ISSN 0347-8769

Seminar Paper No. 278

OIL PRICE INCREASES AND THE STRUCTURE
OF SMALL OPEN ECONOMIES

by

Parameswar Nandakumar

Seminar Papers are preliminary material circulated to stimulate discussion and critical comment.

June, 1984

Institute for International Economic Studies
S-106 91 Stockholm
Sweden

OIL PRICE INCREASES AND THE STRUCTURE OF SMALL OPEN ECONOMIES*

Following the oil price increases in the last decade, the various OECD economies have traced out rather dissimilar patterns. This paper seeks to account, at least partially, for the differing patterns of macroeconomic adjustment, the analysis building upon the familiar Small Open Economy (SOE) model, with the incorporation of an imported good that is used in consumption as well as a factor of production. The focus is on the structure of the economy as defined in a broad sense, encompassing various structural parameters in the markets for goods and factors, and it is shown that these parameters have no insignificant role to play in determining the nature of macroeconomic adjustment in OECD economies in the wake of oil price increases. This is done with the help of an empirical study of Germany, Japan, Sweden and the United Kingdom - when as yet a net oil importer. These countries differ from one another in the degree of oil dependence, in production as well as consumption; in the intensities of labour input in the two sectors; in the degree of wage indexations; and in the nature of policies undertaken by the government in the aftermath of the oil price shock. All these differences are instrumental in producing varied responses in domestic prices, employment and output in the two sectors, and in the trade balance. This paper attempts to isolate those structural characteristics that augur well for a relatively small deterioration in output, employment and the trade balance. These would be the characteristics that distinguish 'successful' countries like Germany

and Japan from their less fortunate compatriots like Sweden and the United Kingdom. The policies actually followed in these countries are not considered, being outside the scope of this paper. It does transpire, however, that given the dissimilar structures, policies designed to, say, reduce the fall in total employment, may not take the same form in all countries.

The analysis in this paper is in the same spirit as Bruno & Sachs (1979), which are also theoretical and empirical investigations of the effects of increases in the price of intermediate goods. However, they considered only the manufacturing sectors and hence did not take up the issue of internal structural adjustment which is captured in this paper using the SOE framework. Dornbusch (1980) does work with a two-sector model and does illustrate the role of relative factor intensities in determining macroeconomic variables such as total employment. But working with a more detailed production specification, as done here, facilitates a deeper analysis of the way in which key structural parameters enter into output and price determination. Dixon, Parmenter and Powell (1982) have modelled the Australian economy in the SOE cast and simulate, among other things, the macroeconomic adjustment to an oil price increase, much in the same way as being done in this paper. But the model here differs from theirs in the specifications of the production functions and of consumer demand,¹ and so the final reduced form equations assume a different form. Besides, they are not emphasizing the importance of structure in a cross-country perspective. The methodology adopted here is also not too dissimilar from that in Gylfason & Risager (1983), though they are

actually looking at the effects of devaluation in the presence of an imported factor of production that is used in the production of a single aggregate good. Marion & Svensson (1983), working with an intertemporal three-country model, note amongst their findings that structural asymmetries between oil importers play a crucial role in determining the final goods terms of trade and relative trade balance positions. The model here differs in many ways from theirs, for instance in having a short-run view and the SOE cast, but most of the structural parameters they earmarked as important, such as the marginal propensity to consume, the degree of wage flexibility and the degree of oil dependence retain their importance in the present analysis. Again, the adoption of a two-sector model ushers in a few more important parameters that did not come to the fore in the one-sector analysis of Marion & Svensson.

In section I the model is formulated and the theoretical ground for the analysis is laid. II examines the effects of an oil price increase on domestic prices, sectoral employments, real income and the trade balance in four OECD countries, Germany, Japan, Sweden and the United Kingdom.² Section III considers the possibilities of government policies, that may differ across countries, to soften the impact of the oil price shocks. IV conducts some sensitivity tests to shed light on the importance of various structural parameters individually, and section V provides some concluding comments.

I. The Model

We view a small open economy producing traded and nontraded goods using capital, labour, and imported oil, and represent production in these sectors as

$$Q_N^S = Q_N^S [V_N(K_N, L_N), I_N] \quad (1)$$

$$Q_T^S = Q_T^S [V_T(K_T, L_T), I_T] \quad (1a)$$

Q_N^S is the gross output in the nontradable sector, and Q_T^S that in the tradable sector - the suffix 'N' denotes the nontradable sector and 'T' the tradable sector. We have chosen to nest capital K and labour L together in a domestic value added function V as in Bruno & Sachs (1979) and Schmid (1982). V is in CES form with an elasticity of substitution σ between capital and labour. The gross output function Q is itself CES with an elasticity of substitution σ_1 between V and the imported input, oil, I. In the time horizon of our interest capital accumulation does not occur, and so we may write

$$\hat{Q}_N^S = \alpha_N \hat{L}_N + \beta_N \hat{I}_N \quad (2)$$

$$\hat{Q}_T^S = \alpha_T \hat{L}_T + \beta_T \hat{I}_T \quad (2a)$$

where α_N and α_T are the shares of labour in total value added in the N & T sectors and β_N and β_T are the shares of oil in total value added. Hats indicate rates of change. The factor demands may be represented, using the properties of the CES function, as

$$\hat{L}_N - \hat{Q}_N^s = \sigma_{IN} (\hat{P}_N - \hat{P}_I) \quad (3)$$

$$\hat{L}_T - \hat{Q}_T^s = \sigma_{IT} (\hat{P}_T - \hat{P}_I) \quad (3a)$$

$$\eta_N \hat{L}_N - \hat{Q}_N^s = \sigma_{IN} (\hat{P}_N - \hat{W}) \quad (4)$$

$$\eta_T \hat{L}_T - \hat{Q}_T^s = \sigma_{IT} (\hat{P}_T - \hat{W}) \quad (4a)$$

where

$$\eta_N = \frac{\sigma_N \alpha_N + \sigma_{IN} (1 - \alpha_N - \beta_N)}{\sigma_N (1 - \beta_N)} \quad (4b)$$

$$\eta_T = \frac{\sigma_T \alpha_T + \sigma_{IT} (1 - \alpha_T - \beta_T)}{\sigma_T (1 - \beta_T)} \quad (4c)$$

P_N is the price of the nontraded good, W is the nominal wage rate and P_T and P_I are the world prices of the traded good and oil, setting the exchange rate equal to unity. Derivations of these factor demand forms are available in Bruno & Sachs (1979), and are provided in the appendix.

Private consumption comprises of the two final goods as well as of oil. The development of the consumer price index is represented as

$$\hat{P}_C = \lambda \hat{P}_T + \gamma \hat{P}_N + (1 - \lambda - \gamma) \hat{P}_I \quad (5)$$

where λ and γ are the shares of the traded and the nontraded good in the consumption bundle. Substituting from (3), (4) and (5) into (2),

$$\begin{aligned} (1 - \alpha_N - \beta_N) \hat{Q}_N^s &= [(\alpha_N \sigma_N) (1 - \gamma) + \beta_N \sigma_N \eta_N] \hat{P}_N - \\ &- [\beta_N \sigma_N \eta_N + \alpha_N \sigma_N (1 - \lambda - \gamma)] \hat{P}_I - \alpha_N \sigma_N \lambda \hat{P}_T - \alpha_N \sigma_N \hat{W}_R \end{aligned} \quad (6)$$

where W_R is the real wage measured in terms of the consumer price index. Similarly proceeding,

$$\begin{aligned} (1 - \alpha_T - \beta_T)\hat{Q}_T^S = & -\alpha_T\sigma_T\gamma\hat{P}_N + [(\alpha_T\sigma_T)(1 - \lambda) + \beta_T\sigma_T\eta_T]\hat{P}_T \\ & - [\beta_T\sigma_T\eta_T + (\alpha_T\sigma_T)(1 - \lambda - \gamma)]\hat{P}_I - \alpha_T\sigma_T\hat{W}_R \end{aligned} \quad (7)$$

(6) states that when real wages are rigid the supply of non-tradable goods increases with an increase in the price of the non-traded good and decreases with increases in the price of the traded good and of oil.³ Since we will be undertaking a comparative study across countries of the macroeconomic effects of oil price increases, it may be noted that larger values of α_N , β_N , σ_N and σ_{IN} make the supply curve flatter and also cause a greater upward shift of the supply curve in the wake of the external shocks. A smaller value for γ , the share of the nontraded good in the consumption bundle, implies a smaller rise in the nominal wage as p_N rises and so favours a flatter supply curve. Similarly a larger share of oil in the consumption bundle increases the upward shift of the supply curve following the oil price shock. From (6) it may also be seen that larger values for α_N and β_N lead to a greater upward shift of the supply curve following an increase in the real wage. Similarly (7) states that the supply of tradable goods falls with increases in the real wage or in the price of nontradable goods and oil, and rises with an increase in the price of the tradable good.

Aggregate demand for the nontradable good is given by

$$Q_N^d = C_N(Y_D, \frac{P_N}{P_T}, \frac{P_I}{P_T}) + G_N \quad (8)$$

C_N is total private consumption described as depending upon disposable income and prices measured in terms of traded goods. We assume

$$1 > \frac{\partial C_N}{\partial Y_D} > 0, \quad \frac{\partial C_N}{\partial \left(\frac{P_N}{P_T}\right)} < 0 \quad \& \quad \frac{\partial C_N}{\partial \left(\frac{P_I}{P_T}\right)} > 0. \quad G_N \text{ is government expenditure}$$

on nontraded goods.

Disposable income is obtained by subtracting value added by the intermediate input from total output, both being now measured in traded goods units. In terms of rates of change,

$$\hat{Y}_D = \Sigma_T \hat{Y}_T + \Sigma_N \hat{Y}_N + \Sigma_N (\hat{P}_N - \hat{P}_T) \quad (9)$$

where Σ_N and Σ_T are the shares of the nontradable and tradable sectors respectively in domestic value added and

$$\hat{Y}_T = \hat{Q}_T^s - \frac{\beta_T}{1 - \beta_T} [(1 - \sigma_{1T})(\hat{P}_I - \hat{P}_T)] \quad (9a)$$

$$\hat{Y}_N = \hat{Q}_N^s - \frac{\beta_N}{1 - \beta_N} [(1 - \sigma_{1N})(\hat{P}_I - \hat{P}_N)] \quad (9b)$$

In (9), given gross output,

$\Sigma_T \frac{\beta_T}{1 - \beta_T} (\hat{P}_I - \hat{P}_T) + \Sigma_N \frac{\beta_N}{1 - \beta_N} (\hat{P}_I - \hat{P}_N)$ is the fall in disposable income due to a terms of trade effect as the price of oil rises relative to that of final goods produced at home.

$\Sigma_T \frac{\beta_T}{1 - \beta_T} \sigma_{1T} (\hat{P}_I - \hat{P}_T) + \Sigma_N \sigma_{1N} (\hat{P}_I - \hat{P}_N)$ is the increase in disposable income as there is substitution away from oil towards domestic factors.

