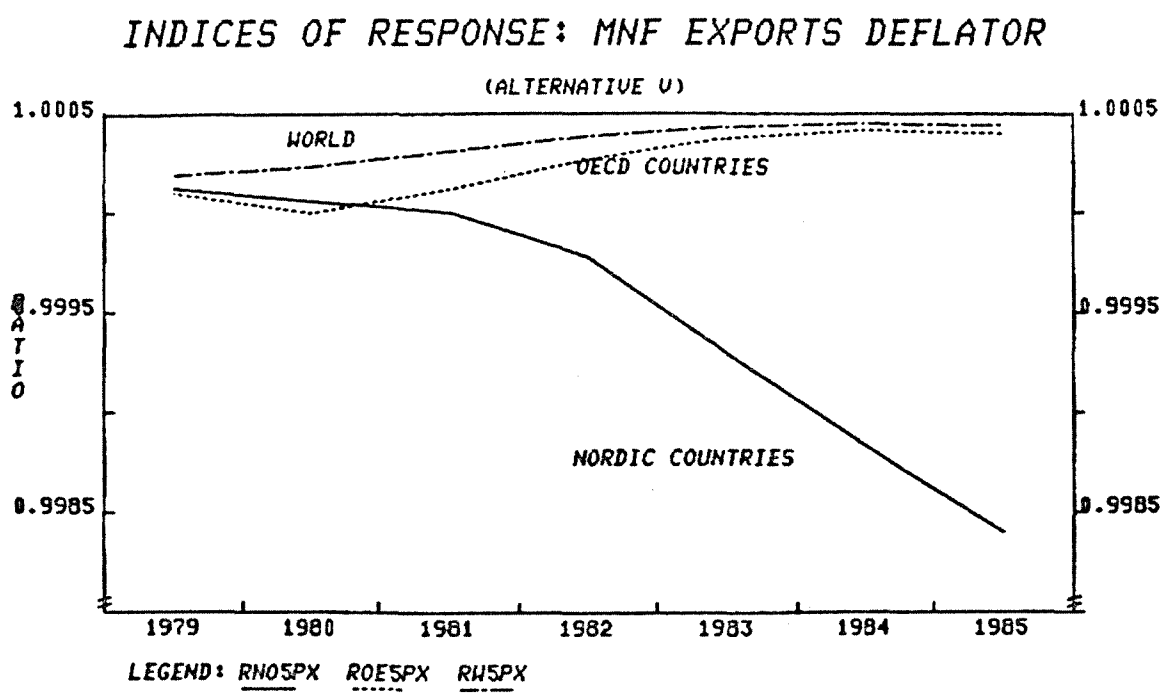
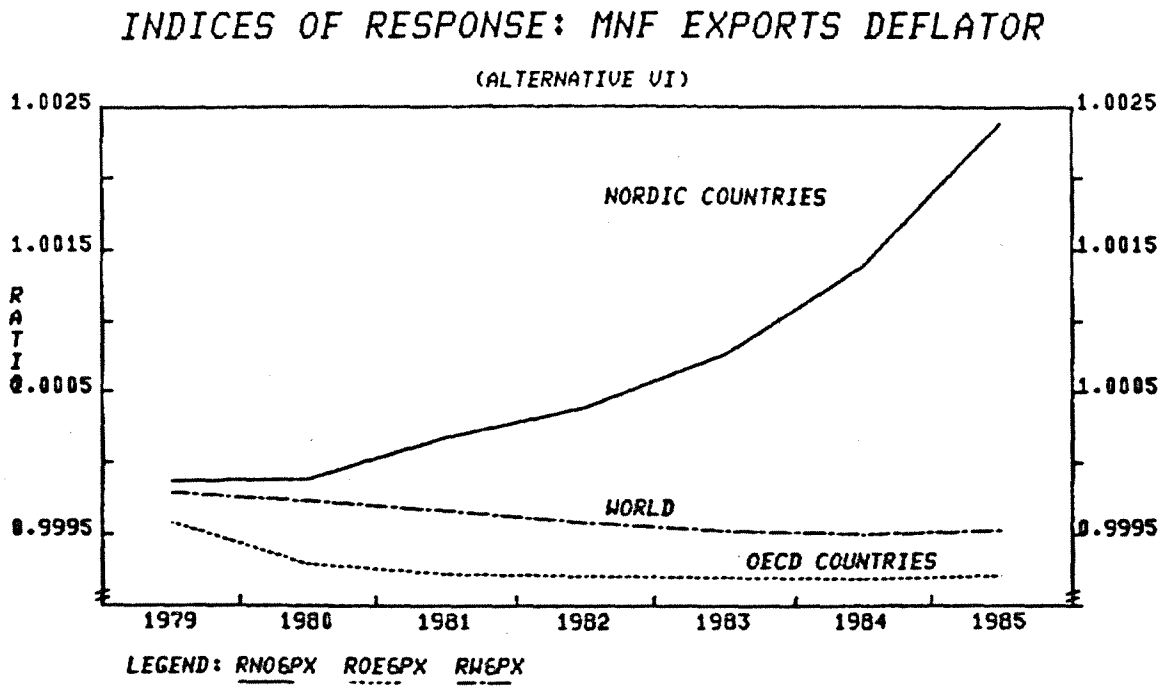


