OIL PRICE DECLINES AND STRUCTURAL ADJUSTMENT POLICIES IN INDONESIA: A STATIC CGE ANALYSIS FOR 1980 AND 1985

By Mitsuo Ezaki*

This paper presents a static Computable General Equilibrium (CGE) model of Indonesia constructed for 1980 and 1985, and applies the model to the analysis of comparative statics by which the impacts of oil price declines are compared between the two years and the effects of structural adjustment policies are evaluated for the two cases of financial and tax reforms in 1983.

The model has been applied to the analysis of comparative statics in the case of a 10% decline in oil price for both years (1980 and 1985) independently and the results of the two years compared. A notable outcome from the comparisons is the fact that negative impacts of the 10% price decline are fairly smaller in 1985 than in 1980. This means that there should have occurred some structural changes or structural adjustments in the Indonesian economy between the two years to mitigate the negative effects of the 'reverse oil shock' which began in March 1983.

Actually, two major policy reforms were introduced in 1983 to cope with the reverse oil shock, aiming at a full mobilization of domestic resources. One was financial reform, and the other was the tax reform. Comparative statics based on the model clearly indicates that the two policy reforms, especially the financial reform, contributed significantly to the mitigation of negative effects caused by the reverse oil shock.

1. Introduction: Purpose and Outcome

The purpose of this paper is to present a static Computable General Equilibrium (CGE) model of Indonesia for the years 1980 and 1985, in which input-output tables are available, and to apply the model to the analysis of comparative statics, by which the impacts of oil price declines are compared between the two years, on the one hand, and the effects of structural adjustment policies are evaluated for the 1983 financial and tax reforms, on the other.

There already exist at least four CGE models or CGE studies for the economy of Indonesia, namely: (1) Gelb [1983] (World Bank), (2) CBS, ISS and CWFS [1986] (Dutch group), (3) Behrman, Lewis and Lotfi [1988] (Harvard group), and (4) Ezaki [1987b] (Kyoto University).[1] Each model has its own purpose of study as well as its own framework of modelling. The model of this paper, which is essentially the same in framework as the 1987 version above,[2] has two important characteristics compared with the other models above. First, it integrates real and financial sectors rigorously. Second, it determines the rate of foreign exchanges endogenously, covering both fixed and flexible rate systems.

The model with these characteristics has been constructed for the years 1980 and 1985, and applied to the analysis of comparative statics in the case of a 10% decline in oil price for each year. In other words, comparisons of comparative statics have been attempted between two time points by using two static models with different parameters and technological structures. A notable outcome from the comparisons is the fact that *negative* impacts of the oil price decline are fairly smaller in 1985 than in 1980. For example, impacts on real GDP of the 10 percent decline in oil price are -2.1 percent in 1980 but only -0.5 percent in 1985 for the case where government deficits due to oil price declines are financed through private savings (strictly, domestic savings of the non-government sector) under the framework of fixed exchange rate system.[3] The same impacts become -2.7 percent in 1980 and -1.0 percent in 1985 when government deficits are counterbalanced by curtailing government consumption.[4] This indicates that there should have occurred some structural changes or structural adjustments in the Indonesian economy between the two years to mitigate the negative effects of the 'reverse oil shock' which began in March 1983.

Actually, two institutional reforms or two structural adjustment policies were introduced in 1983 to cope with the reverse oil shock,

---

[1]See Bautista (1988) for CGE studies on East and Southeast Asian countries. It refers also to the works of the Kyoto University group (Ezaki (ed.), 1987) on four ASEAN countries. See, for example, Dervis, De Melo and Robinson (1982) for CGE modelling in general, to which the model here owes much.

[2]Major differences are as follows between the model here and the 1987 version: The aggregation of industry here follows that of BAPPENAS. The model here is constructed also for 1985. The labor market here is not divided into formal and informal ones.

[3]See columns for FO_{GG} in Table 4.

[4]See columns for $C_G n$ in Table 4.

aiming at a full mobilization of domestic resouces. First is the financial reform, by which deposit and lending rates of interest were liberalized for state commercial banks while credit ceilings were abolished for the banking sector, causing not only a shift in the choice of financial assets from foreign assets to domestic deposits on the side of the public but also a shift in the investment behavior from investment abroad to domestic lending on the side of the banking sector. Second is the tax reform, which simplified the taxation system and, at the same time, broadened the tax base to increase non-oil tax revenues, including the introduction of value added tax (VAT). The VAT came into effect in April 1985 and the revenue from VAT accounted for 12 percent of total government receipts from domestic sources in the fiscal year 1985/86.

The model has been applied again to the analysis of comparative statics in order to evaluate the effects of these institutional reforms by identifying structural adjustments with changes in appropriate parameters. In the case of counterbalancing government deficits by consumption curtailment (under the fixed exchange rate system), for example, the impact on real GDP of the 10 percent decline in oil price is -1.0 percent for 1985 as mentioned above, but the same impact becomes far greater at -2.9 percent if the asset choice behaviors of both depositors and banks in 1985 are not so much different from (or close to) those in 1980.[5] It may be concluded, from the results of similar comparative statics, that the two policy reforms, the financial reform in particular, contributed significantly to the mitigation of negative impacts caused by the reverse oil shock. It seems natural to evaluate the effects of tax reform (VAT in particular) positively as a contribution to the improvement of government fiscal position rather than to the betterment of economic performance in general, at least in the short run.