Use (9) in (8) and adopt the following notation:

E_Y - Elasticity of C_N with respect to Y_D .

E_P - " " " " " " $\frac{P_N}{P_T}$.

E_I - " " " " " " $\frac{P_I}{P_T}$.

Then we get the following expression for the change in aggregate demand for nontraded goods:

$$\hat{Q}_N^d = \hat{A}_N + \hat{B}_I + \hat{C}_R + \hat{D}_T + \hat{F}_N \quad (10)$$

where A, B, C, D and F are given by

$$\left(\frac{Q_N^d}{C_N} \cdot M\right)A = \left[- \frac{\alpha_T \sigma_T}{1 - \alpha_T - \beta_T} \gamma \Sigma_T + \Sigma_N \right] E_Y + E_P + \frac{\beta_N}{1 - \beta_N} \Sigma_N (1 - \sigma_{1N}) E_Y \quad (10a)$$

$$\left(- \frac{Q_N^d}{C_N} M\right)B = \left[\frac{\beta_T \sigma_T \eta_T}{(1 - \alpha_T - \beta_T)} + \frac{\beta_T}{1 - \beta_T} (1 - \sigma_{1T}) + \frac{\alpha_T \sigma_T}{(1 - \alpha_T - \beta_T)} (1 - \lambda - \gamma) \right] \Sigma_T E_Y + \frac{\beta_N}{1 - \beta_N} (1 - \sigma_{1N}) \Sigma_N E_Y - E_I \quad (10b)$$

$$\left(- \frac{Q_N^d}{C_N} M\right)C = \frac{\alpha_T \sigma_T}{(1 - \alpha_T - \beta_T)} \Sigma_T E_Y \quad (10c)$$

$$\left(\frac{Q_N^d}{C_N} M\right)D = \left[\frac{\alpha_T \sigma_T \gamma}{(1 - \alpha_T - \beta_T)} + \frac{\beta_T \sigma_T \eta_T}{(1 - \alpha_T - \beta_T)} + \frac{\beta_T}{1 - \beta_T} (1 - \sigma_{1T}) \right] \Sigma_T - \Sigma_N \Big] E_Y - E_P - E_I \quad (10d)$$

$$(M)F = \frac{G_N}{Q_N^d} \quad (10e)$$

$M = 1 - \frac{C_N}{\alpha_N} \Sigma_N E_Y$, is the inverse of the relevant Keynesian multiplier.

'A' has to be negative if the demand curve for N is to be downward sloping. In (10a) E_P is a negative substitution effect which has to outweigh any net positive income effects. The last term in (10a) is a positive income effect due to the rise in disposable income

in the N sector as P_N rises - relative to P_I . In the first bracketed term, the first term is a negative income effect as the tradable sector contracts due to the rise in the product wage in this sector following an increase in P_N - with constant real wages; the second term is just a price effect on income as P_N rises, since disposable income is being measured in units of traded goods. It is assumed that the negative substitution and income effects dominate so that A is negative and the empirical section will validate this assumption.

'B', the shift in the demand curve following an increase in P_I , would also be negative, the positive substitution effect E_I being the only positive term in (10b). The first three terms are all negative income effects as the T sector contracts. The first term is the effect due to the fall in gross output of the sector as P_I rises, the second term is the effect due to the fall in domestic value added within a given level of gross output, and the third term is the effect due to the fall in gross output as the product wage in this sector rises in response to the rise in P_I to keep the real wage constant. The fourth term is a negative income effect as disposable income arising in the nontraded sector falls within the same level of output as P_I rises - relative to P_N .

From (10) and (6) we can solve for the equilibrium values of $\hat{Q}_N$ and $\hat{P}_N$. Figure (1) provides a graphical representation.

Fig. 1

The demand curve slopes downwards, assuming 'A' is negative.

Increases in the price of oil or in the real wage rate $-C'$ in (10c) is negative - shift the demand curve to the left. The effect of a rise in P_T is not unambiguous, looking at the sign of D in (10d), but is likely to be positive. So a rise in P_T may shift the demand curve for N to the right.

The supply curve of N slopes upwards; in (6) the coefficient of $\hat{P}_N$ is positive. It is also seen from (6) that increases in P_I , P_T and W_R shift the supply curve upwards and to the left.

So it is seen that with an increase in P_I , output of N must fall. The effect on P_N is likely to be positive, and will depend on the extent to which the supply and demand schedules shift to the left. If the supply shift dominates then P_N rises.

We can now proceed to obtain formal solutions for $\hat{Q}_N$ and $\hat{P}_N$.
From (6) and (10),

$$\begin{aligned} & \left[(1 - \alpha_N - \beta_N)A - [\alpha_N \sigma_N (1 - \gamma) + \beta_N \sigma_N \eta_N] \right] \hat{Q}_N = \\ & \left[-B[\alpha_N \sigma_N (1 - \gamma) + \beta_N \sigma_N \eta_N] - A[\alpha_N \sigma_N (1 - \lambda - \gamma) + \beta_N \sigma_N \eta_N] \right] \hat{P}_I - \\ & \left[C[\alpha_N \sigma_N (1 - \gamma) + \beta_N \sigma_N \eta_N] + A\alpha_N \sigma_N \right] \hat{W}_R - \\ & \left[D[\alpha_N \sigma_N (1 - \gamma) + \beta_N \sigma_N \eta_N] + A\alpha_N \sigma_N \lambda \right] \hat{P}_T - \\ & \left[\alpha_N \sigma_N (1 - \gamma) + \beta_N \sigma_N \eta_N \right] \hat{F} \hat{G}_N \end{aligned} \quad (11)$$

$$\begin{aligned} & \& \\ & \left[(1 - \alpha_N - \beta_N)A - [\alpha_N \sigma_N (1 - \gamma) + \beta_N \sigma_N \eta_N] \right] \hat{P}_N = \\ & \left[- (1 - \alpha_N - \beta_N)B - [\alpha_N \sigma_N (1 - \lambda - \gamma) + \beta_N \sigma_N \eta_N] \right] \hat{P}_I - \\ & \left[(1 - \alpha_N - \beta_N)C + \alpha_N \sigma_N \right] \hat{W}_R - \\ & \left[(1 - \alpha_N - \beta_N)D + \alpha_N \sigma_N \lambda \right] \hat{P}_T - \hat{F} \hat{G}_N \end{aligned} \quad (12)$$

Let us take a look at the coefficients of $\hat{P}_I$ in (11) and (12).
It is negative in (11), so that Q_N definitely falls. In (12), for
it to be positive, the following condition has to be satisfied:

$$\beta_N \sigma_N \eta_N + \alpha_N \sigma_N (1 - \lambda - \gamma) > (1 - \alpha_N - \beta_N)B \quad (12a)$$

(12a) just points out that the coefficient of $\hat{P}_I$ in (6), the equation
for change in supply of N, should be more negative than that
in (10), the equation for change in demand for N, for P_N to rise.

Price adjustment in the nontraded market

The movement of P_N with a disturbance in P_I is of interest since, P_T being fixed, that will decide the development of relative prices in the economy. When W_R , P_T and G_N are unchanged, (12) may be written as

$$\begin{aligned} \frac{\hat{P}_N}{\hat{P}_I} &= - \frac{\frac{[\alpha_N \sigma_N (1 - \lambda - \gamma) + \beta_N \sigma_N \eta_N]}{1 - \alpha_N - \beta_N} - B}{A - \frac{[\alpha_N \sigma_N (1 - \gamma) + \beta_N \sigma_N \eta_N]}{1 - \alpha_N - \beta_N}} \\ &= \frac{\text{shift of supply curve} - \text{shift of demand curve}}{\text{slope of demand curve} \left(\frac{\hat{Q}_N^d}{\hat{P}_N} \right) - \text{slope of supply curve} \left(\frac{\hat{Q}_N^s}{\hat{P}_N} \right)} \quad (12b) \end{aligned}$$

(12b) may be obtained directly from figure 1. In figure 1,

$$\frac{\hat{P}_N}{\hat{P}_I} = XV = \frac{uz - uv}{\tan \theta_d - \tan \theta_s} = \frac{\text{Shift of SS} - \text{Shift of DD}}{\frac{\hat{Q}_N^d}{\hat{P}_N} - \frac{\hat{Q}_N^s}{\hat{P}_N}}$$

The advantage of obtaining (12b) from the reduced form for $\hat{P}_N$ is that the importance of the structural parameters in determining the slopes and shifts of the demand and supply curves is brought out clearly. It is seen that the numerator of (12b) is smaller when the structural parameters in the tradable sector, β_T , α_T , σ_T and σ_T , are large relative to those in the nontradable sector, and when the share of oil in the consumption bundle is small. Larger values of these traded sector parameters - at unchanged nontraded sector parameters - also increase the denominator of (12b) by accentuating the - negative - slope of the demand curve. So we may include that relatively large

differences in structural parameters between the two sectors with higher values for those of the tradable sector imply a smaller rise in the price of the nontraded good following an increase in the price of oil.⁴ So does a small share of oil in the consumption bundle. The economic intuition behind (12b) is as follows: The oil price increase raises the relative price of oil in terms of the final goods and both sectors reduce output. The reduction in the output of the nontraded good is smaller for smaller values of α_N , β_N , σ_N and σ_{IN} . A small share of oil in the consumption bundle means that the product wage rises less in this sector and this also acts to keep the fall in output small. Larger values for α_T , β_T , σ_T and σ_{IT} cause a larger fall in the output of the traded goods sector, and hence in disposable income and demand for the nontraded good.⁵ Hence relatively large values for the tradable sector parameters and a small consumption share of oil act to keep down the rise in excess demand for the nontraded good and hence curtail the rise in its price. A high marginal propensity to consume the nontraded good, E_Y , also acts to bring down the demand for the nontraded good sharply as disposable income falls. A relatively small increase in the price of the nontraded good would mean that the product wage in the traded sector rises relatively less so that in the new equilibrium situation the fall in employment and output of this sector is also less pronounced.

The inclusion of oil in the consumption bundle affects the development in two ways. Firstly, there is an additional impetus to the increase in nominal product wages under real wage rigidity and this accentuates the fall in supply of the nontraded good. Secondly, there is substitution

in consumption away from oil towards the nontraded good, and this reduces the fall in demand. So on both counts the effect is a larger increase in P_N than when oil is used solely as a factor of production.

