

Der Open-Access-Publikationsserver der ZBW – Leibniz-Informationzentrum Wirtschaft
The Open Access Publication Server of the ZBW – Leibniz Information Centre for Economics

Gupta, Sanjeev; Togan, Sübidey

Working Paper

On managing adjustment to external shocks in oil importing developing countries

Kiel Working Papers, No. 149

Provided in cooperation with:

Institut für Weltwirtschaft (IfW)

Suggested citation: Gupta, Sanjeev; Togan, Sübidey (1982) : On managing adjustment to external shocks in oil importing developing countries, Kiel Working Papers, No. 149, <http://hdl.handle.net/10419/47119>

Nutzungsbedingungen:

Die ZBW räumt Ihnen als Nutzerin/Nutzer das unentgeltliche, räumlich unbeschränkte und zeitlich auf die Dauer des Schutzrechts beschränkte einfache Recht ein, das ausgewählte Werk im Rahmen der unter

→ <http://www.econstor.eu/dspace/Nutzungsbedingungen> nachzulesenden vollständigen Nutzungsbedingungen zu vervielfältigen, mit denen die Nutzerin/der Nutzer sich durch die erste Nutzung einverstanden erklärt.

Terms of use:

The ZBW grants you, the user, the non-exclusive right to use the selected work free of charge, territorially unrestricted and within the time limit of the term of the property rights according to the terms specified at

→ <http://www.econstor.eu/dspace/Nutzungsbedingungen>
By the first use of the selected work the user agrees and declares to comply with these terms of use.

Kieler Arbeitspapiere Kiel Working Papers

Working Paper No. 149

On Managing Adjustment to External Shocks
in Oil Importing Developing Countries*

by

Sanjeev Gupta and Sübidey Togan

Institut für Weltwirtschaft an der Universität Kiel

Kiel Institute of World Economics
Department IV
Düsternbrooker Weg 120, 2300 Kiel 1

Working Paper No. 149

On Managing Adjustment to External Shocks
in Oil Importing Developing Countries*

by

Sanjeev Gupta and Sübidey Togan

August 1982

Ag 28 12 / 82
Weltwirtschaft
Kiel

*

Kiel Working papers are preliminary papers written by staff members of the Kiel Institute of World Economics. Responsibility for contents and distribution rests with the authors. Critical comments and suggestions for improvement are welcome.

Abstract

This paper employs country specific multisectoral general equilibrium models of Turkey, Kenya and India to study the adjustment problems confronting these countries. The affects of liberal and interventionist policies on GDP and on incomes of different classes are analysed. The results show that liberal policies minimise the GDP losses and that farmers are relatively better off under these policies.

On Managing Adjustment to External Shocks in Oil Importing
Developing Countries *

The oil importing developing countries suffered various external shocks in the seventies. These shocks comprised of higher oil prices and a slowdown in foreign demand for their exports arising from lower rates of economic growth in the world economy and from increased protection in many developed countries. Economists like Balassa (1981), Agarwal et al. (1982) and the World Bank (1981) have studied the nature of actual adjustment policies adopted by many of the non-opec developing countries to counter these adverse consequences of changes in terms of trade and in export volume. However, the issue of what really are the appropriate

* Kiel Institute of World Economics and Middle East Technical University Ankara, respectively. The work was done while the second author was an Alexander von Humboldt Research Fellow at the Kiel Institute. The financial support from Alexander von Humboldt Foundation is gratefully acknowledged. Financial support to the first author has been provided by the "Deutsche Forschungsgemeinschaft" in the "Sonderforschungsbereich 86" (Hamburg-Kiel) "Teilprojekt 3" (Die Wirkungen internationaler Rohstoffmarktregulierungen auf Wachstum und Allokation in Entwicklungsländern). The authors wish to thank J.B. Donges and Thomas Mayer for helpful comments.

policies to accommodate external shocks has not been sufficiently studied. The study of various policy alternatives open to the developing countries has assumed further importance because of tight climate for external aid and stringent conditions being imposed by the international lending institutions. This implies that greater reliance will have to be placed on the domestic policies to adjust to the external shocks. Keeping this in view, this paper attempts to quantify the macro effects for three developing countries, Turkey, Kenya and India of alternative policy responses to external shocks with the help of general equilibrium models. This is made possible by creating four plausible policy scenarios ranging from liberal to interventionist policies. In this way, the characteristics of the policy that minimises the GDP losses are highlighted. The paper also provides evidence on the varying effects of alternative policies on the various income groups in the economy. The objective is to indicate the groups that have a vested interest in getting a specific policy implemented that minimises their losses or maximises their gains.