Diagram 3/VI


INDICES OF RESPONSE: MNF EXPORTS DEFLATOR
(ALTERNATIVE VI)
1.0025
1.0015
1.0005
0.9995
RATIO
NORDIC COUNTRIES
WORLD
OECD COUNTRIES
1979
1980
1981
1982
1983
1984
1985
LEGEND: RNO6PX ROE6PX RW6PX

4. Balance on Current Account:

Increases in fuel prices adversely affect the balances on current account of the non oil producing countries by raising their oil import bills. Higher oil imports bills reduce the ability of many countries to finance non-oil imports. As a result, the demand for manufactured goods in the international markets except in the OPEC nations weakens. Countries which are able to penetrate into the OPEC markets and those which have high import elasticities are able to minimize the negative effects of the upward movements of fuel prices on their current account balances, somewhat. In the OECD group as a whole, increases in oil import bills surpass any gains in exports of manufactured goods.

Diagram 4.1/I

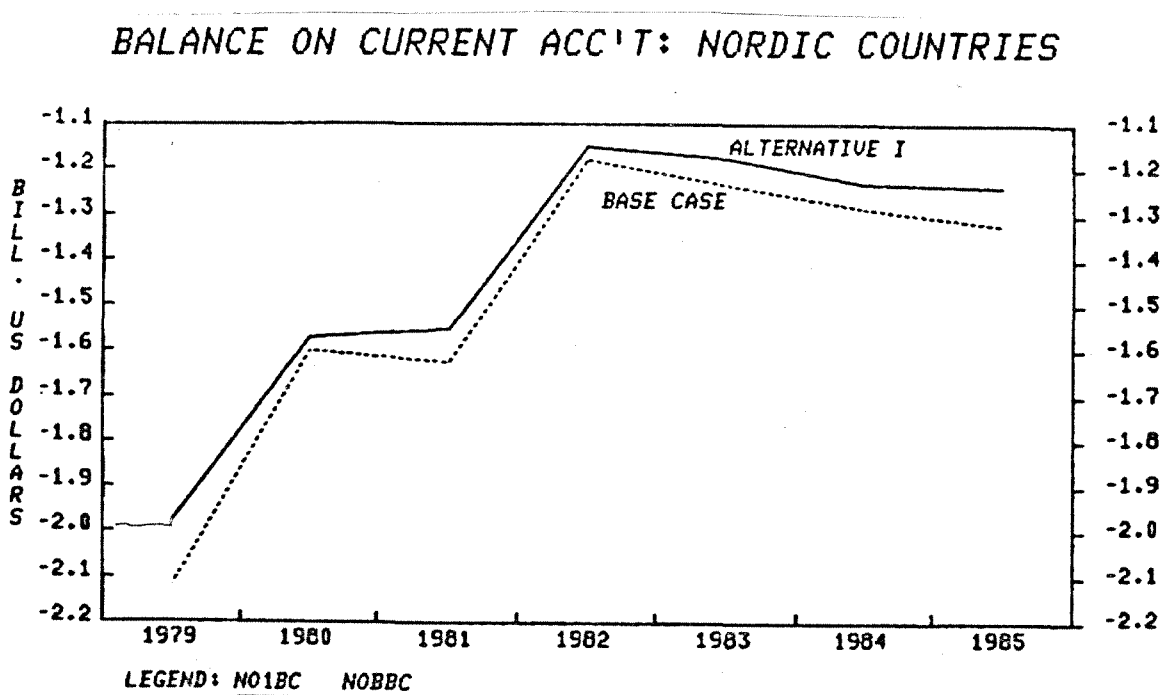


Diagram 4.2/I

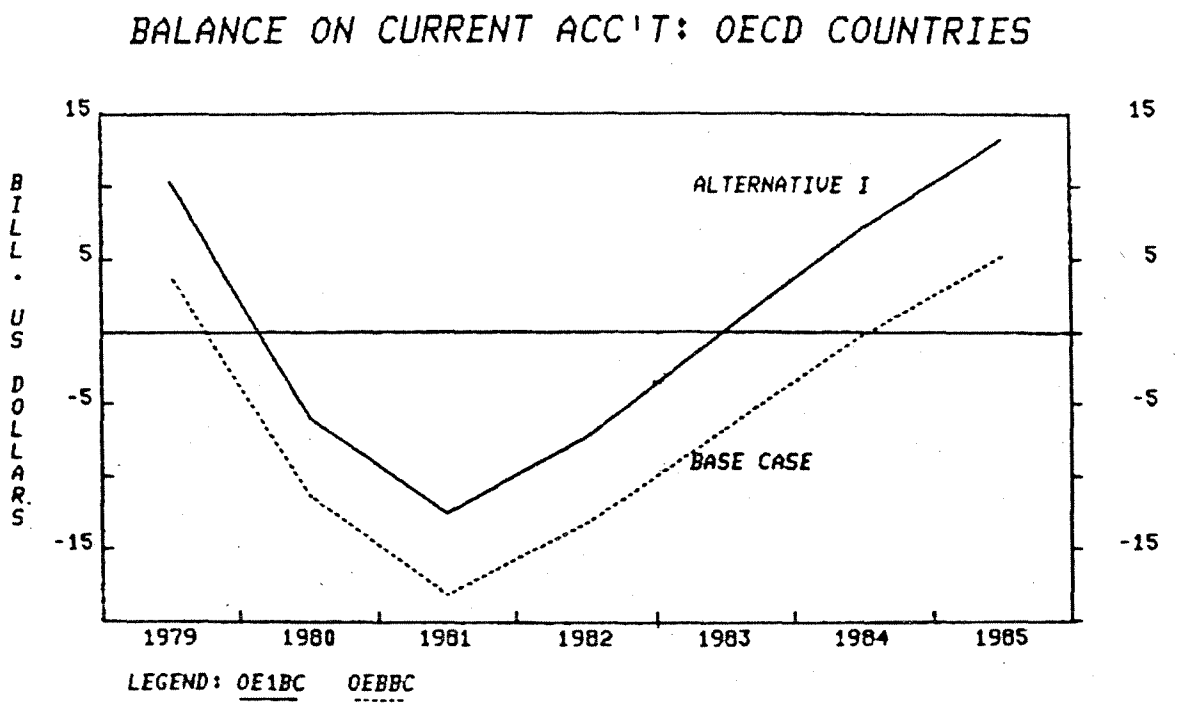

BALANCE ON CURRENT ACC'T: OECD COUNTRIES
BILL. US DOLLARS
15
5
-5
-15
ALTERNATIVE I
BASE CASE
1979
1980
1981
1982
1983
1984
1985
LEGEND: OE1BC OEBBC