Output adjustment in the nontraded market

Holding P_T , W_R & O_N unchanged, (11) may be written as⁶

$$\frac{\hat{Q}_N}{\hat{P}_I} = \frac{(\text{shift of SS})(\text{slope of DD}) - (\text{shift of DD})(\text{slope of SS})}{\text{slope of DD} - \text{slope of SS}} \quad (12c)$$

The composition of the shifts & slopes are as indicated in (12b). Both shifts have a negative sign, the slope of DD is negative, while that of SS is positive. So the output of N falls unambiguously. Increases in the shifts of SS & DD accentuate the fall. The shift in SS is smaller for smaller values of oil and labour-intensities and elasticities of factor substitution. For two countries with the same values of these parameters, nontraded output falls more for the country that has experienced a smaller rise in P_N - which in turn, as we have seen in the discussion about price adjustment, occurs when that country has relatively higher values of these parameters in the tradable sector. In figure 1, for the same upward shift of the supply curve, a greater downward shift of the demand curve implies a lower price as well as output in the nontraded sector. It may be observed that larger values of the traded sector parameters also increase the slope of the demand curve which also acts to lower price and output. This may be seen by increasing the slope of DD in figure 1 for the same shift.

Labour input in the nontraded sector can be obtained from (4) as

$$\hat{L}_N = \frac{1}{\eta_N} \hat{Q}_N - \frac{\sigma_{1N}}{\eta_N} [\hat{W}_R + \lambda \hat{P}_T - (1 - \gamma) \hat{P}_N + (1 - \lambda - \gamma) \hat{P}_I] \quad (13)$$

Substituting the solved values of $\hat{P}_N$ and $\hat{Q}_N$ into (13) we can obtain $\hat{L}_N$ in terms of $\hat{W}_R$, $\hat{P}_T$, $\hat{P}_I$ and $\hat{G}_N$, increasing with $\hat{G}_N$ and decreasing with $\hat{P}_I$ and $\hat{W}_R$.

The traded goods sector

Equation (7) describes the change in output of the traded goods sector. Substituting from (12), the reduced form solution for $\hat{P}_N$, the rate of change of output of the traded sector can be represented as increasing in its own price and decreasing in the real wage and in the price of oil. Figure 2 represents equilibrium in the traded goods market. The supply schedule slopes upwards, and is shifted

Fig. 2

upwards by increases in the real wage or in the price of oil.

Combined with a horizontal demand schedule, it is clear that such shifts of the supply curve imply reduced output at the prevailing price.

The upward shift of the supply curve following an increase in P_I is greater for larger values of the labour and oil-intensities in production and the elasticities of substitution between factors in this sector, for the same movement of P_N . Higher shares of oil and the nontraded good in the consumption bundle imply a larger rise in the product wage and hence a greater reduction in output of the tradable sector, the supply curve shifting up more.

Labour input in the tradable sector is obtained from (4a)

as

$$\hat{L}_T = \frac{1}{\eta_T} \hat{Q}_T - \frac{1}{\eta_T} \sigma_{LT} \left[\hat{W}_R - (1 - \lambda) \hat{P}_T + \gamma \hat{P}_N + (1 - \lambda - \gamma) \hat{P}_I \right] \quad (14)$$

Substituting for $\hat{Q}_T$ and $\hat{P}_N$, we can get $\hat{L}_T$ in terms of $\hat{P}_T$, $\hat{W}_R$, $\hat{P}_I$ and $\hat{G}_N$. The change in total employment is given by

$$\hat{L} = \frac{L_T}{L} \hat{L}_T + \frac{L_N}{L} \hat{L}_N \quad (15)$$

Trade balance

The trade balance is given by⁷

$$TB = Y_D - E - G_N \frac{P_N}{P_T} \quad (16)$$

TB is the trade balance and E is total private expenditure, both measured in units of traded goods. Differentiating (16),

$$\frac{d(TB)}{Y_D} = \hat{Y}_D - \frac{E}{Y_D} \hat{E} - \frac{P_N G_N}{P_T Y_D} (\hat{G}_N + \hat{P}_N - \hat{P}_T), \text{ or}$$

$$\frac{d(TB)}{Y_D} = \hat{Y}_D (1 - \ell) - \frac{P_N G_N}{P_T Y_D} (\hat{G}_N + \hat{P}_N - \hat{P}_T) \quad (17)$$

where ℓ is the marginal propensity to spend.⁸

Significance of structure

It may be appropriate, before moving on to the empirical section, to recapitulate what the theoretical analysis has thrown up regarding the importance of the structure of the economy in the process of macroeconomic adjustment to oilprice shocks. In the comparative study of countries it will be assumed - for want of accurate, strictly comparable estimates - that the elasticities of demand and factor substitution are identical across countries. But the importance of variations in other structural parameters is discussed and we will confine our present concise remarks to those. It has been seen that relatively large values of labour and oil-intensities in the tradable sector lead to a relatively small rise in excess demand for the non-traded good and hence in its price. Under real wage rigidity this works to reduce the fall in supply in the tradable sector. At the same time, low-absolute-values of labour and oil-intensities in both sectors help to reduce the fall in output of both goods. So what seems to be desirable is a sizeable structural disparity between the two sectors with the tradable sector being relatively oil and labour-intensive, combined with low absolute values for oil and labour-intensities in both sectors. A low consumption share of oil is an added blessing since it leads to a relatively small direct impact on product wages. A low share of the nontraded good in consumption implies a smaller rise of the product wage and hence a smaller fall in output of the tradable sector. It may be added that all the countries studied with the exception of Japan exhibit greater labour-intensity in the tradable sector so that this sector holds the key to a relatively less painful development in total employment.

II. Empirical Analysis

This section studies the macroeconomic effects of an oil price increase on four OECD countries, Germany, Japan, Sweden and the United Kingdom, for the years 1973 and 1978.⁹ The actual policies followed in these countries during these years are not studied; what is studied is the isolated effect of the oil price increase, given the structural parameters for these years. The empirical work involves splitting up of the national accounts of each country into tradable and nontradable sectors. The results are affected by the nature of this division inasmuch as important structural parameters such as the factor intensities of production vary with the division adopted. We define these sectors initially as in Brundell & Söderström (1983). The tradable sector consists of manufacturing and mining & quarrying. The nontradable sector is comprised of utilities, construction and distribution. Table 1 gives the values of the relevant structural parameters, according to this division, for the year 1978. For data sources, please see appendix 1.

Table 1. Parameter values for 1978

	α_N	β_N	α_T	β_T	λ	γ	ϵ_N	ϵ_T
Germany ^{a)}	0.54	0.01	0.68	0.03	0.66	0.31	0.35	0.65
Japan	0.58	0.02	0.54	0.02	0.55	0.45	0.46	0.54
Sweden	0.73	0.03	0.84	0.03	0.57	0.41	0.46	0.54
UK	0.55	0.02	0.81	0.04	0.53	0.46	0.52	0.48

a) 1977 values for Germany

Also, we assume the following for all countries: $E_y = 0.6$; $E_p = -0.2$; $E_I = 0$; $\sigma_T = \sigma_N = 0.9$; $\sigma_{IN} = \sigma_{IT} = 0.8$.

These values are being assumed because even though estimates of these parameters are available for individual countries, they may not be of a comparable nature.¹⁰ By assuming identical values of all countries, variations in the macroeconomic adjustment process due to variations in these elasticities are isolated away. In the final section the sensitivity of the results to changes in some of these assumed values will be studied.

The effects of an increase in the price of oil in the year 1978, relative to the price of T, which is kept fixed, are listed in Table 2. The only new macroeconomic variable which appears there is Y_R , which is nominal income deflated by the consumer price-index- as opposed to Y_D , which is income measured in units of traded goods.

Table 2. Ten percent increase in the price of oil:

(Preliminary) Simulation results for 1978

	$\hat{Q}_N$	$\hat{P}_N$	$\hat{L}_N$	$\hat{Q}_T$	$\hat{L}_T$	$\hat{L}_e$	$\hat{Y}_R$	$\frac{d(TB)}{Y_D}$
Germany	-0.71	-0.16	-1.11	-1.05	-0.95	-0.99	-1.28	-0.83
Japan	-0.24	0.18	-0.17	-0.51	-0.57	-0.38	-0.42	-0.33
Sweden	-1.4	0.09	-1.63	-2.38	-2.37	-2.05	-2.09	-1.48
UK	-0.84	-0.49	-1.24	-1.21	-1.01	-1.10	-1.3	-0.88

Before proceeding to discuss these results in detail, we may note one curious fact in Table 2. While the price of the nontraded good rises in Sweden and Japan following the oil price shock, it seems to fall in Germany and UK. But this is only due to the specific constellation of values assumed for the parameters, particularly for E_y ,

the income elasticity of demand for the nontraded good. If we assume $E_y = 0.3$ instead, we get the results in Table 2A.

Table 2A. Ten percent increase in the price of oil. Simulation results for 197

	$\hat{Q}_N$	$\hat{P}_N$	$\hat{L}_N$	$\hat{Q}_T$	$\hat{L}_T$	$\hat{L}_e$	$\hat{Y}_R$	$\frac{d(TB)}{Y_D}$
Germany	-0.39	0.25	-0.53	-1.31	-1.32	-1.08	-1.32	-0.95
Japan	-0.14	0.31	-0.01	-0.57	-0.69	-0.36	-0.41	-0.38
Sweden	-0.77	0.48	-0.80	-3.29	-3.41	-2.29	-2.25	-1.89
UK	-0.44	-0.01	-0.56	-2.12	-2.10	-1.47	-1.40	-1.15

Now $\hat{P}_N$ is positive for Germany also, though slightly negative for UK. Increasing the share of oil in consumption will also drive up $\hat{P}_N$ more, as the sensitivity analysis in the final section shows.

Let us now compare the effects on the countries under scrutiny. The German and the Swedish tradable sectors have the same degree of dependence on oil, as represented by β_T . Yet, the Swedish tradable sector is hurt much more by an oil price increase - $\frac{\hat{Q}_T}{\hat{P}_I}$ is -3.29 for Sweden and -1.31 for Germany. This is because Germany has

- (a) a larger disparity in labour intensity of production between the the sectors, and in oil dependence.
- (b) a lower share of oil in consumption.
- (c) a smaller absolute value of labour intensity in the traded good sector
- (d) a lower share of the nontradable good in the consumption bundle.

As argued earlier, when α_T and β_T are large relative to α_N and β_N , net supply of the nontraded good falls relatively less and so P_N should rise less for Germany. This is indeed the case in Table 2A. A lower share of oil in consumption and a lower γ also contribute to this, since these work towards a smaller upward shift of the supply curve and a smaller numerator for (12b).

So P_N rises less for Germany. α_T , γ and $(1-\lambda-\gamma)$ are also smaller for Germany. With this scenario, it is easy to see from equation (7) that the fall in output in the German tradable sector should be less than in the Swedish counterpart.

Comparing the effects on the nontraded sector, the German sector has again fared better, but not by such a large margin as in the case of the traded sector. P_N has risen less in the case of Germany. But the German nontraded as well as traded sector is, relative to the Swedish counterpart, less oil and labour-intensive. So the shifts of the supply and demand curves are smaller for Germany. From (12c) it is seen that this implies a smaller fall in the German nontraded sector output.¹¹ Looking at the economy as a whole, it is seen from the table 2A that total employment L_e and real income Y_R also fall less for Germany.