So far were the summary and conclusion of the paper. In Section 2, we will explain the essence of the model to be used for the analysis of comparative statics, referring briefly to the theoretical framework, assumptions, and data base. Detailed explanations of the model will be skipped to save space.[6] In Section 3, we will summarize, first, the results of comparative statics of the reverse oil shock (i.e., impacts on

---

[5]Compare column (4) with column (1) in $C_g n$ of Table 7.

[6]The CGE model of this paper is a non-linear system of equations, consisting approximately of 400 endogenous variables, 50 exogenous variables, and 800 parameters. See Appendix Tables A and B for notation and the system of equations. The system is solved by the Gauss-Seidel method, which is the simplest iterative method, with the convergence criterion of 1/10,000.

the Indonesian economy of the 10 percent decline in oil price) in both macro and industry levels, allowing for various channels of financing government deficits due to oil price declines. Then, we will investigate the role of financial and tax reforms quantitatively under the framework of comparative statics of the reverse oil shock above. Finally in Section 4, we will discuss the direction of future studies, focusing on various policy packages for structural adjustment introduced after 1985 as well as on the necessity of dynamization of the present model.

2. Basic Framework and Data of the Model

The model here has two important characteristics as mentioned briefly in the previous section. First, the model integrates real and financial sectors rigorously under the framework of multi-sector general equilibrium system, making it possible to determine absolute price levels endogenously. The model can analyze consistently not only such real aspects as industrial productions and GDP growth but also such monetary aspects as inflation and exchange rates. The integration of real and financial sectors seems to be a new field in CGE studies, and the present study is an attempt to provide an example in this new field. Second, the model endogenously determines the exchange rate, treating the system of partially flexible exchange rate as the system of reference. This system covers as special cases the systems of fixed exchange rate as well as of completely flexible exchange rate. The fixed rate system is the case where the upper and lower bounds coincide in the reference system. The completely flexible rate system is the case where the two bounds become wide enough in the reference system. This paper considers the fixed rate system as standard, referring to the flexible rate system only for supplementary information.

It must be noted that the model is essentially static in nature, since sectoral capital stocks are treated as fixed and and constant. Neither capital accumulation nor technical progress is allowed for here directly.[7]

The model describes the market economy of Indonesia through four component major markets: (1) product markets, consisting of 21 industries, (2) labor market, consisting of a single kind of homogeneous labor (where various relative wages are assumed to be constant), (3)

---

[7]This does not mean that the model completely neglects capital accumulation and technical progress, in the sense that different input-output tables (i.e., different technical coefficients and different parameterss for capital) are used for different time points (1980 and 1985).

financial markets, consisting of 7 financial assets, and (4) foreign exchange market, consisting solely of US dollars (See Table 1).[8] These component markets are connected with each other through receipts and outlays of such institutional sectors as households and corporate enterprises (HC), general government (GG), and the rest of the world (W).

Data on receipts and outlays are not available for households, corporate enterprises, and general government separately, since the Indonesian national income statistics still lack detailed data for the distribution side. As a result, households (including unincorporated enterprises) and corporate business (including state enterprises) are integrated into the HC sector mentioned above, and data on receipts and outlays for this integrated HC sector are estimated indirectly by using estimates on government accounts of other sources.[9] Furthermore, this integrated HC sector includes by definition the monetary system consisting of various state and private banks (BD) and the central bank (BI), so that the BD and BI sectors are separated out of the HC sector when (only when) the model deals with financial transactions in the financial markets (See Table 2). Data on financial transactions between institutional sectors are estimated indirectly by using data on assets and liabilities of the two banking sectors (i.e., BD and BI) due to the lack of flow of funds accounts in Indonesia. Data for product markets are input-output (IO) tables of 1980 and 1985. The official IO table is still in the process of compilation for 1985, so that the model has utilized an approximate 1985 table extended on the basis of the 1980 IO table. Data for labor market are derived, in principle, from supplementary tables of the two IO tables.[10] Data are often unavailable directly in accordance with the framework of the model, but all possible efforts have been exerted to obtain a consistent data base through the use of indirect information, simplifying assumptions, and so on.

---

[8]In the previous version (Ezaki, 1987b), the labor market was divided into two parts, i.e., formal and informal, and the formal labor was identified with employers and employees while the informal labor with self-employed and unpaid family workers. However, the distinction is not precise and the data compilation becomes fairly arbitrary, so that the present version has simplified the labor market, assuming a single kind of homogeneous labor.

[9]See, for example, CBS (Central Bureau of Statistics), 1984.

[10]See CBS (Central Bureau of Statistics) [1985] for the 1980 IO table, and Kaneko and Nidaira (1988) for the 1985 extended IO table. Data for employment by industry in 1985 are based on Yanagi (1986).