Diagram 4.1/II

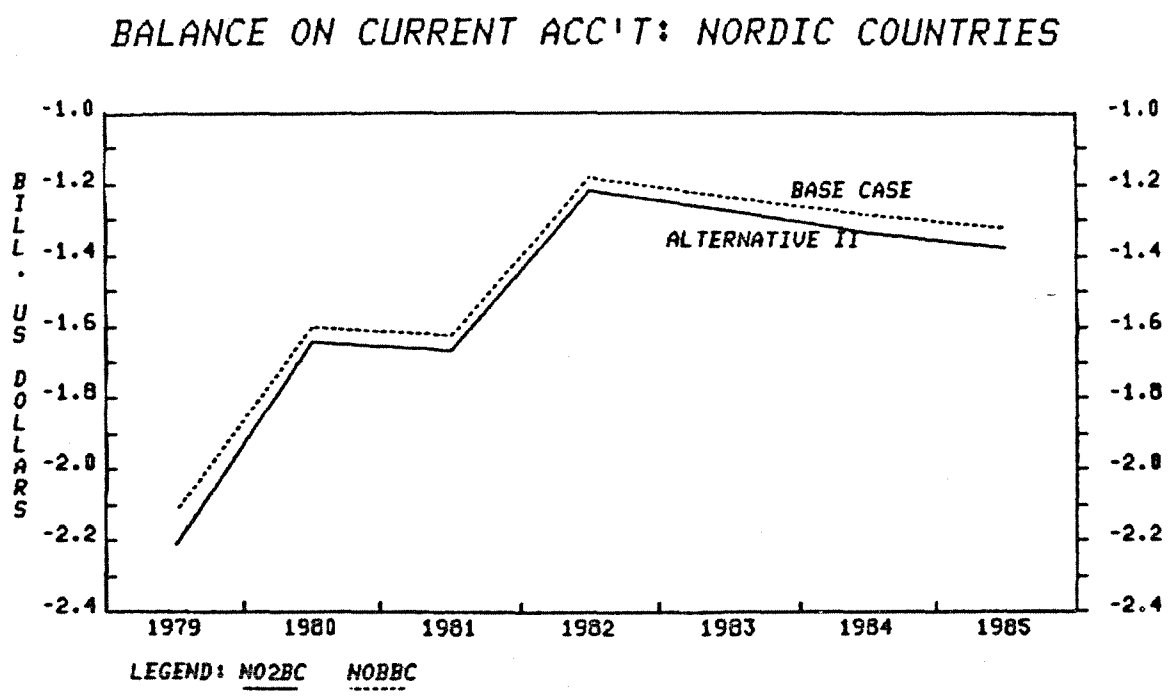