For the UK, with the given constellation of parameters, P_N is shown in Table 2A to fall with an increase in P_I . However, in the sensitivity analysis conducted in the last section, we will come across instances where P_N rises for UK also. The differences between α_T and α_N , and between β_T and β_N , are large for the UK, and these signal a rise in P_N that is lowest for the countries under study - actually negative in this example, in Table 2A. With a still lower E_y or a larger share of oil in the consumption bundle, $\hat{P}_N$ would be positive for the UK also.

According to the results in Table 2A, the product wage rises less for the British traded sectors than for the Swedish and the German counterparts. However, the UK has a high α_T , though not as high for Sweden, and the highest absolute value for β_T . So output and employment in the British traded sector falls more than in the German sector, though less than in the Swedish sector. The output in the British nontraded sector follows a similar pattern, falling more than in the German sector, the rise in P_N being relatively less, and less than in the Swedish sector. Aggregate employment also suffers more of a set back in UK in comparison with Germany and Japan.

In the case of Japan, there is very little structural disparity between the two sectors, as visible in Table 1. And actually the nontrades sector is more labour-intensive. So, just in the light of relative factor-intensities, excess demand for the nontraded good should rise more compared to the other countries. But the share of oil in the consumption bundle is not significantly different from zero and this acts to reduce the shift of the supply curve relative to that in other countries, and to reduce the numerator of (12b). So the price of the nontraded good rises less than it does in Sweden, but somewhat more than in Germany, where there is more inter-sectoral differences in factor-intensities than in Sweden. The effects of increased direct consumption of oil in Japan is taken up in the sensitivity analysis.

The Japanese traded sector is less adversely affected in comparison even with the German. This is because the Japanese sector is less oil and labour-intensive. Also while P_N rises slightly more in Japan, the product wage rises relatively more in the German traded sector due to

the greater share in consumption of oil in Germany. It is just this relative development of the product wages that causes a less disfavoured development in the Japanese nontraded sector also despite its greater oil and labour intensities relative to the German nontraded sector. As seen in Table 2A, total employment and real income have fallen least for Japan. The deterioration in the trade balance is also least for Japan.

Effects of an oil price increase in 1973

By scrutinizing the structure of the economies in 1973 and comparing the effects of an oil price shock in 1973 with that in 1978, we can see how the countries have fared over time, individually and relative to others, in their ability to face such disturbances.

Table 3 gives the values of relevant parameters for 1973, and Table 4 the simulation results.

Table 3. Parameter values for 1973

	α_N	β_N	α_T	β_T	λ	γ	Σ_N	Σ_T
Germany	0.55	0.01	0.69	0.01	0.68	0.31	0.36	0.64
Japan	0.51	0.01	0.48	0.01	0.57	0.43	0.42	0.58
Sweden	0.71	0.02	0.72	0.02	0.57	0.42	0.42	0.58
UK	0.49	0.01	0.75	0.02	0.54	0.45	0.53	0.47

It is assumed that $E_Y = 0.3$.

Table 4. Ten percent increase in the price of oil:

	<u>Simulation results for 1973</u>							
	$\hat{Q}_N$	$\hat{P}_N$	$\hat{L}_N$	$\hat{Q}_T$	$\hat{L}_T$	$\hat{L}_e$	$\hat{Y}_R$	$\frac{d(TB)}{Y_D}$
Germany	-0.11	0.16	-0.12	-0.34	-0.36	-0.29	-0.36	-0.25
Japan	-0.07	0.19	0.01	-0.24	-0.31	-0.17	-0.19	-0.18
Sweden	-0.27	0.41	-0.20	-1.06	-1.18	-0.77	-0.82	-0.65
UK	-0.23	0.05	-0.30	-1.06	-1.06	-0.74	-0.75	-0.59

Looking at the effects on total employment, real income and the trade balance in Table 4, we see that it is again Japan that fares best, followed by Germany.

Germany has the same difference in labour intensities between the sectors as in 1978. The share of oil in consumption is lower. Due to this lower consumption share of oil, and hence the smaller rise in the wage rate, supply of N falls less than in 1978. By the same reasoning, the supply of T and disposable income originating in that sector should also fall less. Hence demand for N should also fall less. But the supply fall dominates and in the new equilibrium situation P_N has risen less. Due to the smaller rise in the product wage rate, in turn due to the smaller consumption share of oil. Q_N has fallen less.

The lower rise in P_N and the smaller consumption share of oil - γ , the share of the nontraded good is the same in both years - imply a smaller rise in the product wage in the traded sector. β_T is also lower. So despite the slightly higher α_T , output falls by less in the traded good sector, as compared to 1978. Both the sectors having fared better, total employment and real income have fallen less, and the trade balance also deteriorates less.

In Japan, as was the case in 1978, the nontradable sector is more labour-intensive, and in absolute terms, only slightly less labour-intensive than the German nontradable sector. So the supply of N should fall relatively more, and the demand rather less, as the fall in disposable income as the capital-intensive tradable sector contracts is relatively less - in comparison with Germany. However, just as in 1978, the oil share in consumption is not significantly different from zero, and this acts to curtail the fall in the supply of N . So P_N rises only about as much in Germany. α_N and β_N being lower than in 1978, the fall in supply is relatively less, and so P_N rises less than in 1978. The output of the Japanese traded sector falls less than the German due to its lower labour intensity and also due to the smaller product wage increase deriving from the lower consumption share of oil. The fall is also less than that of the Japanese sector in 1978 due to the lower labour and oil intensities in 1973.

With the same kind of reasoning, in Sweden, with high and similar labour intensities in both sectors, P_N rises the most. The differences in labour intensities between the sectors is higher in 1978, the traded sector having outpaced the nontraded in this regard in the intervening five years. But the production dependence on oil, as well as its consumption share are lower in 1973. P_N rises less in 1973 - see Tables 2A and 4. The lower labour and oil intensities and the lower consumption share of oil also mean that the fall in Q_N is less. The same goes for the traded sector.

However, relative to Germany and Japan in the same years, Sweden fares badly. The United Kingdom more or less keeps Sweden company. The high labour intensities of the T sectors of these two countries lead to relatively large reductions in output in these sectors. The

relatively low labour intensity of the British nontraded sector serves to curtail the fall in supply of N, and P_N rises least in the UK. Still, with the large consumption share of N and the high labour intensity of the traded sector, the output of the traded sector falls by as much as in Sweden. While the price of the nontraded good has risen most in Sweden, the high labour intensity of this sector - as can be seen from equation (6) - implies as large a fall in the output of this sector as in the British.

A few comments are in order before concluding this section, though anticipated already in the theoretical section. All four countries fared worse in 1978, and the reasons are not far to seek. In general, oil and labour intensities in production and the consumption share of oil are high relative to 1973.

In figure (1), a fall in σ_N or β_N - we are assuming that the elasticities of demand and of demand of factor substitution are not different across countries - decreases the slope of the supply curve of N, and decreases its upward shift following the oil price increase. A reduction in the consumption share of oil also acts to reduce the upward shift of the supply curve. Increases in σ_T or β_T - or E_y - increase the slope of the demand curve and also its downward shift. In figure (1), the German supply curve shifts up by less than the Swedish curve. The German demand curve also shifts by less than the Swedish curve. The German curves are drawn steeper, reflecting the lower oil and labour-intensities. The relative shift, the difference between the supply and the demand shifts, the numerator of (12b), is also less for Germany. As seen in the figure, the rise in P_N and the fall in Q_N are both relatively less for Germany.

In figure (2), an increase in σ_T or β_T , or the consumption share of oil or of the nontraded good increases the upward shift of the supply curve, and cause a greater fall in the output of this sector, for the same development of P_N , as can be seen from equation (7). A smaller rise in P_N , as in Germany relative to Sweden, implies a smaller rise in the product wage and in the supply curve. With a lower σ_t also pointing the same way, the German curve is seen to shift up less in figure (2). It may be noted again that when α_T and β_T are large relative to α_N and β_N the difference between the supply and demand shifts is smaller and P_N rises less. So the cause of the traded sector is best served by having low values for α_T and β_T , that however, are large relative to α_N and β_N . Such has been the case in Germany.

To sum up this discussion, it may be stated that the stagflationary effects of oil price increases tend to be relatively less in countries that possess low absolute values of oil and labour-intensities for both sectors, with these parameter values being relatively high for the tradable sector. A low share of oil in the consumption bundle is an added boon.

III. Combating Oil Price Shocks

Fall in real wages

Japan has differed from the three European OECD countries under consideration in that real wages have been flexible downwards. That this is of the utmost importance in ameliorating the stagflationary effects created by the oil price shock, can be gauged from Table 5.

Table 5. Effects of a one percent fall in the real wage rate (1978)

	$\hat{Q}_N$	$\hat{P}_N$	$\hat{L}_N$	$\hat{Q}_T$	$\hat{L}_T$	$\hat{L}_e$	$\frac{d(TB)}{Y_D}$
Germany	0.60	-0.61	1.12	2.47	3.52	2.80	1.68
Japan	0.41	-1.20	0.72	1.72	3.04	1.93	1.0
Sweden	1.45	-0.74	1.95	7.41	8.55	5.71	4.16
UK	0.93	-0.31	1.67	5.33	6.34	4.43	2.69

(Parameter values are as for Tables 1 and 2A.)

It is seen that Sweden gains most from a fall in the real wage, in terms of gain in employment and improvement in the trade balance. As can be seen from (6), a fall in W_R shifts the supply curve down and to the right, the shift being larger the larger the values of α_N , β_N , σ_N and σ_{IN} . The demand curve in figure (1) also shifts to the right, as disposable income increases due to expansion of the tradable sector. Q_N rises, and as seen in Table 5, P_N falls for all countries. In figure (2), the supply curve of the traded good shifts outwards, the shift being greater the greater the values of α_T , β_T , σ_T and σ_{IT} and output of this good increases in all countries. It is the higher labour intensities of the Swedish sectors that usher in the most favourable responses to a real wage decline.

To judge to the effectiveness of a decline in real wages in combating the oil price shock, compare Tables 5 and 2A. The fall in total employment in Sweden due to a 10 percent increase in the price of oil can be restored by a fall in real wages by 0.4 percent. In Japan only a 0.2 percent fall in the real wage is required to keep total employment at the same level following a 10 percent oil price

increase. To restore the Swedish trade balance to the original level, a somewhat higher fall in real wages, around 0,5 percent, is required. In Japan the corresponding figure is 0.4 percent. In Germany, a 0.4 percent fall in W_R restores employment and a fall around 0.6 percent the trade balance. In the UK the corresponding figures are 0.3 percent and 0.4 percent.

Relative price stabilization policy

While an accommodation of real wages has been seen to be an effective way of combating oil price shocks, such accommodation has been lacking in most European OECD countries, though forthcoming in Japan and the USA. This being the case, European OECD countries have been reluctant to follow expansionary policies also, given the structure of their economies. Here we will examine a specific policy, that of restoring relative prices to their original level, that might, in some instances, help to reduce the fall in total employment.