Table 1 – Classification of Markets

Products	Markets (21 industries):	IO Code* (1980)	(1985)
X1	: Agriculture	1–17	1–3
X2	: Animal Husbandry	18-20	4
X3	: Forestry	21,22	5
X4	: Fishery	23	6
X5	: Oil Mining	25	8
X6	: Other Mining and Quarrying	24, 26	7, 9
X7	: Food, Beverage, Tobacco	27-34	10-27
X8	: Textile, Apparel, Leather	35,36	28-35
X9	: Wood and Wood Products	37	36-38
X10	: Paper, Printing, Publishing	38	39-41
X11	: Chemicals, Petroleum & Coal Products	39, 42	42-52
X12	: Non-metallic Mineral Products	43, 44	53-57
X13	: Basic Metal	45, 46	58,59
X14	: Fabricated Metal Products	47	60-63
X15	: Machinery & Equipment	48, 49	64-73
X16	: Other Manufacturing Products	50	74-79
X17	: Construction	52	81
X18	: Electricity, Gas, Water	51	80
X19	: Trade	53, 54	82, 83
X20	: Transportation, Storage, Communication	55-60	84
X21	: Banking, Insurance, Services, n.e.c.	62-66	85, 86

Labor Market:

L   : Employers, Employees, Self-employed, Unpaid Family Workers

Financial Markets (7 financial assets and liabilities)#:

FM   : Reserve Money
FD   : Demand, Time and Foreign Currency Deposits
FG   : Government Deposits at Monetary System
FL   : Loans and Credits
FB   : Loans from Bank Indonesia to Deposit Money Banks
FO   : Net Other Domestic Items
FF   : Net Foreign Financial Assets
FN   ; Net Financial Assets

Foreign Exchange Market:

$: Foreign Exchanges in terms of US Dollars

* CBS 66-sector table for 1980 and CBS-MOI-JICA 86-sector table for 1985.
#*Indonesian Financial Statistics*, various issues.

Table 2 – Changes in Assets and Liabilities (1980,1985)*

(billion of rupiahs)

	Assets				Liabilities			
	(HC)	(GG)	(BI)	(BD)	(HC)	(GG)	(BI)	(BD)
FM	FM_{HC} (551) (780)	–	–	FM_{BD} (278) (182)	–	–	FM_{BI}^* (829) (962)	–
FD	FD_{HC} (1917) (4436)	–	–	–	–	–	$\overline{FD_{BI}^*}$ (14) (39)	FD_{BD}^* (1903) (4397)
FG	–	$\overline{FG_{GG}}$ (1920) (214)	–	–	–	–	$\overline{FG_{BI}^*}$ (1534) (-183)	FG_{BD}^* (387) (397)
FL	–	$\overline{FL_{GG}}$ (71) (-604)	$\overline{FL_{BI}}$ (302) (178)	$\overline{FL_{BD}}$ (1365) (3663)	FL_{HC}^* (1739) (3237)	–	–	–
FB	–	–	$\overline{FB_{BI}}$ (513) (-6)	–	–	–	–	FB_{BD}^* (513) (-6)
FO	FO_{HC} (2256) (375)	FO_{GG} (-1920) (-214)	$\overline{FO_{BI}}$ (-26) (202)	FO_{BD} (-307) (-363)	–	–	–	–
FF	FF_{HC} (2623) (187)	$\overline{FF_{GG}}$ (-1219) (-3549)	FF_{BI} (1588) (444)	FF_{BD} (1467) (1306)	–	–	–	–
FN	–	–	–	–	FN_{HC} (5608) (2541)	FN_{GG} (-1148) (-4153)	$\overline{FN_{BI}}$ (0) (0)	$\overline{FN_{BD}}$ (0) (0)

*Figures in the upper brackets are changes in assets and liabilities between December 1979 and December 1980, while figures in the lower brackets are those between 1984 and 1985. See *Indonesian Financial Statistics,* various issues, and Ezaki 1983), Table 3. Note that net financial assets of Bank Indonesia and deposit money banks (FN_{BI} and FN_{BD}) are assumed to be zero. Sectoral classification here is:

HC: households and corporate business sectors, including
BI: Bank Indonesia (monetary authority), and
BD: deposit money banks,
GG: general government, and   W: the rest of the world.

How component markets are cleared is the key element in general equilibrium systems. There are two ways of clearing component markets. One is price adjustment, in which price adjusts to attain equilibrium between supply and demand. The other is quantity adjustment, in which either supply or demand adjusts to attain equality between the two, with the price to be determined outside the market. Market clearing mechanisms which the model has adopted are summarized in Table 3. The model assumes quantity adjustment to hold in many of the component markets rather than price adjustment. In the case of product markets, quantity adjustments are assumed for the products of heavy-chemical and service industries. For those products, prices are determined first by costs (including profits assumed to be proportional to total costs). Then, price levels determine quantities of demand and, finally, demand levels determine quantities of supply. The cost mark-up process seems to be realistic because even if some of the prices are set by the government at some artificial levels by policy considerations, those prices must reflect various costs at least in the medium run or in the long run. In the case of financial markets, the model assumes only quantity adjustments (except for reserve money), specifying asset choice functions in their simplest form based on the flow data.

Almost all of the parameter values in the model (shares, ratios, constant terms, elasticities, etc.) are derived either directly or indirectly from the data base mentioned above.[11] Procedures for parameter estimation are generally simple, since the model adopts the simplest form for its behavioral and technological equations. For example, production functions by industry have fixed coefficients for intermediate inputs and adopt Cobb-Douglas type for primary factor inputs. Aggregation functions for composite goods (which correspond to Armington's procedure) are also of Cobb-Douglas type. Utility function for the households (non-government domestic) sector is also of Cobb-Douglas type, and the saving rate of that sector is assumed to be constant. Furthermore, asset choice functions in each of the four institutional sectors (HC, GG, BD and BI) are, in most cases, of fixed coefficients or of proportional type. In principle, the model of this paper gives top priority to realistic interpretation and proper treatment of various identities in SNA (System of National Accounts), and adopts the most simplified approaches to the theoretical hypotheses (behavioral equations and technological relations) in linking those identities.