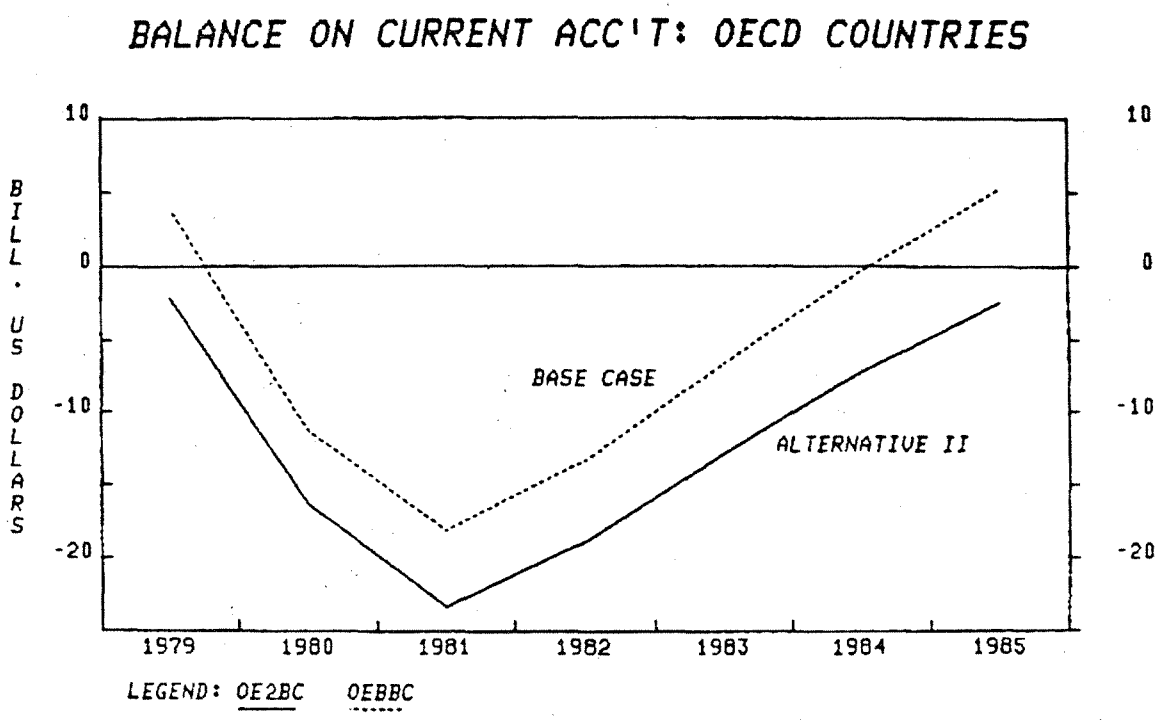
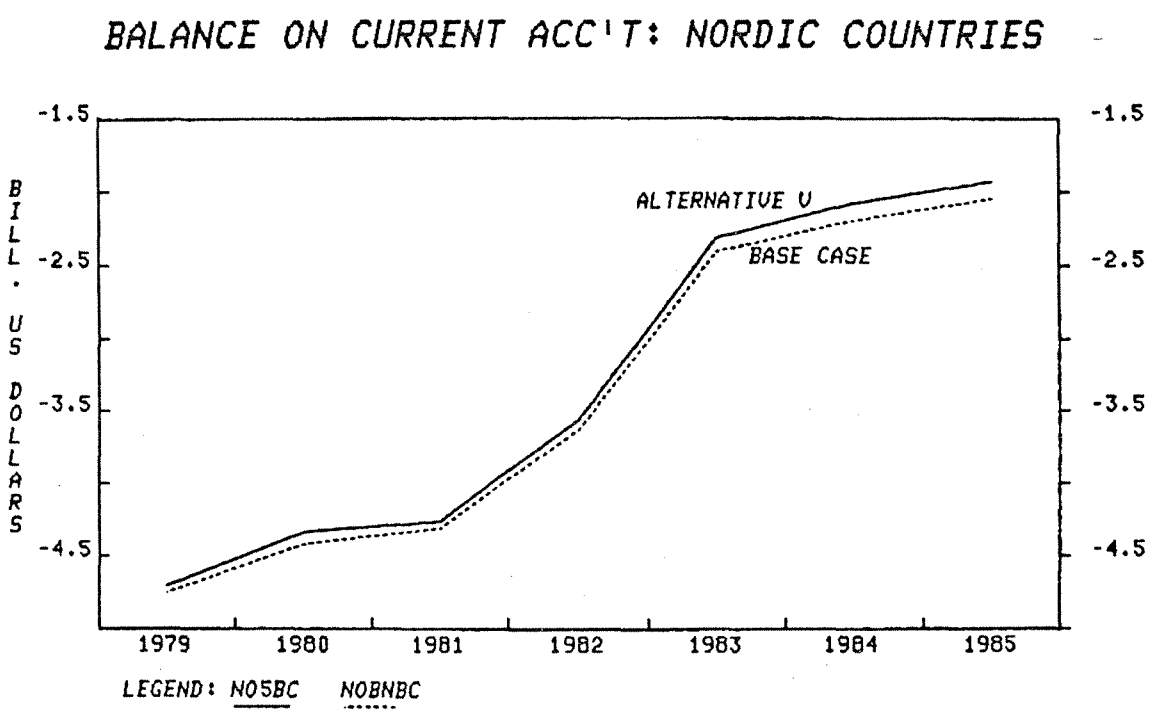