Assume now that the respective governments follow a policy of adjusting expenditures to bring back relative prices to their original level before the oil price shock. From (12), (10a) and (10e) it is clear that an increase in government spending on N pushes up P_N . In Table 2A, P_N has risen in Germany, Japan and Sweden, and fallen in the UK - given the assumed parameter values, especially E_Y . So stabilizing relative prices will involve cutting down government spending in Sweden, Germany and Japan, and increasing it in the UK. Table 6 gives the combined macroeconomic effects of an oil price increase followed by a government policy of stabilizing relative prices.

Table 6. Simulation results for an oil price increase of 10 percent followed by a government policy of relative price stabilization

	$\hat{Q}_N$	$\hat{P}_N$	$\hat{L}_N$	$\hat{Q}_T$	$\hat{L}_T$	$\hat{L}_e$	$\hat{Y}_R$	$\frac{d(TB)}{Y_D}$
Germany	-0.59	0	-0.88	-1.15	-1.09	-1.02	-1.30	-0.92
Japan	-0.38	0	-0.40	-0.42	-0.41	-0.40	-0.44	-0.40
Sweden	-1.60	0	-1.89	-2.17	-2.10	-2.08	-2.05	-1.65
UK	-0.43	0	-0.54	-2.16	-2.14	-1.49	-1.40	-1.16

Comparing to the results in table 2 A for the isolated oil price shock, it is seen that the fall in total employment and the deterioration of the trade balance are now less for Germany and Sweden. In Japan, where the two sectors have very similar labour-intensity in production, the nontradable sector being slightly more labour-intensive, the picture becomes a shade darker. The government policy worsens the picture a bit in the U.K, only because with the parameter values assumed, P_N falls with an oil price increase. But, as seen in the section on sensitivity analysis, P_N may very well rise for the U.K also, for instance, on taking into account the likelihood of a higher share of government demand in initial total demand for the nontraded good. Then, since the British tradable sector is the relatively labour-intensive one, just as with her European OECD compatriots studied, a cut-back in government spending to stabilize relative prices will be seen to lessen the fall in employment and the deterioration in the trade balance.

So it is seen that a 'neutral' government policy of stabilizing relative prices in the wake of an oil price increase has, for the European OECD countries studied, some beneficiary macroeconomic effects. Besides, it stands clear that given the relative factor-intensities,

an expansion in government spending undertaken with the objective of employment creation will be self-defeating.

IV. Sensitivity Analysis

In this section we will explore how sensitive the simulation results are to changes in various parameter values.

Changes in labour-intensity

Let us resimulate the effects of our oil price increase of one percent assuming the following new lower values of labour-intensity in the Swedish and German nontraded sectors, in 1978: $\alpha_N = 0.62$ for Sweden and 0.41 for Germany. Assume $E_Y = 0.3$. The results of the simulation are presented in table 7.

Table 7

	$\hat{Q}_N$	$\hat{P}_N$	$\hat{L}_N$	$\hat{Q}_T$	$\hat{L}_T$	$\hat{L}_e$
Germany	-0.39	0.09	-0.53	-1.21	-1.17	-0.98
Sweden	-0.73	0.32	-0.80	-2.92	-2.99	-2.05

Comparing with table 2A, it is seen that lowering α_N has reduced $\hat{P}_N$ and increased $\hat{Q}_T$, $\hat{L}_T$ and $\hat{L}_e$. $\hat{Q}_N$ and $\hat{L}_N$ are unchanged or affected but slightly despite the lower values of α_N , because of the fall in the rate of increase of P_N . So we see that lower values of labour-intensity in the nontraded sector augur well for less painful adjustment to oil price shocks.

Let us now scrutinize the effects of a change in labour-intensity of the traded sector. Assume that $\alpha_T = 0.85$ for Sweden and $\alpha_T = 0.73$ for Germany in 1978. With these changes, the simulated results of an oil price increase are shown in table 8.

Table 8

	$\hat{Q}_N$	$\hat{P}_N$	$\hat{L}_N$	$\hat{Q}_T$	$\hat{L}_T$	$\hat{L}_e$
Germany	-0.46	0.17	-0.65	-1.47	-1.45	-1.21
Sweden	-0.85	0.43	-0.91	-3.6	-3.71	-2.51

The increase in labour-intensity of the traded sector acts to curtail the increase in price of the nontraded good, working through the increased fall in disposable income following the oil price increase. So compared to table 2A, employment in the nontraded sector falls more in both countries. The lower rise in the price of the nontraded good also implies a lower rise in the product wage of the tradable sector. Still, the effect of the increased labour-intensity dominates so that traded sector employment falls more in both countries.

Change in the elasticity of substitution between oil and domestic factors in the nontraded sector

Assume that $\sigma_{IN} = 1.5$ instead of 0.8 in 1978, for Sweden and Germany. The simulated results are in table 9.

Table 9

	$\hat{Q}_N$	$\hat{P}_N$	$\hat{L}_N$	$\hat{Q}_T$	$\hat{L}_T$	$\hat{L}_e$	$\frac{d(TB)}{Y_D}$
Germany	-0.41	0.36	-0.39	-1.38	-1.41	-1.11	-0.97
Sweden	-0.80	0.59	-0.60	-3.55	-3.71	-2.37	-1.90

The fall in L_N is reduced as there is more substitution towards domestic factors. So, within the same level of gross output of the nontraded sector, the share of domestic value added increases - see equation (9b). This means that the fall in disposable income

is less, and as can be seen from (10) and (10b), the demand curve for N shifts inwards less following the oil price increase. From (6) it is seen that the supply curve for gross output of N shifts upwards more with a higher σ_{1N} . In the new equilibrium situation in Table 9 - comparing with Table 2A - $\hat{P}_N$ is higher in both countries, while $\hat{Q}_N$ is unchanged. Due to the higher substitution towards domestic factors and the smaller increase of the product wage in the N sector, $\hat{L}_N$ is less negative. The higher $\hat{P}_N$ has given rise to a higher rise in the product wage in the T sector, and so $\hat{L}_T$ and $\hat{Q}_T$ are more negative. The T sector being more labour-intensive, total employment has also fallen in both countries. The deterioration in the trade balance is also more in both countries, but rather imperceptibly so.

Change in the elasticity of substitution between oil and domestic factors in the tradable sector

Consider a change in σ_{1T} from 0.8 to 1.5 in 1978 for Sweden and Germany. Table 10 gives the resimulated results of an oil price increase of one percent.

Table 10

	$\hat{Q}_N$	$\hat{P}_N$	$\hat{L}_N$	$\hat{Q}_T$	$\hat{L}_T$	$\hat{L}_e$	$\frac{d(TB)}{Y_D}$
Germany	-0.39	0.25	-0.53	-1.52	-1.79	-1.41	-0.95
Sweden	-0.77	0.48	-0.80	-3.51	-3.91	-2.56	-1.86

As can be seen from (10) and (10b), an increase in σ_{1T} decreases the inward shift of the demand curve for N, while the shift of the supply curve is unaffected. But the net effect of this increase is σ_{1T} is not significant enough so that $\hat{Q}_N$ and $\hat{P}_N$ are unchanged

in Table 10 - as compared to Table 2A. From (4c) and (1), it is seen that the increase in σ_{IT} decreases the gross output of the tradable sector. This effect is strong enough to override the effect on employment from the increased substitution towards domestic factors of production so that traded sector employment falls. Comparing Table 10 to Table 12A, the nontraded sector is unaffected while tradable sector and economy-wide employment have fallen while the effect on the trade balance is negligible.

Zero substitution between foreign and domestic factors

It has been shown that in the short-run when the capital stock is fixed, increased substitution between domestic factors and oil in either sector increases the fall in total employment and the trade balance. Let us now resimulate the effects of an oil price increase of one percent with $\sigma_{iN} = \sigma_{iT} = 0$. The results are in Table 11. and are compared with those in table 2A.

Table 11

	$\hat{Q}_N$	$\hat{P}_N$	$\hat{L}_N$	$\hat{Q}_T$	$\hat{L}_T$	$\hat{L}_e$	$\frac{d(TB)}{Y_D}$
Germany	-0.38	0.12	-0.69	-1.0	-0.70	-0.70	-0.93
Sweden	-0.75	0.35	-0.99	-2.75	-2.55	-1.88	-1.79

It is seen that with zero substitution between domestic and foreign factors, the fall in total employment and the deterioration in the trade balance is reduced. The traded sector fares better, and dominates the economy-wide development with its greater labour-intensity. The price of the nontraded good has risen less, the

demand curve shifting inwards relatively more, and the supply curve shifting up less. With P_N rising less, and no substitution between oil and domestic factors, employment in the nontraded sector falls more.

Changes in the share of oil in the consumption bundle

The figures used for the consumption share of oil, $(1 - \lambda - \gamma)$, in the various countries are not very exact. As discussed in greater detail in the appendix on data and data sources, these have been arrived at by splitting up the total net imports of oil between the two sectors of the economy and final consumption in proportions obtained from tables on intermediate consumption (input-output tables). So it may be worthwhile exploring how the simulation results are affected by changes in these ratios.

Let us now use the ratio of oil consumption - actually, fuel consumption - to total private consumption available from National Accounts of OECD Countries (1980). The figures relating to production dependence on oil, β_N and β_T , are kept unaltered. For all countries the consumption of share of oil increases now by 3 to 7 percentage points. In Table 1 the following parameter changes may be made now:

	λ	γ
Germany	0.63	0.30
Japan	0.51	0.42
Sweden	0.54	0.39
UK	0.49	0.44

The resimulated results of an oil price increase in 1978 are presented in Table 12.

Table 12

	$\hat{Q}_N$	$\hat{P}_N$	$\hat{L}_N$	$\hat{Q}_T$	$\hat{L}_T$	$\hat{L}_e$	$\frac{d(TB)}{Y_D}$
Germany	-0.63	0.49	-0.99	-1.86	-1.84	-1.58	-1.35
Japan	-0.38	1.10	-0.56	-1.63	-1.87	-1.24	-0.92
Sweden	-1.29	0.84	-1.42	-4.53	-4.66	-3.41	-2.38
U.K	-0.96	0.17	-0.92	-3.10	-3.02	-2.42	-1.79

The increased consumption share of oil deteriorates the results for both sectors, in all countries, as a comparison between tables 12 and 2A reveals. This is because the product wage rises more in both sectors. Besides the increased fall in employment in both sectors, there is increased upward pressure on the price of the nontraded good. The demand curve for the nontraded good shifts more inwards in figure (1) following the oil price shock due to the increased fall in disposable income, but in price determination the dominating effect is the increased upward shift of the supply curve, and P_N rises relatively more. So $\hat{P}_N$ is higher in table 12, and the figure for the U.K. has turned positive.