---

[11]The most important exception is elasticities of export demand by industry (η_i's), which are all set equal to one as the first approach. Sensitivity test has not been attempted yet to check whether the results of comparative statics are stable or not under different η_i's but, in the case of Thai and Japanese models, fairly stable results have been obtained by such tests.

Table 3 – Market-Clearing Mechanisms

Product Markets:

X1	(agriculture)	price (PD1) adjusts; supply (X1) fixed
X2	(animal husbandry)	price (PD2) adjusts; supply (X2) fixed
X3	(forestry)	price (PD3) adjusts
X4	(fishery)	price (PD4) adjusts
X5	(oil mining)	supply (X5) adjusts; PD5 linked to PW5
X6	(other mining)	supply (X6) adjusts; PD6 det. by cost
X7	(food, etc.)	price (PD7) adjusts
X8	(textiles, etc.)	price (PD8) adjusts
X9	(wood, etc.)	price (PD9) adjusts
X10	(paper, etc.)	price (PD10) adjusts
X11	(chemicals, etc.)	supply (X11) adjusts; PD11 det. by cost
X12	(non-metallic)	supply (X12) adjusts; PD12 det. by cost
X13	(basic metal)	supply (X13) adjusts; PD13 det. by cost
X14	(fabric. metal)	supply (X14) adjusts; PD14 det. by cost
X15	(machinery, etc.)	supply (X15) adjusts; PD15 det. by cost
X16	(other manuf.)	supply (X16) adjusts; PD16 det. by cost
X17	(construction)	supply (X17) adjusts; PD17 det. by cost
X18	(public utility)	supply (X18) adjusts; PD18 det. by cost
X19	(trade)	supply (X19) adjusts; PD19 det. by cost
X20	(transp., etc.)	supply (X20) adjusts; PD20 det. by cost
X21	(other services)	supply (X21) adjusts; PD21 det. by cost

Labor Market:

L	(average labor)	money wage (W) is downward rigid; either supply or wage adjusts, but the former is considered more probable

Financial Markets

FM	(reserve money)	demand-supply equality always holds due to Walras' Law; price is known a priori
FD	(deposits	supply ($FD_{BD}{}^*$) adjusts; r_D exogenous
FG	(gov. deposits)	supply.($FG_{BD}{}^*$) adjusts; r_G exogenous
FL	(loans)	demand ($FL_{HC}{}^*$) adjusts; r_L exogenous
FB	(BI loans)	demand ($FB_{BD}{}^*$) adjusts; r_B exogenous
FO	(n.o.i.)	FO_{HC} adjusts (as a residual)
FF	(n.f.a.)	infinitely elastic supply or demand of the rest of the world; r_F exogenous

Foreign Exchange Market:

$	(US dollars)	either exchange rate (ER) or foreign capital inflow (F_w) adjusts

Detailed explanations are skipped but supplementary comments are given here on the following two scores: the Law of Walras and the exchange rate determination. First is on the Law of Walras. The model is formulated as a general equilibrium system, but not purely so, in that there exist markets for which quantity adjustments are assumed rather than price adjustments. However, the aggregate identity (i.e., aggregate budget constraint) which leads to the Law of Walras still holds precisely for the markets in which price adjustments are assumed to prevail. As a result, all of the supply-demand equilibrium conditions do not constitute independent constraints, so that one of them must be dropped as redundant for price determination. In the present model, the equilibrium condition for reserve money (FM) is regarded as redundant and skipped in solving the system. Since the price of reserve money is *a priori* known and unitary, equilibrium conditions for all of other markets will determine the corresponding prices in their absolute levels.

Second is on the determination of exchange rate in the foreign exchanges market. The model regards the system of partially flexible rate as the starting point, assuming that the equilibrium rate will fall within a small range set by the maximum deviation rate (θ) from the exogenous central level (ER°). The model, however, can deal with a fixed exchange rate by setting the maximum deviation rate to zero ($\theta = 0.0$) and with a completely flexible exchange rate by setting the maximum deviation rate to one ($\theta = 1.0$). It is assumed that quantity adjustments occur in the sector of central bank (BI) through its net foreign assets (FF_{BI}) if the exchange rate becomes equal to either the upper or the lower boundary. On the other hand, net foreign assets of the central bank (FF_{BI}) is treated as exogenous (in the case of price adjustments) if the exchange rate is at a level between the two boundaries which equilibrates demand and supply for US dollars. What is meant by these two cases is the fact that the central bank cannot control its net foreign assets when it controls the foreign exchange rate, while the central bank cannot control the foreign exchange rate when it controls its net foreign assets. Note that the equilibrium in the foreign exchanges market means the situation where the demand for US dollars (imports + net factor and transfer payments abroad) becomes equal to the supply of US dollars (exports + net capital inflow from abroad). Net capital inflow from abroad (F_W) is defined here in its

broad sense and equal to deficits in the current balance of payments.[12]

3. Implications of the Model:
Comparative Statics of the Reverse Oil Shock

The CGE model of Indonesia has been applied to the analysis of comparative statics for the years 1980 and 1985 to see the impacts of oil price declines (i.e., reverse oil shock) in both macro and industry levels and to evaluate the effects on shock mitigation of the financial and tax reforms in 1983.[13] The results of comparative statics in relation with the reverse oil shock are summarized in Tables 4 to 7, and their implications are discussed below, focusing on production and prices of the industry, as well as on growth, consumption, inflation, the balance of payments, and employment at the macroeconomic level.