The next section discusses the external shocks of 1970's and presents the World Bank estimates for them for each of the three countries. The various policy regimes that are open to these countries are also discussed. Section III briefly describes the main characteristics of the general equilibrium model employed in this study. In the following section, the results are presented and analysed. The last section gives the conclusions. The list of the main equations and the variables is available in appendix A.

II. External Shocks, Adjustment, and Policy Regimes

During the two decades before 1973, the year of the quadrupling of oil prices, the industrial countries, until the last few years of the period, experienced rapid economic growth and relatively little inflation and unemployment. The expansion of output and trade occurred in an atmosphere marked by progressive trade liberalizations achieved during the 1950's through the tariff reductions in EEC and EFTA, and during the 1960's through Dillon and the Kennedy rounds and integration in Western Europe. As a result, the developing countries' exports increased considerably, raising the foreign exchange earnings of these countries, which in turn allowed them to increase their imports from the industrial countries. Thus, rapid expansion of foreign trade contributed to economic growth in the industrial countries, which was transmitted to developing countries through trade, and the imports by the developing countries provided an important market for the manufactured exports of the industrial countries.

World market conditions changed with the oil price shock of the 1970's. The oil price increase added not only to the inflation rate prevailing in the industrial countries, but it also resulted in considerable balance of trade deficits. As a result, the industrial countries adopted anti-inflationary policies and measures designed to reduce the balance of trade deficits. These measures further increased the rate of unemployment but did not succeed in reducing the rate of inflation. High unemployment, in turn, contributed to the emergence of protectionist pressures which took the forms of non tariff restric-

tions on trade and of government aids under the guise of rationalization of domestic industries.

Since industrial countries are the most important markets for exports from developing countries, the slowdown in economic activity in industrial countries had adverse effects on the developing countries' exports. The slowdown in foreign demand for the exports, due to the lower economic growth and increased protection in industrial countries, deteriorated the balance of payments on current accounts of the developing countries, and hence aggravated for the oil importing countries the balance of payments effects of the rise in oil prices.

Higher oil prices had clearly improved the prospects of those developing countries with oil to export. But the oil importing developing countries were faced with the problem of adjusting to higher oil prices and sluggish world trade. The latter set of countries, which we consider in this paper, basically had two alternatives in the short run. They could respond to external shocks by squeezing complementary imports, which would slow economic growth. But since a fall in growth is undesirable both economically and politically they could alternatively try to finance the large current account deficits by running down foreign exchange reserves or borrowing on international markets. The latter strategy has in fact been adopted by most of the oil importing developing countries during the 1970's. However, a country cannot pursue such a strategy over the long run because the external sources will then be exhausted. Therefore in the long run

the countries would have to adjust, and try to reduce with a minimum sacrifice of income growth the current account deficits over a period of about five years to sustainable levels.

Faced with the task of balancing the current account with a minimum sacrifice of income growth, the country can adopt a variety of policy measures to overcome the effects of external shocks. In this paper we broadly consider two sets of policies: (1) interventionist policies and (2) liberal policies. By interventionist policies we imply a mechanism that deemphasizes the role of prices and places reliance on non price measures in resource allocation. In particular we assume, that the exchange rate has been fixed by the government, and that trade unions do not allow the real wage of the organised labour to decrease. On the other hand liberal policies represent a mechanism, where all prices including the exchange rate and the wage rate are flexible, and trade barriers are reduced. Prices adjust so as to equate demand and supply in commodity and factor markets as well as in the balance of payments. Thus under liberal policies the country aims to produce products in which it has comparative advantage, allows imports to compete with all domestically produced commodities except the nontradeables, and enhances labour market mobility. On the other hand a country pursuing interventionist policies aims for greater self-sufficiency in a wide range of goods so that trading links with the rest of the world are limited. Furthermore, it is presumed that increasing the income share of labour improves the distribution of income in the economy. Hence, the prevention of a

fall in the real wages of organised labour is regarded as desirable.