Alternate definitions of nontraded and traded sectors

The simulation results depend naturally on the definitions adopted for the sectors. Here the coverage of the sectors is enlarged to include the entire material sphere of the economies, that is, all marketable products or services. The tradable sector is now defined to include all industries as against only mining and manufacturing earlier. The nontradable sector is now enlarged to include all services including transport. The parameters now describing the economies are given in table 15.

Table 13. Parameter values for 1978 with industries-services division

	α_N	β_N	α_T	β_T	λ	γ	Σ_N	Σ_T
Germany	0.47	0.02	0.63	0.02	0.62	0.36	0.48	0.52
Japan	0.48	0.034	0.49	0.02	0.52	0.48	0.58	0.42
Sweden	0.6	0.03	0.74	0.03	0.54	0.44	0.59	0.41
U.K.	0.6	0.02	0.73	0.02	0.51	0.48	0.55	0.45

With this new division, with the exception of the British nontradable sector, all other sectors have become less labour-intensive, which speaks well for better accommodation to oil price shocks. Table 16 gives the simulation results.

Table 14. Effects of an oil price increase of ten percent:

<u>Industries-services division</u>							
	$\hat{Q}_N$	$\hat{P}_N$	$\hat{L}_N$	$\hat{Q}_T$	$\hat{L}_T$	$\hat{L}_e$	$\frac{d(TB)}{Y_D}$
Germany	-0.23	0.45	-0.14	-0.87	-0.96	-0.63	-0.56
Japan	-0.16	0.85	0.21	-0.72	-1.05	-0.32	-0.41
Sweden	-0.39	0.66	-0.30	-2.10	-2.27	-1.20	-0.97
U.K.	-0.31	0.33	-0.28	-1.60	-1.67	-1.00	-0.79

Due to the lower labour-intensities, employment and output fall less in both sectors as compared to the earlier sectoral division. The deterioration in the trade balance is also less. The price of the nontraded good rises more; due to the lower labour-intensity in the tradable sector, disposable income falls less as this sector contracts, and the fall in the demand for the nontraded good is relatively less, dominating the decrease in the reduction in output of the nontraded good. The fall in Σ_T - the share of the tradable sector in domestic value added - in all countries also serves to lessen the fall in demand for N

and contributes to the upward movement in its price. On replacing only the values of Σ_N & Σ_T in Table 2A by those in table 13 and re-simulating it is seen that the rise in P_N is greater for all countries - the actual values of $\hat{P}_N$ being 0.57 for Sweden, 0.004 for U.K, 0.32 for Germany and 0.35 for Japan.

Higher shares of government demand in total demand for the
nontraded good.

The countries studied would naturally differ in the relative importance of government activity as manifested in the share of government demand in total demand for the nontraded good. Due to the difficulties involved in splitting government expenditure between nontraded and traded goods. This ratio has not been calculated for each country. But it is easy enough to visualize the consequences of an increase in this ratio. A larger part of the total demand for the nontraded good is exogenous and unaffected by the oil price increase. So the left-ward shift of the demand curve is less - from (10b) it is seen that 'B' will be smaller. Also, 'A', the slope of the demand curve is smaller. From Figure 1 it may be seen that all this implies a greater rise in the price of the nontraded good and a smaller fall in its output. Under real wage rigidity, the product wage in the traded sector rises more, and hence output in this sector suffers a greater reduction. Table 15 lists the results of an oil price increase of ten percent when the ratio $\frac{G_N}{Q_N^d}$ is assumed to be 0.4 for all countries. The contrast is with table 2A where this ratio was kept at zero for all countries.

Table 15Re-simulation with larger share of government in total demand

	$\hat{Q}_N$	$\hat{P}_N$	$\hat{L}_N$	$\hat{Q}_T$	$\hat{L}_T$	$\hat{L}_e$	$\frac{d(TB)}{Y_D}$
Germany	-0.25	0.44	-0.28	-1.43	-1.48	-1.12	-0.98
Sweden	-0.48	0.67	-0.42	-3.72	-3.90	-2.41	-1.92
U.K	-0.30	0.21	-0.31	-2.61	-2.67	-1.70	-1.29

It is seen that total employment and the trade balance falls more now for all countries. Hence it seems clear that other things equal, countries with relatively high shares of government spending in total demand for the home good are at a disadvantage in facing up to oil price shocks.

V. Concluding comments

This study has showed that the structure of a small open economy plays a significant role in the nature of macroeconomic adjustment to oil price shocks. Countries with relatively low labour-intensities in production such as Germany and Japan suffer less reduction in employment and output and a smaller deterioration of their trade balances. Low production dependence on oil works the same way, and a low share of oil in the consumption bundle is an added boon. Large technological disparities between the two sectors work to elicit a less disfavoured macroeconomic response to oil price increases. The change in the price of the nontraded good was found to be influenced by the differences in the intensities of oil and labour inputs between the sectors, larger intensities for the tradable sector tending to reduce the rate of increase. This, in turn, helps to curtail the fall in production of the tradable good - the product wage in this sector moving up less - as well as the fall in total employment. It may be added that the tradable sector was found to be relatively labour-intensive for all the European O.E.C.D. countries studied, so that this sector holds the key to a relatively less painful development in total employment. Various sensitivity tests were conducted to see how changes in the structural parameters affect the adjustment patterns and to demonstrate that the differing structures of the four countries under scrutiny imply differing macroeconomic responses. Relatively small reductions in real wages were found to be sufficient to wipe out the adverse employment effects of oil price shocks. In the absence of such accommodation in the labour market, a government policy of stabilizing relative prices was found to ameliorate these adverse affects to

some extent. It was also seen that the detrimental effects on total employment and the trade balance are greater for larger shares of government demand in total demand for the nontraded home good. In the short-run horizon adhered to, ruling out capital accumulation, increased substitution away from oil was not found to improve matters.

Appendix 1

Data and Data Sources

The figures for value added by labour and total domestic value added, including consumption of capital, are taken from Yearbook of National Accounts Statistics, United Nations (1980). Since this publication does not indicate capital consumption figures for the UK, these were obtained from National Income and Expenditure, 1981 edition, Central Statistical Office of the United Kingdom.

Two alternate divisions of the aggregate economy into nontraded and traded sectors were used in this paper. The first division dumped together manufacturing, mining and quarrying as the tradable sector. Construction, utilities and distribution were aggregated to form the nontraded sector. The second division aggregated all industries into the tradable group, and all services - excluding the non-marketable - into the nontradable group, thus enveloping the entire material sphere. Yearbook of National Accounts Statistics, United Nations (1980) was used for these divisions. The tables on private consumption expenditure available in the same publication were used to split total consumption expenditure into spending on non-traded and traded goods. The same definitions of the two sectors underlie these divisions on the expenditure side.

The figures for total net imports of oil - actually crude petroleum and petroleum products - were taken from Handbook of International Trade and Development Statistics, UNCTAD (1980). To split these figures for net imports between nontradables, tradables, final consumption, and the non-material sphere, a publication (1982) of the United Nations Statistical Commission

and Economic Commission for Europe, Standardized Input-Output Tables of ECE Countries for Years Around 1975, was used. The proportions of the total usage of petroleum products available to the economy taken up by production processes in different sectors and in final consumption, were used to split net imports of petroleum and petroleum products between these usages. For final consumption of oil, alternate figures of fuel consumption - which would typically overstate the amount of imported oil consumed - available from tables on private consumption expenditure in United Nations (1980) were also tried, and also served the purpose of a sensitivity test on how increases in the consumption share of oil affected the macro-economic performance and structure of the economy.

Appendix 2

Demand for Factors of Production

The following derivation is available in Bruno & Sachs (1979), and applies to both the traded and the nontraded sectors. Omitting the subscripts N and T, and the superscript s, write the CES production functions in (1) and (1a) in the conventional forms:

$$Q^{\rho_1} = aV^{\rho_1} + (1 - a)I^{\rho_1} \quad (2.1)$$

$$V^{\rho} = bL^{\rho} + (1 - b)K^{\rho} \quad (2.2)$$

$\sigma_1 = \frac{1}{1 - \rho_1}$ and $\sigma = \frac{1}{1 - \rho}$ are the elasticities of substitution. a and b are constants.

Differentiating (2.1) and (2.2),

$$\frac{\partial Q}{\partial L} = a \left(\frac{V}{Q} \right)^{\rho_1 - 1} \frac{\partial V}{\partial L} \quad (2.3)$$

$$\frac{\partial V}{\partial L} = b \left(\frac{L}{V} \right)^{\rho - 1} \quad (2.4)$$

Also, $\frac{\partial Q}{\partial L} = \frac{W}{P}$, P being the price of the final good, N or T, and not the consumer price index.

Using (2.4) in (2.3) and differentiating logarithmically,

$$\sigma_1 (\hat{W} - \hat{P}) = \hat{Q} - (1 - \frac{\sigma_1}{\sigma}) \hat{V} - \frac{\sigma_1}{\sigma} \hat{L} \quad (2.5)$$

Differentiation of the output and domestic value added functions also gives

$$\hat{V} = \frac{\alpha}{1 - \beta} \hat{L} \quad \text{and}$$

$$\hat{Q} = (1 - \beta) \hat{V} + \beta \hat{I}.$$

So (2.5) becomes

$$-\sigma_1(\hat{W} - \hat{P}) = \left[\frac{\sigma}{1-\beta} \left(1 - \frac{\sigma_1}{\sigma}\right) + \frac{\sigma_1}{\sigma} \right] \hat{L} - \hat{Q}$$

Or,

$$\hat{L} - \hat{Q} = -\sigma_1(\hat{W} - \hat{P}), \quad \text{where}$$

$$\eta = \frac{1}{\sigma(1-\beta)} [\sigma\alpha + \sigma_1(1-\alpha-\beta)].$$

Differentiating (2.1) with respect to oil input,

$$\frac{\partial Q}{\partial I} = (1-a) \left(\frac{I}{Q}\right)^{\rho_1-1} = \frac{P_I}{P}$$

Taking log,

$$\log \left(\frac{I}{Q}\right) = -\sigma_1 \log \frac{P_I}{P}$$

Differentiating,

$$\hat{I} - \hat{Q} = -\sigma_1(\hat{P}_I - \hat{P})$$

Footnotes

* Comments from Jörgen Appelgren, Lars Calmfors, Henrik Horn, Assar Lindbeck, Torsten Persson, Per Skedinger and Lars Svensson, and financial support from Bankforskningsinstitutet are gratefully acknowledged.

1. Dixon, Parmenter and Powell (1982) assumed zero substitution between oil and domestic factors of production. Also, they do not take into account the endogenous fall in disposable income following the oil price increase in determining consumption demand and price changes in the nontradables market.

2. The United Kingdom became self-sufficient in oil only in 1980. See Bond & Knöbl for a study of the transformation of the structure of the British economy following the rapid build up of oil production from the North Sea.