Comparative statics of the reverse oil shock must be done very carefully for the case of Indonesia since the dependence of its government revenue on oil is extremely high. For example, the Indonesian government received almost 70 percent of its current revenue (direct and indirect taxes and other non-tax revenue) from oil company tax in 1983 (the year in which the reverse oil shock began). Directions and degrees of the impacts of the reverse oil shock in Indonesia, therefore, will depend heavily on how to deal with the tendency towards deficits in the government balance under the oil price declines. In short, the impacts will be very much influenced by the means of financing government deficits.

The model of this paper can allow for four means of financing government deficits. First is the case of financing government deficits through savings of the private or non-government domestic sector (See FO_{GG} in each table). Second is the case of withdrawing government deposits from the monetary system by the amount of increased deficits

---

[12]Transactions of foreign exchanges in Indonesia are free in principle, though exports and imports are regulated in a complicated manner. The rupiah was devalued drastically three times since the beginning of the 1970s. The first devaluation ($1 = Rp. 415 →Rp. 625) occurred in November 1978, the second ($1 = Rp. 702 → Rp, 970) in March 1983, and the third ($1 = Rp. 1134 → Rp. 1644) in September 1986. Between these drastic devaluations, the rupiah was maintained almost constant or had a tendency of mild depreciation. At the time of devaluation in 1987, the foreign exchange rate system in Indonesia shifted from the fixed rate system vis-a-vis the US dollars to the managed floating system vis-a-vis the basket of foreign currencies.

[13]Comparative statics have been attempted also for such shocks as rupiah devaluation, increase in agricultural production, and so on, though the results are not shown here. Note that agricultural production is treated as exogenous as seen in Table 3.

(See FG_{GG} in each table). Third is the case of borrowing from abroad by the amount of increased deficits (See FF_{GG} in each table). Fourth is the case of curtailing government consumption expenditure with no changes in government deficits (See $C_G n$ in each table). There exist several other means of financing government deficits such as cutting government loans (FL_{GG}), and curtailing government investment expenditure ($I_G n$), which, however, give almost the same results of comparative statics as the four above, since the investment function of the private (HC) sector is derived from the fund availability (savings + net borrowing) of that sector in the model. Financing government deficit by curtailment may be considered as most probable, judging from the balanced budget principle of Indonesia since the beginning of the Soeharto government.[14]

In any case, the results of comparative statics under a 10 percent decline in oil price in terms of US dollars are summarized in Tables 4 to 6 covering all of the four means of government deficit financing above for the years 1980 and 1985. Table 4 indicates by percentage changes (or by kind of elasticities) the impacts on key macro-variables under the fixed exchange rate system; Table 5, those on key macro-variables under the flexible exchange rate system; and Table 6, those on real production by industry under the fixed exchange rate system.

From Tables 4 and 6, which are based on the fixed exchange rate system, we can derive an important general observation, although with some exceptions depending on the means of government deficit financing. That is to say, declines in oil price (i.e., the reverse oil shock) have negative impacts on the oil-exporting economy of Indonesia in almost all aspects of both industry and macro-levels. [15] Worsening the balance

---

[14]See, for example, Booth and McCawley (1981, Ch. 5), Ichimura (1988, Ch. 7), and so on for the Indonesian fiscal policy. It is needless to say that the specification of the model becomes slightly different depending on the four types of financing government deficits. The system of equations in Appendix Table B corresponds to the first means (FO_{GG}). For the second and third means (FG_{GG} and FF_{GG}), eq. (22.2) in Appendix Table B must be changed into:

$$(22.2)' \ FG_{GG} = FN_{GG} - (\overline{FO_{GG}} + \overline{FL_{GG}} + \overline{FF_{GG}}) \ \text{ or } FF_{GG} = FN_{GG} - (\overline{FO_{GG}} + \overline{FG_{GG}} + \overline{FL_{GG}})$$

For the fourth means ($C_G n$), on the other hand, eqs. (22.1) and 17.3) should be replaced by:

$$(22.1)' \ C_G n = Y_{GG} - PI_G \overline{I_G} - \overline{FN_{GG}} \ \text{ and } \ (17.3)' \ C_G = C_G n / PC_G$$

where $C_G n$ is nominal government consumption expenditure.

[15]Impacts of oil price declines on such oil-importing countries as Thailand, the Philippines and Japan are almost opposite in direction to those on oil-exporting Indonesia. See Ezaki (1987a) and Ezaki and Ito (1988).