Diagram 4.2/II



A 10% rise in metal prices increases the export earnings of the nordic countries helping their balances on current account (Diagram 4/V). The balance on current account of the OECD group as a whole deteriorates in response to higher metal prices in the international markets. Diagram 4/VI shows the opposite effects when metal prices come down by 10%.

Diagram 4.1/V



Due to the relatively high dependency of Japan on imported fuels, its current account balances are the hardest hit under alternative III. Under Alternative III, the current account balances of the OECD group seem to worsen progressively throughout the simulation period.

Diagram 4.2/III

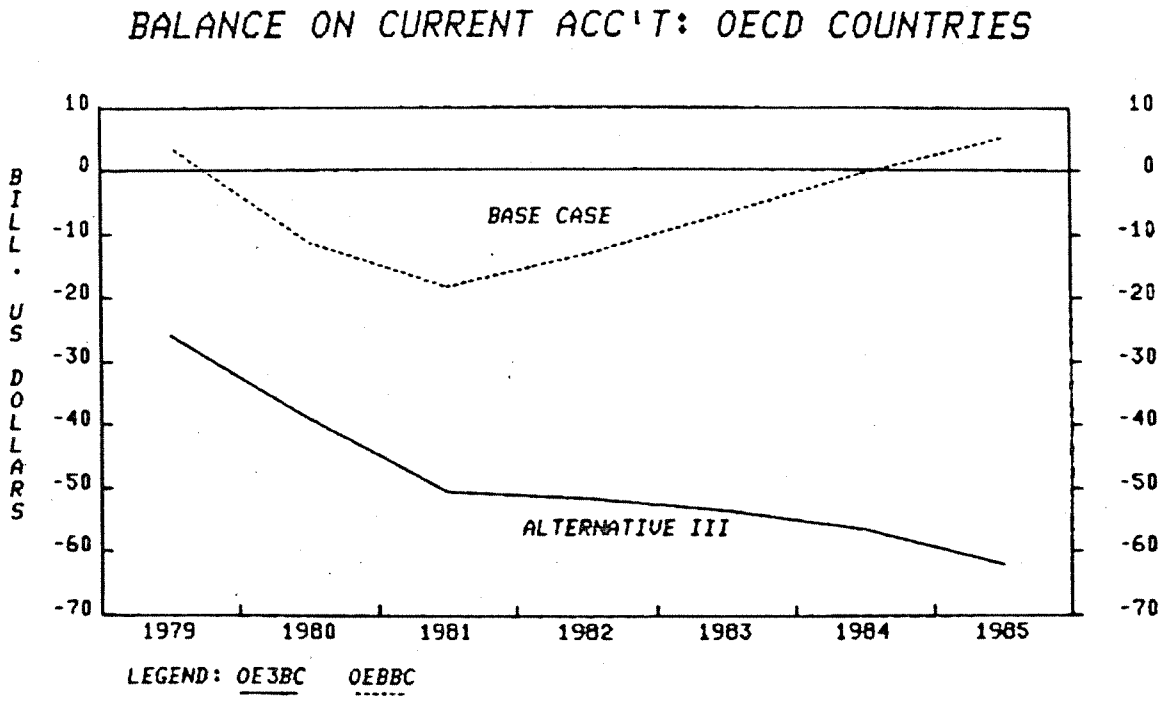


Diagram 4.1/III

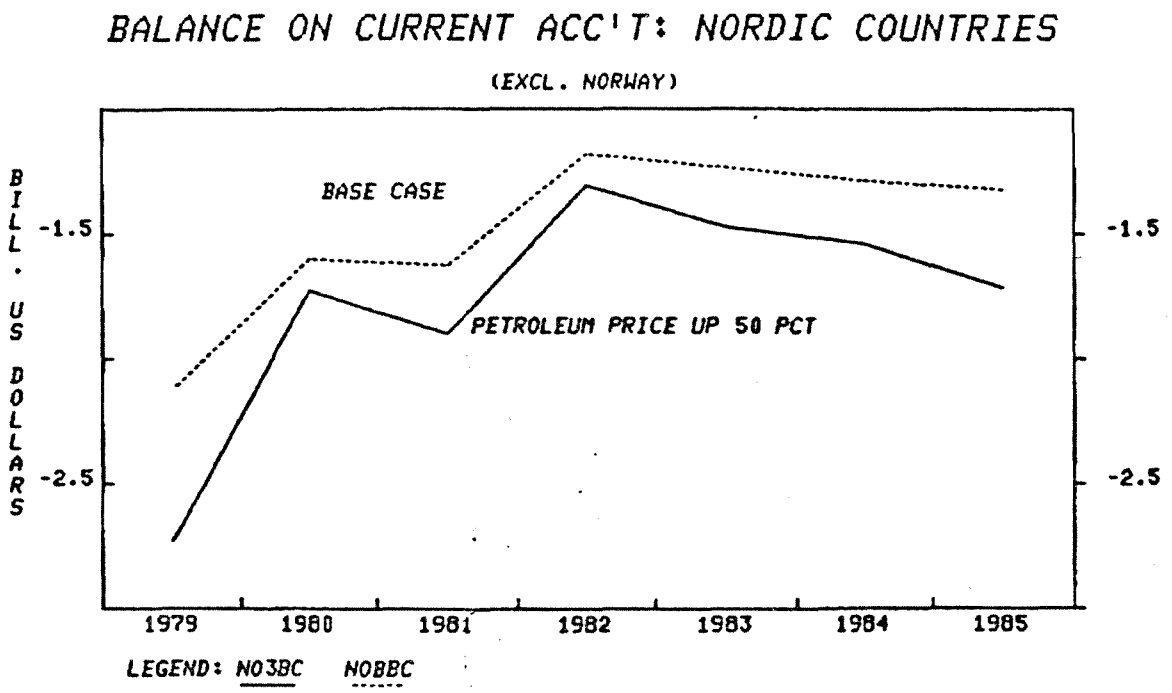
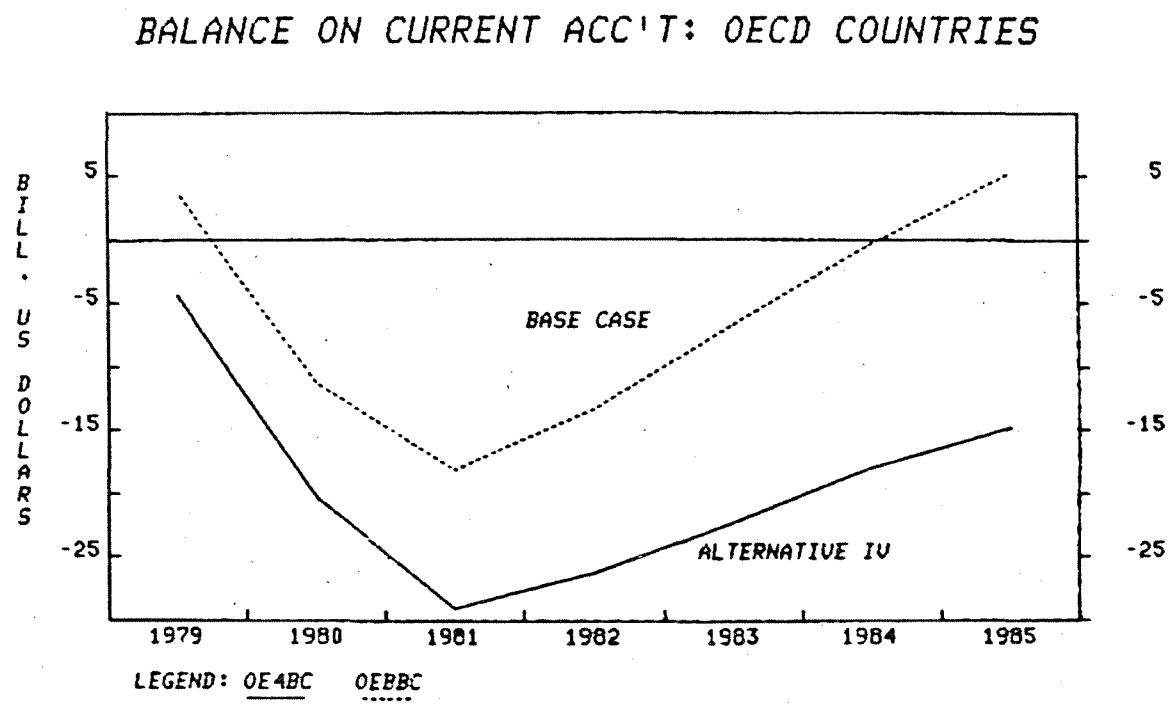