3. Equation (6) may be alternately written as

$$\hat{Q}_N^S = - \frac{\alpha_N \sigma_N}{(1 - \sigma_N - \beta_N)} (\hat{W} - \hat{P}_N) - \frac{\beta_N \sigma_N \eta_N}{(1 - \alpha_N - \beta_N)} (\hat{P}_I - \hat{P}_N) .$$

This formulation shows that increases in the price of either variable factor relative to the price of the final good decreases output.

4. The effect of changes in the shares of the nontraded and traded goods in domestic value added, Σ_N & Σ_T , and in consumption, γ & λ , - at unchanged consumption share of oil - cannot be studied a priori without recourse to simulation for actual values of parameters. Increasing Σ_T affects the slope and the shift of the demand curve, the sign of these effects depending on parameter values. Increasing γ causes a greater rise in the product wage to keep real wages constant as P_N moves up and hence decreases the slope of the ss curve. At the same time, this also accentuates the increase in the product wage and

hence the fall in intraded sector output, disposable income and demand for the nontraded good, and thereby the slope of the demand curve, 'A'.

So the effect of changes in γ on the denominator of (12b) is not clear, and depends on actual parameter values.

5. It may be noted that a smaller consumption share of oil not only works to keep down the fall in the supply of the nontraded good, but also to keep down the fall in demand - the fall in the output of the tradable sector and hence in disposable income and demand for N is less. But the net effect of a fall in the consumption share of oil is to reduce the excess demand for N and the increase in its price as verified in the empirical section.

6. From figure 1,

$$\frac{\hat{\alpha}_N}{\hat{P}_I} = UW = UV + VW = \text{shift of DD} + XW \cdot \tan \theta_d = \text{shift of DD} + \frac{\hat{P}_N}{\hat{P}_I} \cdot \text{slope of DE}$$

This gives (12c) on manipulation, after substituting for $\frac{\hat{P}_N}{\hat{P}_I}$ from (12b)

7. Adding the equilibrium conditions in the two goods markets,

$$C_N \frac{P_N}{P_T} + G_N \frac{P_N}{P_T} + C_T + X_T = Q_N^s \frac{P_N}{P_T} + Q_T^s,$$

where X_T is net exports and C_T is private demand at home for the traded good. Rewriting,

$$(Y_N \frac{P_N}{P_T} + Y_T) - (C_N \frac{P_N}{P_T} + C_T) - G_N \frac{P_N}{P_T} = X_T - (I_N + I_T) \frac{P_I}{P_T}$$

Or, in the absence of tax changes in this model,

Income - Expenditure - Government Budget Deficit = The Trade Balance.

8. For a more rigorous treatment of the change in the trade balance following an oil price increase within the richer framework of an intertemporal model incorporating investment, see Marion & Svensson (1983) and also Marion (1984), which are, however, purely theoretical in nature.

9. The year 1978 is chosen instead of 1979 when the actual oil price shock occurred, because this is the last year for which the full range of structural data is available for all countries at the moment of completion of this paper.

10. Also, only the structure of the private sector is being studied. It has not been possible to split up government demand into that for nontradables and tradables separately, for all countries. So differences between countries, in the share of private demand in total demand for nontradables, $\frac{C_N}{Q_N}$, are not considered. But the implications of an increased government share in total demand for nontradables in initial equilibrium are clear enough. There is a part of total demand which is exogenous, and is not affected by the price shock. The shift 'B' as well as the slope 'A' is less. The price of the nontraded good rises more and output in this sector falls less for larger shares of government demand in total demand for this good. Since the rise in the product wage in the traded goods sector will also be greater, output in the tradable sector falls more.

11. The German SS & DD curves are steeper than the Swedish curves, and this also affects the values of (12b) & (12c). But it is the shifts that dominate the outcome as the simulation shows. By themselves, steeper curves tend to increase the rise in P_N , as can be seen by drawing in them in figure 1. A steeper SS curve for the same shift gives a smaller output and a steeper DD curve a larger output.

References

Bond, M. E. and A. Knöbl (1982), "Some implications of North Sea Oil for the UK economy", IMF Staff Papers, September.

Brundell, P. and H. Tson Söderström (1983), "Macroeconomic causes of unbalanced productivity growth in open economies", Seminar Paper No. 252, Institute for International Economic Studies, Stockholm.

Bruno, M. and J. Sachs (1979), "Macroeconomic adjustment with import price shocks: real and monetary aspects", Institute for International Economic Studies, Seminar Paper No. 118, Stockholm, February.

_____ (1984), chapters 1 and 6 in "Wages, profits and commodity prices: Macroeconomics of stagflation", forthcoming.

Dixon, P. B., B. R. Parmenter and A. A. Powell (1982), "Farm incomes in Australia and the real exchange rate: Orani Simulations with a back-of-the-envelope explanation", Paper presented at a workshop on macroeconomics, Institute for International Economic Studies, Stockholm, August.

Dornbusch, R. (1980), "Open economy macroeconomics", New York: Basic Books.

Findlay, R. and C. A. Rodriguez (1977), "Intermediate imports and macroeconomic policy under flexible exchange rates", Canadian Journal of Economics, 10.

Gylfason, T. and O. Risager (1983), "Does devaluation improve the current account?", forthcoming in European Economic Review.

Gylfason, T. and M. Schmid (1983), "Do devaluations cause stagflation?", Canadian Journal of Economics, August.

Marion, N. P. and L. E. O. Svensson (1983), "Structural differences and macroeconomic adjustment to oil price changes: a three-country approach", Seminar Paper No. 248, Institute for International Economic Studies, Stockholm, April.

Marion, N.P. and L.E.O. Svensson (1984), "World equilibrium with oil price increases - an intertemporal analysis", Oxford Economic Papers, March.

Sachs, D. J. (1979), "Wages, profits and macroeconomic adjustment: a comparative study", Brookings Papers on Economic Activity.

Sachs, J. (1981), "The current account and macroeconomic adjustment in the 1970s", Brookings Papers on Economic Activity 1.

Schmid, M. (1982), "International adjustment to an oil price shock - the role of competitiveness", Seminar Paper No. 217, Institute for International Economic Studies, Stockholm, August.

SEMINAR PAPER SERIES

The series was initiated in 1971. For a complete list of Seminar Papers see the Institute's annual brochure.

1981

166. *Torsten Persson:*
The Neutrality of Money and the Analysis of Alternative Exchange Rate Regimes. 28 pp.
167. *Roy J. Ruffin:*
Trade and Factor Movements with Three Factors and Two Goods. 19 pp. (Also as Reprint No. 170)
168. *Carl Hamilton:*
A New Approach to Estimation of the Effects of Non-Tariff Barriers to Trade on Prices, Employment and Imports: An Application to the Swedish Textile and Clothing Industry. 65 pp. (Also as Reprint No. 160)
169. *Marian Radetzki:*
Has Political Risk Scared Minerals Investments away from the Deposits in Developing Countries? 24 pp. (Also as Reprint No. 174)
170. *Lars E.O. Svensson and Assaf Razin:*
The Terms of Trade, Spending, and the Current Account: The Harberger-Laursen-Metzler Effect. 43 pp. (Also as Reprint No. 205)
171. *Assar Lindbeck:*
The Distribution of Factor Income versus Disposable Income in a Welfare State: The Case of Sweden. 84 pp. (Also as Reprint No. 213)
172. *Ake G. Blomqvist:*
Education, Unemployment and Government Job Creation for Graduates in LDCs. 35 pp.
173. *Per Magnus Wikman:*
Seigniorage, Financial Intermediation, and the International Role of the Dollar, 1960-1971. 48 pp.
174. *Carl Hamilton:*
Public Subsidies to Industry: The Case of Sweden and Its Shipbuilding Industry. 31 pp.
175. *Lars Calmfors:*
Output, Inflation and the Terms of Trade in a Small Open Economy. 25 pp.
176. *Carl Van Duijne:*
Price Determination in Markets for Storable Commodities. 30 pp.
177. *Peter Svedberg:*
Colonialism and Foreign Direct Investment Profitability. 35 pp.
178. *Carl Hamilton and Lars E.O. Svensson:*
On the Choice Between Capital Import and Labor Export. 47 pp. (Also as Reprint No. 203)
179. *Henrik Horn:*
Some Implications of Non-homotheticity in Production in a Two-sector General Equilibrium Model with Monopolistic Competition. 39 pp.
180. *Thorvaldur Gylfason and John F. Hellwig:*
A Synthesis of Keynesian, Monetary, and Portfolio Approaches to Flexible Exchange Rates. 37 pp. (Also as Reprint No. 225)

181. *Elhanan Helpman and Assaf Razin:*
The Role of Saving and Investment in Exchange Rate Determination under Alternative Monetary Mechanisms. 33 pp.
182. *Mario I. Blejer and Hans Genberg:*
Permanent and Transitory Shocks to Exchange Rates: Measurement and Implications for Purchasing Power Parity. 36 pp.
183. *Torsten Persson:*
Global Effects of National Stabilization Policies under Fixed and Floating Exchange Rates. 45 pp.
184. *Lars E.O. Svensson:*
Oil Prices and a Small Oil-Importing Economy's Welfare and Trade Balance: An intertemporal approach. 55 pp.
185. *Michael Hoel:*
Short Run and Long Run Effects of a Tax Cut in an Open Economy with a Sticky Real Wage. 60 pp.
186. *Martin Feldstein:*
Inflation, Tax Rules and the Accumulation of Residential and Nonresidential Capital. 32 pp.
187. *Jeffrey Sachs:*
The Current Account in the Macroeconomic Adjustment Process. 20 pp.
188. *J. Peter Neary and Douglas D. Purvis:*
Sectoral Shocks in a Dependent Economy: Long-Run Adjustment and Short-Run Accommodation. 58 pp.
189. *Tomas Björk, Johan Myhrman, and Mats Persson:*
Consumption and Savings under Price Uncertainty. 40 pp.
190. *John F. Hellwig, Paul M. Booth, and Robert N. McRae:*
Stabilization, Allocation and the 1970s Oil Price Shocks. 53 pp.
191. *Nancy P. Marion and Lars E.O. Svensson:*
World Equilibrium with Oil Price Increases: An Intertemporal Analysis. 38 pp. (Also as Reprint No. 230).
192. *Lars Calmfors:*
Employment Policies, Wage Formation and Trade Union Behavior in a Small Open Economy. 39 pp.
- 1982
193. *Michael Bruno:*
Adjustment and Structural Change Under Supply Shocks. 39 pp.
194. *Assaf Razin and Lars E.O. Svensson:*
The Current Account and the Optimal Government Debt. 21 pp.
195. *W.M. Corden and J.P. Neary:*
Booming Sector and De-Industrialisation in a Small Open Economy. 45 pp. (Also as Reprint No. 204)
196. *Torsten Persson and Lars E.O. Svensson:*
Is Optimism Good in a Keynesian Economy? 19 pp. (Also as Reprint No. 221).
197. *Lars E.O. Svensson:*
On Variable Capital Utilization and International Trade Theory. 14 pp. (Also as Reprint No. 210)
198. *Wilfred J. Ethier:*
International Trade and Labor Migration. 30 pp.