To study the effects of alternative policy regimes we consider the external shocks suffered by the oil importing developing countries after 1973. These shocks, which include changes in the terms of trade and the slowdown of foreign demand for the exports of the developing countries, have been quantified for broad country groups by the World Bank (1981) following the approach of Balassa (1981). The country groups are: semi industrial countries, primary producers, populous South Asia and the least developed countries. In this paper we abstract from consideration of the least developed countries and concentrate on the study of the first three country groups. Table 2 shows the extent to which on an annual basis the balance of payments of the country groups were affected by the external shocks between 1974 and 1978. The data are expressed as percentages of GNP. From the table it follows that the terms of trade and export volume effects were adverse for each country group, that the export volume effect for semi-industrial countries was as important as the terms of trade effect, that export volume effect was more important than the terms of trade effect for primary producers, and that for populous South Asia the terms of trade effect was more important than the export volume effect.

Table 1: Balance of Payments Effects of External Shocks, 1974-1978
averages (% of GNP)

	Semi-Industrial	Primary Producing	Populous South Asia
Terms of Trade Effect	0.9	1.65	1.26
Export Volume Effect	0.91	1.99	0.69

Source: Table 6.2 of World Bank (1981).

Given the external shocks summarized in Table 1, we study the effects of these shocks using country specific general equilibrium trade models described in the next section. For this purpose we need parameter values and initializations for each of the country groups. Since this information is not available we consider the data for three countries representing each of the groups. The countries are: Turkey, Kenya and India. Information on structural characteristics of these countries are summarized in Table 2. The World Bank estimates include Turkey as a semi-industrial country, Kenya as a primary producer and India as a country from South Asia.

III. The Model

The basic framework of our analysis is a multisectoral general equilibrium trade model. The model, emphasizing the importance of substitution effects in product and factor markets, determines both the commodity and factor prices and quantities endogenously. Following Armington (1969, 1970) we make a distinction between domestically produced and imported commodities. For each sector the domestically produced and imported commodities are considered not as perfect substitutes, as in

Table 2: Structure of the Economies in the Base Year

	Sectors in IO-Tables			Structure of Production (%)			Structure of Exports (%)			Structure of Imports (%)			Ratio of Exports to Domestic Output (%)			Ratio of Imports to Domestic Demand (%)		
	Turkey	Kenya	India	T	K	I	T	K	I	T	K	I	T	K	I	T	K	I
Agriculture	1-4, 14,19-20	1-3	1-5 25,32	24.3	23.0	26.0	28.7	31.5	20.0	3.2	2.0	2.0	6.4	22.5	3.0	1.3	2.0	0.4
Consumer Goods	11-13, 15-18, 21-24	5-13 15-16	20-24, 26-31, 33-41	13.0	20.0	19.0	24.9	12.0	32.0	2.2	14.0	10.0	10.4	10.0	8.0	1.9	18.0	4.0
Other industry	5-10, 25-49	4,14, 17-20	16-19, 42-78	20.1	15.0	14.0	9.0	20.0	29.0	88.3	71.0	88.0	2.4	22.5	5.0	22.9	13.3	24.0
Services	50-64	21-37	79-89	42.6	42.0	41.0	37.4	36.5	19.0	6.3	13.0	-	4.8	14.5	2.0	1.1	6.0	-

	Ratio of Intermediate Inputs to Total Production Costs (%)			Ratio of Imported Inputs to total Intermediate Inputs (%)			Share of Labour in Value Added (%)		
	T	K	I	T	K	I	T	K	I
Agriculture	29.4	13.0	29.0	5.2	18.0	5.0	58.7	61.0	39.0
Consumer Goods	76.0	70.0	73.0	6.5	17.0	2.0	35.8	26.0	49.0
Other industry	63.5	72.0	71.0	26.6	64.0	17.0	34.0	31.0	44.0
Services	24.0	41.0	42.0	7.7	12.0	3.0	60.2	59.0	69.0

The Main Sources: Input-Output Tables for Turkey 1973, Kenya 1976, India 1979-80.

classical models of trade theory, nor as perfect complements, as in two-sector models of trade and growth. The commodities are supposed to be imperfect substitutes. The extent of possibilities of substitution are represented by the values of trade substitution elasticity parameters.

The country is supposed to be small on the import side, so that the world price of imported commodities are fixed. On the export side it is assumed to face downward sloping demand curves for each of the tradeable domestic commodities. The responsiveness of export demands to changes in world prices of exports are represented by the values of the export demand elasticity parameters.