184

Table 4 – Impacts of 'Reverse Oil Shock' on the Macro-economy of Indonesia: Comparative Statics for 1980 and 1985 in the Case of 10% Decrease in Oil Price under Fixed Exchange Rate System*

Means of financing government deficits:	FO_{GG}		FG_{GG}		FF_{GG}		(% changes) $C_G n$	
	1980	1985	1980	1985	1980	1985	1980	1985
Real GDP (GDP)	-2.1	-.05	-0.7	-0.1	-0.3	0.9	-2.7	-1.0
GDP deflator ($PGDP$)	-6.1	-4.4	-4.9	-4.0	-4.4	-3.2	-6.4	-4.8
Real consumption (C_H)	-3.3	-1.6	-1.9	-1.1	-1.5	-0.2	-3.9	-2.1
Consumption deflator (PC_H)	-4.4	-2.8	-3.0	-2.3	-2.4	-1.3	-5.0	-3.3
Government revenue (Y_{GG})	-11.7	-8.6	-10.4	-7.9	-9.8	-6.5	-12.0	-9.1
Deficits in current B.O.P. (F_w)#	8.1	5.8	16.6	19.3	19.7	42.0	9.3	7.0
Employment (L)	-7.7	-3.8	-4.1	-2.8	-3.0	-0.7	-8.8	-5.0
Manufacturing output (X_M)	-2.9	0.5	-0.6	1.2	0.1	2.5	-2.4	0.7
Exchange rate (ER)	–	–	–	–	–	–	–	–

*Figures above indicate percentage changes in key endogenous variables for the case of a 10% decrease in exogenous world oil prices (PW_5 and PWM_5). FO_{GG} corresponds to the case of financing government deficits through private saving. FG_{GG} is the case of withdrawing government deposits from the monetary system. FF_{GG} is the case of borrowing from abroad. $C_G n$ means the case of curtailing government consumption expenditures without changing the amount of government deficits.

This variable is the same as foreign capital inflow. The current balance of payments was in surplus in 1980 so that positive figures for 1980 mean percentage decreases in surplus.

Table 5 – Impacts of 'Reverse Oil Shock' on the Macro-economy of Indonesia: Comparative Statics for 1980 and 1985 in the Case of a 10% Decrease in Oil Price under Flexible Exchange Rate System*

(% changes)

Means of financing government deficits:	FO_{GG}		FG_{GG}		FF_{GG}		C_G^n	
	1980	1985	1980	1985	1980	1985	1980	1985
Real GDP (GDP)	-1.7	-0.6	-0.5	-0.1	-0.1	0.9	-2.4	-1.2
GDP deflator (PGDP)	1.3	-1.3	-0.3	-1.7	-0.8	-2.6	1.0	-1.3
Real consumption (C_H)	-2.9	-1.7	-1.6	-1.2	-1.2	-0.2	-3.5	-2.3
Consumption deflator (PC_H)	2.9	0.3	1.6	0.0	1.2	-0.7	2.3	0.1
Government revenue (Y_{GG})	-4.3	-5.6	-5.7	-5.6	-6.2	-5.9	-4.5	-5.7
Deficits in current B.O.P. (F_W)	8.0	2.5	16.9	15.9	19.8	42.2	9.1	2.6
Employment (L)	0.4	-1.0	0.7	-0.6	0.8	0.0	-1.4	-2.0
Manufacturing output (X_M)	-1.8	0.5	0.1	1.3	0.7	2.6	-1.3	0.8
Exchange rate (ER)	8.6	3.8	5.2	2.8	4.2	0.7	8.8	4.5

*See footnotes to Table 4.

Table 6 – Impacts of 'Reverse Oil Shock' on the Industries of Indonesia: Comparative Statics for 1980 and 1985 in the Case of 10% Decrease in Oil Price under Fixed Exchange Rate System*

(% changes)

Means of financing government deficits: (gross outputs)	FO_{GG}		FG_{GG}		FF_{GG}		C_G^n	
	1980	1985	1980	1985	1980	1985	1980	1985
X1 (agriculture)	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0
X2 (animal husbandry)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
X3 (forestry)	-1.2	-1.2	-0.5	-0.7	-0.2	0.4	-0.8	-0.7
X4 (fishery)	-2.7	-1.7	-1.7	-1.3	-1.3	-0.5	-3.2	-2.1
X5 (oil mining)	0.2	1.1	0.3	1.2	0.4	1.3	0.2	1.1
X6 (other mining)	-4.6	-0.4	-1.0	0.9	0.2	3.2	-1.8	1.6
X7 (food, etc.)	-2.1	-1.2	-1.3	-0.9	-1.0	-0.3	-2.5	-1.5
X8 (textiles, etc.)	-3.5	-0.7	-1.9	-0.2	-1.3	0.6	-4.8	-3.0
X9 (wood, etc.)	-5.1	-1.2	-2.0	-0.2	-0.9	1.9	-3.3	0.8
X10 (paper, etc.)	-2.0	-0.9	-0.7	-0.1	-0.2	1.5	-4.4	-1.5
X11 (chemicals, etc)	2.0	5.6	4.0	5.9	4.7	6.6	1.9	5.3
X12 (non-metallic minerals)	-8.7	-3.2	-2.7	-1.2	-0.7	2.7	-4.2	0.2
X13 (basic metal)	-3.0	-0.6	-0.2	0.4	0.7	2.4	-0.7	1.3

Table 6 (continued)