Diagram 4.2/IV



When the rate of inflation in the U.S. accelerated by 3%, Nordic countries benefit most interms of improved balances on current account while OECD group as a whole suffers deterioration of its current account balances.

Diagram 4.1/IV

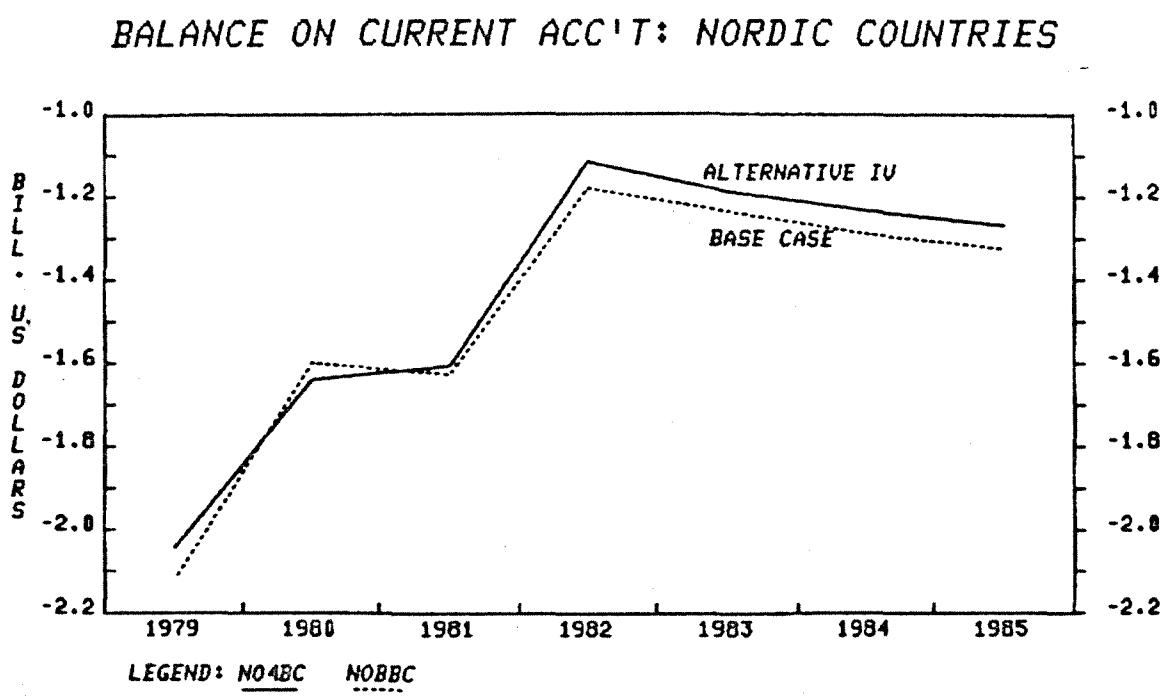