The equations of the model, drawn from the works of Dixon et al. (1982), are summarized in Table A1 in the appendix A.¹ Equations I.1-I.6 describe the product and factor markets. Producers are assumed to minimize the cost of producing a given activity level subject to production functions of a three level form. At the first level we have the Leontief assumption of no substitution between commodity categories, or between them and an aggregate of the primary factors. At the second level we have CES aggregation functions describing substitution possibilities between domestic and imported commodities of the same type; and CRESH functions describing substitution between aggregate primary factors: labour, capital and land.² At the third level we have CRESH functions describing substitution prospects between labour occupations within the aggregate la-

¹ Dixon et al. (1982) provides an exhaustive algebraic treatment of the derivation of the equation system. A complete list of the model equations is contained in Vincent (1981).

² For a discussion of CRESH functions see Hanoch (1971).

bour category, and between different types of land within the aggregate land category. The solution to the optimization problems yields the system of commodity demand equations for current production and capital creation, summarized by equations I.1 and I.2, and also the system of factor demand equations, summarized by equations I.3-I.4 and I.6. The average consumer is assumed to maximize the utility function of the Stone-Geary form,³ yielding the well known linear expenditure system. The utility function is on two levels. The consumer on the first level chooses between e.g. services and manufactures, and then at the second level chooses between domestic and imported manufactures.

Competitive pricing behaviour is imposed by equations II.1 - II.4, relating prices to cost for each of the activities of current production, capital creation, exporting and importing. Equations IV.1-IV.5 describe the allocation of investment by sectors of destination, according to which total investment is allocated across industries so as to equate the expected rates of return.

The system of equations summarized in Table A1 is homogenous of degree zero in commodity and factor prices so that only relative prices can be determined. Some sort of normalization on prices is required. In the following we assume that the price level is constant, implying that monetary authorities control the money supply during the adjustment period.

³ See Stone (1954) and Geary (1950-51).

The external shocks suffered by the country groups, discussed in the previous section have been stated in Table 1 as percentages of GNP. To express those values in terms of the variables of the model of Table A1 we assume that the terms of trade effect can be represented as an across the board increase in foreign prices of imported commodities. Hence, the terms of trade effect is expressed by increases in \bar{P}_{2j} of equation III.3 in Table A1. Given the aggregate export elasticities, the export volume effect can be represented by an across the board decrease in the exogenous part of the export demand. Thus, the export volume effect is expressed by decreases in \bar{E}_i of equation III.1 in Table A1. The results of these calculations are summarized in Table 3.

Table 3: External Shocks (Percentage Changes)

	Turkey	Kenya	India
\bar{P}_{2j}	8.16	4.88	14.29
\bar{E}_i	-0.57	-0.39	-0.63

Source: Own calculations.

IV. Effects of Alternative Policy Regimes

To analyse the impact of policy regimes we consider for each of the three countries four experiments:

E1: liberal policies (LP)

E2: semi-liberal policies (SLP)

E3: semi-interventionist policies (SIP)

E4: interventionist policies (IP)

IP refers to the case where the exchange rate is fixed by the government, foreign exchange is allocated through premium rationing,⁴ and the trade unions do not allow the real wage of organized labour to decrease. SIP differs from IP only in its treatment of labour market. It assumes that wage rate of organized labour is flexible. Hence, under SIP we have flexible wages but premium rationing. SLP is the same as SIP except that exchange rate is flexible now. Thus, under SLP we have flexible wages and flexible exchange rates. Finally, LP refers to the case where we have not only flexible wages and exchange rates but also a lowering of trade barriers. Thus, under LP we assume that import tariffs are decreased by 10%.

To study the effects of exogenous shocks under different policy regimes, we assume that the economy is initially in internal and external equilibrium, so that the set of equations of Table A1 is satisfied. Next, we consider the exogenous shock. To study the effects of this shock under LP and SLP we convert the set of equations of the system, summarized in Table A1, to linear form by logarithmic differentiation and then solve for the endogenous variables using simple matrix methods. Under SIP and IP we replace, following the approach of Dervis et al. (1981), the equations II.4 of Table A1 by the relations.

$$P_{2j} = \bar{P}_{2j} (1 + \bar{t}_j + PR) \bar{E}$$

⁴ Given an excess situation for foreign exchange and the fixity of the exchange rate, we assume that there exists a market for scarce imports. In that case those who demand the imported commodities bid the price of imports over the customs clearing price, so that positive premium rates emerge due to rationing. For a thorough discussion of premium rationing see Dervis et al. (1982).

where PR denotes the premium rate, the new endogenous variable, and \bar{E} the fixed exchange rate, the new exogenous variable. The results of these experiments are summarized in Tables 4 and 5.