Means of financing government deficits: (gross outputs)	FO_{GG}		FG_{GG}		FF_{GG}		C_G^n	
	1980	1985	1980	1985	1980	1985	1980	1985
X14 (fabricated metal)	-7.7	-2.9	-2.5	-1.1	-0.8	2.3	-4.3	-0.1
X15 (machinery, etc.)	-7.4	-2.7	-2.5	-1.0	-0.9	2.3	-4.6	-1.1
X16 (other manufacturing)	-5.5	-2.3	-1.8	-0.6	-0.6	2.5	-4.6	-0.4
X17 (construction)	-10.2	-4.5	-3.5	-2.1	-1.3	2.6	-5.0	-0.3
X18 (public utility)	-3.1	-0.9	-1.1	-0.1	-0.4	1.4	-5.4	-2.0
X19 (trade)	-3.4	-1.4	-1.4	-0.7	-0.7	0.7	-3.5	-1.3
X20 (transportation, etc.)	-3.3	-1.3	-1.3	-0.5	-0.7	1.0	-4.2	-1.5
X21 (other services)	-2.2	-0.9	-1.1	-0.4	-0.7	0.6	-8.8	-4.7

*See footnotes to Table 4. Note that gross outputs of agriculture and animal husbandry (X1 and X2) are treated as exogenous in the model.

of payments (i.e., reducing the current account surplus in 1980 while increasing the current account deficit in 1985), the reverse oil shock suppresses growth, welfare and employment (i.e., reduces industrial production, GDP growth, real private consumption, and total employment), on the one hand, and averts inflation (i.e., reduces price levels), on the other. These negative impacts are fairly large in the case of financing government deficits through private savings or through curtailment of government consumption, but fairly small in the remaining case of withdrawing deposits or borrowing from abroad. Negative impacts on industrial production are conspicuous generally for the sectors of construction and manufacturing due to decreases in investment demand, but those on service production become large in the case of government consumption curtailment. Furthermore (Table 5), the negative impacts are a little weaker under the flexible exchange rate system with a tendency towards rupiah appreciation and inflation. The flexible rupiah rate system, therefore, may be generally considered as a stabilizing factor, making fluctuations smaller in almost all of the macro-fundamentals such as growth, welfare, employment, and inflation.

By comparing between 1980 and 1985 in the three tables (Tables 4 - 6), we can also derive an interesting observation on the structural changes or structural adjustments. That is to say, the negative impacts of oil price declines on the economy of Indonesia are fairly smaller in 1985 than in 1980. This is true for growth, for real consumption, for employment, and also for industrial production. This is true for any of the four means of government deficit financing. For example, impacts on real GDP of the 10 percent decline in oil price are -2.1 percent for 1980 but only -0.5 percent for 1985 in the case of financing government deficits through private savings under the fixed rupiah rate (FO_{GG} in Table 4). The same impacts are -2.7 percent for 1980 and -1.0 percent for 1985 in the case of government deficit financing by consumption curtailment ($C_G n$ in Table 4). It may be inferred from this fact that there should have occurred some structural changes in the Indonesian economy to mitigate the negative impacts of the reverse oil shock for the period from 1980 to 1985.

Such structural changes could occur directly or indirectly in accordance with changes in technologies, behavioral modes, institutions and policies, and so on. Here we focus on changes in institutions and policies, and investigate effects on the shock mitigation of the two institutional reforms or structural adjustment policies which were introduced soon after the beginning (March 1983) of the reverse oil shock. One is the financial reform which aimed at a full mobilization of domestic financial resources (June 1983). Another is the tax reform

which aimed at a rapid increase in non-oil tax revenues (December 1983).[16]

Policy packages for the financial reform consisted mainly of the following three points:

(1) The state banks were given complete freedom to determine their own deposit and lending rates, except for concessional rates on lending to certain categories of priority borrowers.

(2) The system of aggregate credit ceilings on each bank was abolished, and the banks became free from direct central bank control of their lending activities.

(3) The goverment announced increases in interest rates on savings bank deposits, and abolished the 20 percent witholding tax on dollar-denominated deposits with the Indonesian banks.

Under the previous system, the state banks were controlled through credit ceilings with fixed interest rates in their lending activities but were provided with the liquidity credits with very low interest rates from the central bank. After the reform, lending and deposit rates at the state banks were freed and most loans were no longer eligible for an interest rate subsidy through the liquidity credit mechanism, on the one hand, and all bank credit ceilings were eliminated completely, on the other. Under the new system, all the banks were expected to mobilize domestic savings by their own efforts and to supply domestic investment funds by their own judgments. This was the original aim, and the financial reform seems to have succeeded in realizing it, judging from the data comparison between 1980 and 1985.

In other words, the financial reform drastically changed the asset choice behaviors of both savers and banks in Indonesia. It caused a shift in the choice of financial assets from foreign assets to domestic deposits on the side of the domestic savers, and a shift in the investment activity from investment abroad to domestic lending on the side of the banking sector.[17] This fact can be seen from the following ratios (of *flow* variables) in the sectors of domestic savers (i.e., HC: house-

---

[16]See Arndt (1983), IMF (1984), etc. for the details of financial reform.