Diagram 4.2/V

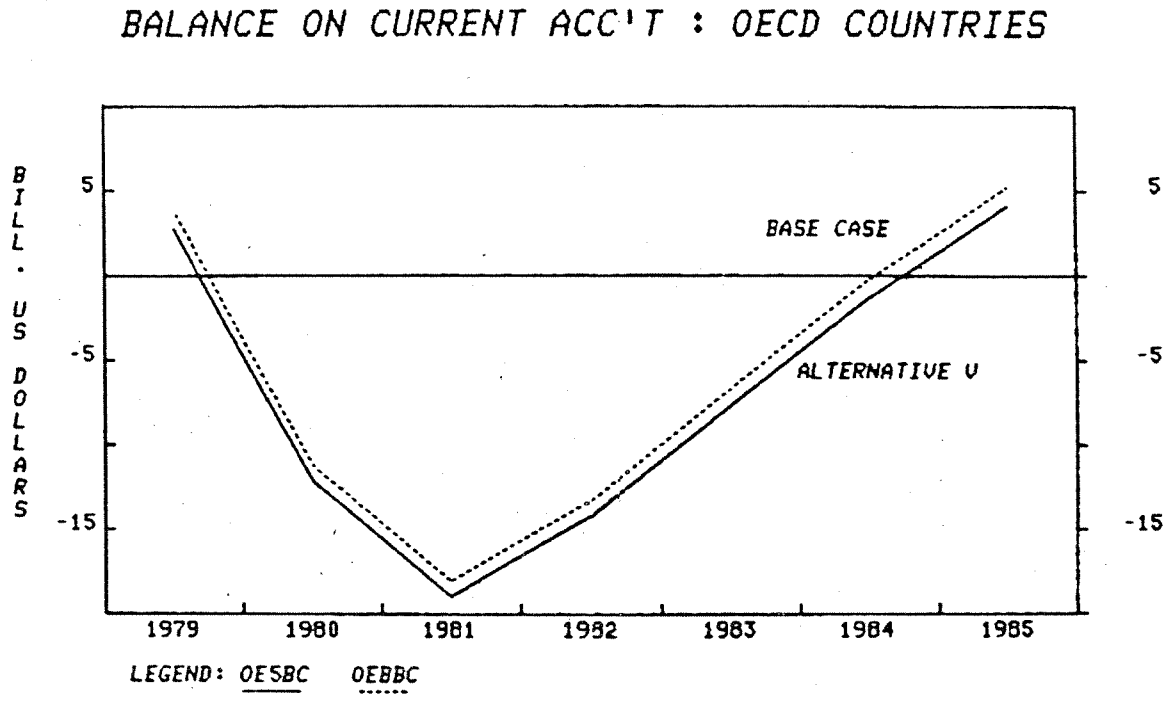

BALANCE ON CURRENT ACC'T : OECD COUNTRIES
BILL. US DOLLARS
5
-5
-15
BASE CASE
ALTERNATIVE V
1979
1980
1981
1982
1983
1984
1985
LEGEND: OESBC OEBBC

Diagram 4.1/VI

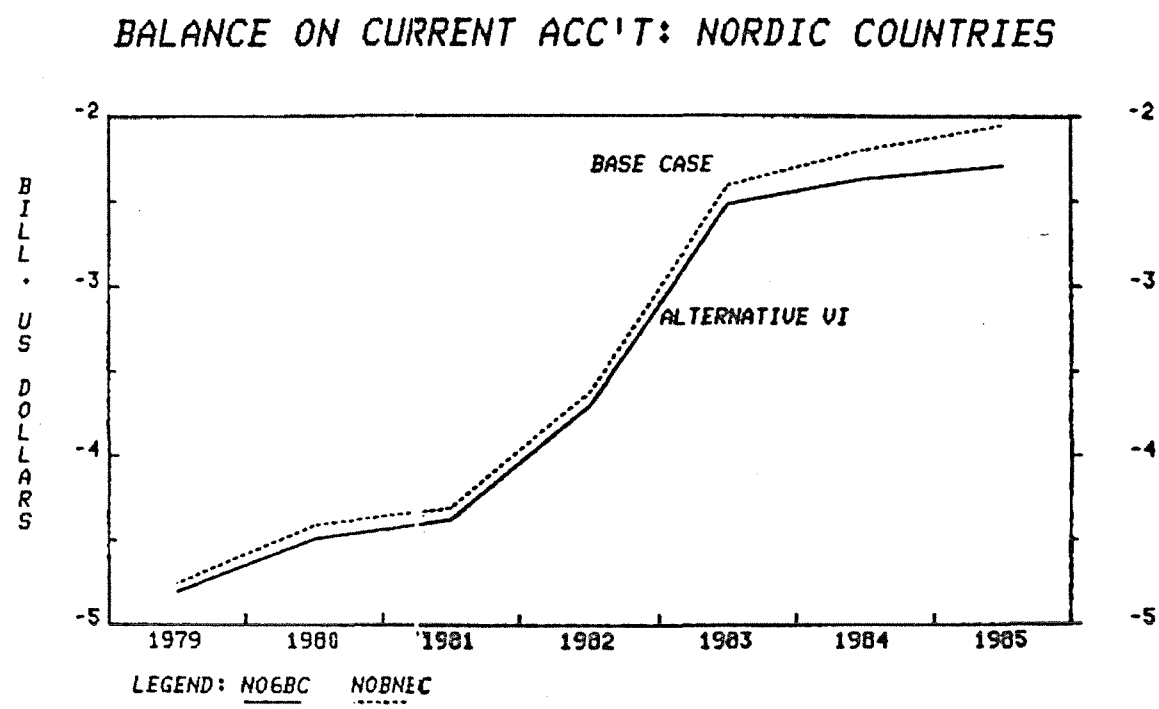


Diagram 4.2/VI