The results in Table 4 show that real GDP declines in all cases. A comparison of the GDP losses under the four policy regimes reveals that liberal policies are the best in terms of minimising GDP changes, followed by semi-liberal policies, semi-interventionist policies and interventionist policies, and that this ranking of alternative policies remains unaffected in spite of the differences among the countries. Hence, countries adjust in the least costly way by adopting liberal policies .

Although, the proposition that the developing countries could minimise the GDP losses by adopting liberal policies is acknowledged by many economists, nonetheless a large number of these countries still adopt interventionist policies. This reliance on controls stems from the fact that they are considered to be part of the overall development plans and also because there exists a general distrust in the ability of the free market to lead to socially optimal production and income patterns. Another plausible explanation has been recently offered by de Melo and Robinson (1982). They argue that different policies affect different classes in society differently and depending on their relative gains and losses,

Table 4: Macroeconomic Effects of Alternative Policy Regimes (% Change from Base Run)

	Liberal Policies			Semi-liberal Policies			Semi-Inter- ventionist Policies			Interventionist Policies		
	Turkey	Kenya	India	Turkey	Kenya	India	Turkey	Kenya	India	Turkey	Kenya	India
GDP	-1.3	-2.28	-0.75	-1.37	-2.53	-0.8	-1.58	-2.62	-0.83	-2.45	-3.28	-1.15
Exchange Rate	0.59	0.19	0.26	0.46	0.08	0.26	-	-	-	-	-	-
Real Wage Rate	-1.12	-1.12	-0.44	-1.4	-1.43	-0.58	-2.21	-1.57	-1.08	-0.31	-1.06	-0.98
Share of labour in GDP	0.18	1.16	0.31	-0.03	1.1	0.22	-0.63	1.05	-0.25	0.36	0.81	-0.31

these groups attempt to influence the final outcome in their favour. In what follows next, we study the impact of alternative policy regimes on the income of various income groups in our sample countries. This will provide some indication about the groups that have an interest in pressing for certain specific policies.

We assume three homogenous income classes: farmers, non-agricultural labour and capitalists. The farmers receive the land and labour income in the agricultural sectors, whereas the capitalist class receives all the capital income including the agricultural profits. The results of the affect of changing policies on three income classes are displayed in Table 5. We note that under semi-interventionist policies as compared with liberal policies, the farmers loose more in absolute terms than the capitalists for all the three countries. These results are reversed when liberal policies are followed. When the ratio of income losses by farmers to income losses by capitalists under interventionist policies is compared with the similar ratio under liberal policies to determine the relative losses, it is found that this ratio is lower for all the three countries under liberal policies.⁵ This implies that relative to capitalists, the farmers are better off under the liberal policies.

⁵ These ratios under interventionist policies are 0.27, 0.17 3.15 for Turkey, Kenya and India, respectively. They fall to 0.09, 0.11 and 0.25 with liberal policies.

Table 5: Real Incomes (% Changes from Base Run)

	Liberal Policies			Semi-liberal Policies			Semi-Interventionist Policies			Interventionist Policies		
	Turkey	Kenya	India	Turkey	Kenya	India	Turkey	Kenya	India	Turkey	Kenya	India
Farmers*	-0.18	-0.53	-0.46	-0.42	-0.69	-0.67	-0.95	-0.75	-0.98	-1.01	-1.07	-1.48
Non-Agricultural Labour	-1.54	-1.92	-0.30	-1.85	-2.47	-0.43	-2.80	-2.68	-1.03	-2.58	-3.26	-1.36
Capitalists	-2.04	-4.92	-1.77	-1.82	-4.91	-1.53	-1.20	-4.89	-0.35	-3.81	-6.07	-0.47

* Farmers receive both wage and land income in the agricultural sectors. Agricultural profits go to capitalists.

Further, the results reveal that capitalists would pressure the government to have semi-interventionist policies, since under such policies their income losses are minimised. They lose relatively more when liberal policies are implemented. On the other hand, farmers and non-agricultural labour would benefit when liberal policies are followed. Thus, it would seem that the major supporters of interventionist policies are likely to be capitalists. But, the actual policy outcome would depend on the relative strength of the various income groups in the political system. For instance, if the capitalist class is better organised and therefore exerts a greater influence on the political system, one would expect semi-interventionist policies to be implemented in the country.