199. *Harry Flam, Torsten Persson and Lars E.O. Svensson:*
Optimal Subsidies to Declining Industries: Efficiency and Equity Considerations. 28 pp.
200. *Lars E.O. Svensson:*
Factor Trade and Goods Trade. 37 pp.
201. *Thorvaldur Gylfason and Michael Schmid:*
Do Devaluations Cause Stagflation? 27 pp.
(Also as Reprint No. 224)
202. *Lars Hörnqvist, Johan Myhrman, Per-Ake Nilsson, Staffan Viotti and Anders Vredin:*
The SSEM Model - A Brief Description. 24 pp.
203. *Hans Tson Söderström and Eva Uddén-Jondal:*
Does Egalitarian Wage Policy Cause Wage Drift? An Empirical Study of Sweden 1960-1979. 49 pp.
204. *Jonathan Eaton and Henryk Kierzkowski:*
Oligopolistic Competition, Product Variety and International Trade. 36 pp.
205. *Pehr Wessén:*
Growth Models for Open Economies with Non-Shiftable, Malleable Capital and Nontraded Goods. 63 pp.
206. *Carl Hamilton and Lars E.O. Svensson:*
Should Direct or Total Factor Intensities be Used in Tests of the Factor Proportions Hypothesis in International Trade Theory? 22 pp.
207. *John T. Cuddington:*
Portfolio Balance and IS-LM: A Marriage under Fixed Exchange Rates. 40 pp.
208. *Carl Hamilton and Lars E.O. Svensson:*
Revealed Comparative Advantage: The Case of Sweden. 20 pp.
209. *Carl Hamilton and Lars E.O. Svensson:*
Testing Theories of Trade among Many Countries. 62 pp.
210. *Avinash Dixit:*
Growth and Terms of Trade under Imperfect Competition. 25 pp.
211. *M June Flanders:*
The Balance-of-Payments Adjustment Mechanism: The Doctrine According to Ohlin. 31 pp.
212. *Ronald W. Jones and Douglas D. Purvis:*
International Differences in Response to Common External Shocks: The Role of Purchasing Power Parity. 38 pp. (Also as Reprint No. 227)
213. *Ake Blomqvist and Henrik Horn:*
Public Health Insurance and Optimal Income Taxation. 32 pp.
214. *Carl Hamilton:*
Agricultural Protection in Sweden 1970-1980. 25 pp.
215. *Thorvaldur Gylfason:*
Why Rational Expectations do not Neutralize Monetary Policy. 8 pp.
216. *John T. Cuddington:*
Currency Substitution, Capital Mobility and Money Demand. 25 pp.
217. *Michael Schmid:*
International Adjustment to an Oil Price Shock - The Role of Competitiveness. 49 pp.
218. *Wilfred J. Ethier:*
Higher Dimensional Issues in Trade Theory. 96 pp.
219. *Paul R. Krugman, Torsten Persson and Lars E.O. Svensson:*
Inflation, Monetary Velocity and Welfare. 27 pp.
220. *Assaf Razin and Lars E.O. Svensson:*
An Asymmetry between Import and Export Taxes. 11 pp.
221. *Wilfred Ethier and Henrik Horn:*
A New Look at Economic Integration. 39 pp.
222. *Assar Lindbeck:*
The Recent Slowdown of Productivity Growth. 58 pp. (Also as Reprint No. 206)
223. *Henrik Horn:*
Product Diversity, Trade, and Welfare. 32 pp.
224. *Thorvaldur Gylfason and Assar Lindbeck:*
Competing Wage Claims, Cost Inflation, and Capacity Utilization. 38 pp. (Also as Reprint No. 228)
225. *Thorvaldur Gylfason and Assar Lindbeck:*
Wage Rigidity and Wage Rivalry: An Oligopolistic Approach. 20 pp. (Also as Reprint No. 233)
226. *Harry Flam:*
A Heckscher-Ohlin Analysis of the Law of Declining International Trade. 21 pp.
227. *Bruno S. Frey and Friedrich Schneider:*
International Political Economy: An Emerging Field. 94 pp.
228. *Torsten Persson and Lars E.O. Svensson:*
Misperceptions and Welfare. 21 pp.
229. *Charles P. Kindleberger:*
The World Economic Slowdown Since the 1970s. 31 pp.
230. *W.M. Corden:*
The Normative Theory of International Trade. 120 pp.
231. *Charles P. Kindleberger:*
Standards as Public, Collective and Private Goods. 27 pp. (Also as Reprint No. 217)
232. *Thorvaldur Gylfason and Assar Lindbeck:*
The Macroeconomic Consequences of Endogenous Governments and Labor Unions. 34 pp.
233. *Kalyan K. Sanyal:*
Trade in Raw Materials in a Simple Ricardian Model. 17 pp.
234. *Charles P. Kindleberger:*
Financial Institutions and Economic Development: A Comparison of Great Britain and France in the Eighteenth and Nineteenth Centuries. 42 pp.
235. *Lennart Ohlsson:*
Structural Adaptability of Metropolitan Sweden to Changing Comparative Advantages During Periods of Growth and Stagnation. 43 pp.
236. *Parameswar Nandakumar:*
Government Policies in Mixed Open Economies. 31 pp.

237. *Torsten Persson:*
Real Transfers in Fixed Exchange Rate Systems and the International Adjustment Mechanism. 38 pp.
238. *Lars Calmfors and Henrik Horn:*
Employment Policies and Centralized Wage Setting. 48 pp.
239. *John T. Cuddington:*
A Fix-Price Trade Model with Perfect Capital Mobility: Fixed versus Flexible Exchange Rates. 38 pp.
240. *Bruno S. Frey, Henrik Horn, Torsten Persson and Friedrich Schneider:*
A Formulation and Test of a Simple Model of World Bank Behavior. 17 pp.
241. *Pekka Ahtiala:*
A Synthesis of the Macroeconomic Approaches to Exchange Rate Determination. 37 pp.
242. *Kalyan K. Sanyal:*
Tariffs, Tradable Intermediate Goods and the Balance of Payments. 12 pp.
243. *Kalyan K. Sanyal:*
Foreign Exchange Constraint, Sectoral Terms of Trade and Aggregate Expenditure in a Dual Economy. 19 pp.
244. *J. Peter Neary:*
The Heckscher-Ohlin Model as an Aggregate. 30 pp.
245. *John T. Cuddington and Jeremy A. Gluck:*
Exchange Rate Forecasting and the International Diversification of Liquid Asset Holdings. 42 pp.
246. *Marian Radetski and Carl Van Duyne:*
The Demand for Scrap and Primary Metal Ores after a Decline in Secular Growth. 37 pp.
247. *Ephraim Kleiman:*
Fear of Confiscation and Redistribution. (Notes towards a theory of revolution and repression). 37 pp.
248. *Nancy Peregrin Marion and Lars E.O. Svensson:*
Structural Differences and Macroeconomic Adjustment to Oil-Price Changes: A Three-Country Approach. 51 pp.
249. *Anne O. Krueger:*
Trade Policies in Developing Countries. 94 pp.
250. *Dennis J. Snower:*
Structural Uncertainty and Monetary Stabilization Policy. 16 pp.
251. *Gene M. Grossman:*
International Competition and the Unionized Sector. 31 pp.
252. *Hans Tson Söderström and Peter Brundell:*
Macroeconomic Causes of Unbalanced Productivity Growth in Open Economies. 48 pp.
253. *Carl Hamilton:*
Voluntary Export Restraints, Trade Diversion and Retaliation. 27 pp.
254. *Gene M. Grossman and Assaf Razin:*
The Pattern of Trade in a Ricardian Model with Country-Specific Uncertainty. 16 pp.
255. *Carl Hamilton:*
Australian Manufacturing Industry during the 1970s: An International Comparison and Implications for the ASEAN Countries. 48 pp.

256. *Gene M. Grossman:*
The Gains from International Factor Movements. 17 pp.
257. *Lars E.O. Svensson:*
Walrasian and Marshallian Stability. 19 pp.
258. *Thorvaldur Gylfason and Ole Risager:*
Does Devaluation Improve the Current Account? 49 pp.
259. *John T. Cuddington:*
Disequilibrium Analysis in Open Economies: A One-Sector Framework. 34 pp.
260. *Gene M. Grossman:*
International Trade, Foreign Investment, and the Formation of the Entrepreneurial Class. 22 pp.
261. *Nils Gottfries:*
Price Dynamics of Exporting and Import Competing Firms. 22 pp.
262. *Ole Risager:*
Devaluation, Profitability and Investment. 64 pp.
263. *Dennis J. Snower:*
Imperfect Competition, Underemployment and Crowding-Out. 51 pp.
264. *W. M. Corden:*
Macroeconomic Policy Interaction Under Flexible Exchange Rates: A Two-Country Model. 28 pp.
265. *Alan S. Blinder:*
Credit, Working Capital, and Effective Supply Failures. 40 pp.
266. *John T. Cuddington and Per Olov Johansson:*
Optimum Tariffs, Revenue-Maximizing Tariffs and Unemployment: A General Disequilibrium Analysis. 19 pp.
267. *Lars E.O. Svensson:*
Money and Asset Prices in a Cash-in-Advance Economy. 74 pp.
268. *Thorvaldur Gylfason:*
Credit Policy and Economic Activity in Developing Countries: An Evaluation of Stabilization Programs Supported by the IMF, 1977-79. 49 pp.
269. *Lars E.O. Svensson:*
Currency Prices, Terms of Trade, and Interest Rates: A General Equilibrium Asset-Pricing Cash-in-Advance Approach. 36 pp.
- 1984
270. *Lars Calmfors and Henrik Horn:*
Classical Unemployment, Accommodation Policies and the Adjustment of Real Wages. 35 pp.
271. *Henrik Horn:*
Trade Union Determined Wages, Unemployment and the Size of the Public Sector. 34 pp.
272. *Lars Calmfors:*
Job Sharing, Employment and Wages. 21 pp.

273. *Lars E.O. Svensson and Torsten Persson:* Time-Consistent Fiscal Policy and Government Cash-Flow: A note. 15 pp.
274. *Christopher Findlay:* Optimal Taxation of International income Flows. 14 pp.
275. *Carl Hamilton:* Voluntary Export Restraints. ASEAN Systems for Allocation of Export Licences. 22 pp.
276. *Carl Hamilton:* Voluntary Export Restraints on Asia: Tariff Equivalents, Rents and Trade Barrier Formation. 30 pp.
277. *Torsten Persson and Lars E.O. Svensson:* Current Account Dynamics and the Terms of Trade: Harberger-Laursen-Metzler Two Generations Later. 37 pp.
278. *Parameswar Nandakumar:* Oil Price Increases and the Structure of Small Open Economies. 52 pp.
279. *Parameswar Nandakumar:* Supply Side Disturbances, International Competitiveness and Employment. 33 pp.