V. Conclusions

This paper has examined the consequences of basically two policy regimes: liberal and interventionist policies. Using general equilibrium trade models and considering the case of the external shocks suffered by the oil importing developing countries after 1973, it was shown that interventionist policies are more costly in terms of lost GDP. The best recourse to managing the economies of Turkey, Kenya and India to external shocks is to adopt liberal policies. By doing so, the countries would minimise the GDP losses. Furthermore, it was shown that the choice of policy regimes has significant impact on the distribution of income. Thus, the unwillingness of some of the developing countries' governments to pursue liberal policies could be explained in terms of relative strength of capitalists in the political system of these countries.

Table 1 Equations of the Model

I. Product and Factor Markets

$$I.1 \quad \sum_{j=1}^n D_{ij}^a(P_{1i}, P_{2i}, Q_j) + D_i^C(P_{11}, \dots, P_{1n}, P_{21}, \dots, P_{2n}, C) + \sum_{j=1}^n D_{ij}^I(P_{1i}, P_{2i}, Y_j) + E_i = Q_i$$

$$I.2 \quad \sum_{j=1}^n M_{ij}^a(P_{1i}, P_{2i}, Q_j) + M_i^C(P_{11}, \dots, P_{1n}, P_{21}, \dots, P_{2n}, C) + \sum_{j=1}^n M_{ij}^I(P_{1i}, P_{2i}, Y_j) = M_i$$

$$I.3 \quad \sum_{j=1}^n L_j^k(w_1^1, \dots, w_h^1, w_j^2, w_1^3, \dots, w_g^3, Q_j) = \bar{L}^k$$

$$I.4 \quad K_j(w_1^1, \dots, w_h^1, w_j^2, w_1^3, \dots, w_g^3, Q_j) = K_j(O)$$

$$I.5 \quad \sum_{j=1}^n \bar{K}_j(O) = \bar{K}(O)$$

$$I.6 \quad \sum_{j=1}^n A_j^1(w_1^1, \dots, w_h^1, w_j^2, w_1^3, \dots, w_g^3, Q_j) = \bar{A}^1$$

$D_{ij}^a(M_{ij}^a)$ interindustry demand of domestic (imported) commodity i by sector j

$D_i^C(M_i^C)$ consumption demand of domestic (imported) commodity i

$D_{ij}^I(M_{ij}^I)$ demand for capital creation of domestic (imported) commodity i by sector j

$P_{1i}(P_{2i})$ price of domestic (imported) commodity i

$Q_i(M_i)$ output (imports) of commodity i

E_i exports of domestic commodity i

C total consumption expenditures

Y_j investment by sector of destination

L_j^k demand for labour category k by sector j

\bar{L}^k supply of labour category k

$K_j(O)$ demand for capital by sector j

A_j^1 demand for land category 1 by sector j

\bar{A}^1 supply of land category 1

w_k^1 average wage of labour category k

w_j^2 rental rate of capital by sector j

w_1^3 average rent of land category 1

$\bar{K}(O)$ aggregate capital

Table 1 continued

II. Prices

$$II.1 \quad P_{1j} Q_j = \sum_{i=1}^n P_{1i} D_{ij}^a + \sum_{i=1}^n P_{2i} M_{ij}^a + \sum_{k=1}^h w_k^1 L_j^k + w_j^2 K_j + \sum_{l=1}^g w_l^3 A_j^l + \bar{t}d_j P_{2j} Q_j$$

$$II.2 \quad \pi_j Y_j = \sum_{i=1}^n P_{1i} D_{ij}^I + \sum_{i=1}^n P_{2i} M_{ij}^I$$

$$II.3 \quad P_{1j} = P_{1j}^* (1 + \bar{v}_j) E$$

$$II.4 \quad P_{2j} = \bar{P}_{2j} (1 + \bar{t}_j) E$$

$$II.5 \quad \bar{\Omega}^C = \Omega^C (P_{11}, \dots, P_{2n}, P_{21}, \dots, P_{2n})$$

$$II.6 \quad \Omega^I = \Omega^I (\pi_1, \dots, \pi_n)$$

td_j indirect tax rate of sector j

π_j price of capital in sector j

P_{1j}^* foreign price of exports of sector j

\bar{P}_{2j} foreign price of imported commodity j

\bar{v}_j export subsidy rate of sector j

E exchange rate

\bar{t}_j tariff rate of sector j

$\bar{\Omega}^C$ consumer price index

Ω^I capital goods price index

III. Foreign Trade

$$III.1 \quad E_i = \bar{E}_i P_{1i}^{*\bar{n}_i}$$

$$III.2 \quad e = \sum_{j=1}^n \bar{P}_{2j} E_j$$

$$III.3 \quad m = \sum_{j=1}^n \bar{P}_{2j} M_j$$

$$III.4 \quad m - e = \bar{F}$$

\bar{n}_i export demand elasticity

e foreign currency value of exports

m foreign currency value of imports

\bar{F} net inflow of foreign exchange

Table 1 continued

IV. Capital Accumulation

$$IV.1 \quad R_j(0) = \frac{P_j^2}{\pi_j} - \bar{d}_j$$

$$IV.2 \quad R_j(0) \left(\frac{K_j(1)}{K_j(0)} \right)^{-\bar{\beta}_j} = \Lambda$$

$$IV.3 \quad R_j(0) = R \quad \bar{R}_j$$

$$IV.4 \quad K_j(1) = K_j(0) + Y_j - \bar{d}_j K_j(0)$$

$$IV.5 \quad I = \sum_{j=1}^n \pi_j Y_j$$

$R_j(0)$ rate of return on capital in sector j

R absolute rate of return on capital

\bar{R}_j variable representing the deviation from the absolute rate of return on capital in section j.

\bar{d}_j rate of depreciation of capital in sector j

Λ economy wide expected rate of return on capital

$K_j(1)$ capital stock of sector j in the terminal period

V. Miscellaneous

$$c = C/\bar{\Omega}^C$$

$$i = I/\bar{\Omega}^I$$

$$w_k^{R1} = w_k^1/\bar{\Omega}^C$$

$$i/c = \bar{f}$$

$$GDP = c + i + e - m$$

c real consumption

i real investment

w_k^{R1} real wage of labour category k

f shift term between aggregate consumption and investment

GDP real gross domestic product

Note: Exogenous variables and parameters are denoted by letters with a bar.

References

- Agarwal, J.P., H.H. Glismann, P. Nunnenkamp (1982), "Ölpreisschocks und wirtschaftliche Entwicklung - Anpassungsprobleme der Nichtöleutwicklungsänder". Kieler Studien Nr. 176 (forthcoming).
- Armington, P.S. (1969), "The Geographic Pattern of Trade and the Effects of Price Changes", IMF Staff Papers, Vol. 16, July.
- , (1970), "Adjustment of Trade Balances: Some Experiments with a Model of Trade Among Many Countries", IMF Staff Papers, Vol. 17, November.
- Balassa, B. (1981), "The Newly-Industrialising Developing Countries after the Oil Crisis", Weltwirtschaftliches Archiv, Vol. 117, January.
- Dervis, K., J. de Melo and S. Robinson (1981), "A General Equilibrium Analysis of Foreign Exchange Shortages in a Developing Economy", Economic Journal, Vol. 91, December.
- Dervis, K., J. de Melo and S. Robinson (1982), "General Equilibrium Models for Development Policy", Cambridge University Press, London.
- Dixon, P.B., B.R. Parmenter and D.P. Vincent (1982), "ORANI: A Multisectoral Model of the Australian Economy", North Holland Publishing Company.
- Geary, R.C. (1950-51), "A Note on 'A Constant Utility Index of the Cost of Living'", Review of Economic Studies, Vol. 18.
- Hanoch, G. (1971), "CRESH Production Functions", Econometrica, Vol. 39, September.
- de Melo, J. and S. Robinson (1982), "Trade Adjustment Policies and Income Distribution in Three Archetype Developing Economies", Journal of Development Economics, Vol. 10.
- Stone, R. (1954), "Linear Expenditure Systems and Demand Analysis: An Application to the Pattern of British Demand", Economic Journal, Vol. 64, September.
- Vincent, D.P. (1981), "Multisectoral Economic Models for Developing Countries: A Theoretical Framework and an Illustration of their Usefulness for Determining some Implications of UNCTAD Proposals for Commodity Market Reforms", Kiel Working Paper, No. 117, Institut für Weltwirtschaft, Kiel.
- World Bank (1981), "World Development Report 1981" Oxford University Press, London.