[17]It is reported in IMF (1984) that, for the fiscal year 1983/84 after the financial reform, the state banks rapidly increased their time deposits by raising interest rates, while the banks had a tendency to accelerate their domestic lending to both private and state enterprises.

holds and private and state enterprises) and of banks (i.e., BD: state and private deposit money banks):

	(1980)	(1985)		(1980)	(1985)
a_{MHC}	0.0417	0.0363	a_{LBD}	0.4235	0.7955
a_{DHC}	0.1452	0.2065	a_{FBD}	0.7291	0.2832
a_{FHC}	0.1987	0.0087			

where a_{MHC}, a_{DHC} and a_{FHC} are the ratios to savings of cash currency, deposits, and net foreign assets, respectively, in the HC sector, while a_{LBD} and a_{FBD} are the ratios to available funds (excluding liquidity credits from Bank Indonesia) of domestic lending and net foreign investment, respectively, in the BD sector. These ratios are all parameters of the model (See eqs. (21.1), (21.2), (21.4), (23.2) and (23.4) in Appendix Table B), so that their drastic changes from 1980 to 1985 may be considered as one of the major reasons for the big difference in impacts between the two years obtained by the comparative statics of the reverse oil shock. In order to see the effects of the financial reform, therefore, the levels of parameters in 1985 above have been changed to approximately the same levels as those in 1980, i.e.,

$$a_{DHC} = 0.2065 - 0.05 \qquad a_{LBD} = 0.7955 - 0.10$$
$$a_{FHC} = 0.0087 = 0.05 \qquad a_{FBD} = 0.2832 + 0.10$$

and the comparative statics for 1985 in the case of a 10 percent decline in oil price have been attempted under the new and changed structure (which is closer to the structure in 1980 with respect to the asset choice behaviors).[18] Results are summarized in Table 7 for each of the four means of government deficit financing (under the fixed exchange rate system).

By comparing column (4) with column (1) in Table 7, we can see that the negative impacts of the reverse oil shock were fairly big also in 1985 if there occurred little structural changes in the asset choice behaviors of domestic savers and banks during the period between 1980 to 1985. In the case of deficit financing through government consumption curtailment ($C_G n$ in Table 7), for example, the impacts on

---

[18]Similar comparative statics for 1985 were made by replacing the financial parameters in 1985 directly with those in 1980, but iteration processes in computation did not converge in this case and the model could not reach its solution. This may be interpreted as indicating the fact that structural changes with many facets including the financial one were quite drastic between 1980 and 1985.

real GDP increases from -1.0 percent (under the actual structure of 1985) to -2.9 percent (under a hypothetical structure closer to 1980). The same is true also for real consumption, total employment, and total manufacturing output. The same holds though to a lesser extent, as reflected by the little changes in the domestic savers' behavior (column (2) in Table 7) or the banks' behavior (column (3) in Table 7). It may be concluded from these observations that the financial reform contributed significantly to the mitigation of negative impacts caused by the reverse oil shock.

The tax reform in 1983 was another institutional change to cope with the reverse oil shock. The new tax laws were ratified by the Parliament in December 1983. The new income tax law became effective as of January 1, 1984. The value added tax (VAT) and the luxury sales tax were introduced in April 1985. The tax reform had twin objectives: to increase revenue from non-oil taxes, and to improve administrative efficiency in transferring resources to the public sector. These objectives led to the following four basic principles in designing the new tax laws: unambiguous and simple laws, low tax rates and minimum differentiation, self-assessment and depersonalization, and a broad tax base.[19] Here we concentrate on the VAT, the revenue from which (including the luxury sales tax) accounted for as much as 12 percent in total current revenue for the fiscal year 1985/86, and investigate the effects of introducing it as a policy of structural adjustment under the reverse oil shock.

The VAT in Indonesia is of the consumption tax type. The tax rate is 10 percent. It is not levied on exports. It is not levied on capital goods (except for imported ones with the possibility of postponed payment). It is levied mainly on manufactured goods. The model, therefore, treats the VAT indirectly as the tax to be levied on the private consumption of the products of manufacturing industries (industry numbers 7 to 16). A rough estimate of the average VAT rate for the calendar year 1985 is 5.8 percent so that the tax rates by industry (tv_i, $i = 7...16$) of the model are set equal to this level.[20] These VAT rates have been set equal to zero

---

[19]For details, see Glassburner and Poffenberger (1883), Rosendale (1984), etc. The author obtained the latest and comprehensive information on the tax reform also from World Bank, "Indonesia: Selected Issues of Public Resource Management" (March 1988), Appendix 2.

[20]A rough estimate of the VAT revenue was divided by private consumption expenditure for manufacturing goods (IO table) to get the average tax rate 5.8% for 1985. It is needless to say that the VAT rates (Tv_i's) for 1980 are all zero.

$(tv_i = 0.0, i = 7\ldots16)$ for 1985, and the analysis of comparative statics of the 10 percent decline in oil price has been attempted in order to evaluate the impacts of the reverse oil shock for the case where the VAT was not introduced in 1985. Results are summarized in Table 7 (column (5) to be compared with column (1)).

Table 7 – Impacts of 'Reverse Oil Shock' in Relation with Financial and Tax Reforms: Comparative Statics in the Case oof 10% Decrease in Oil Price (1985, Fixed Exchange Rate System)*

(% change)

	FO_{GG}: deficit financing through private savings				
	(1)	(2)	(3)	(4)	(5)
	FO_{GG} in Table 4	a_{DHC}: -.05 a_{FHC}: +.05	a_{LBD}: -.10 a_{FBD}: +.10	(2)&(3)	$tv_i = 0.0$ $(i=7\ldots16)$
GDP	-.05	-1.7	-1.3	-2.3	-0.7
PGDP	-4.4	-5.4	-5.1	-5.9	-4.5
C_H	-1.6	-2.8	-2.4	-3.3	-0.4
PC_H	-2.8	-4.1	-3.6	-4.7	-3.3
Y_{GG}	-8.6	-10.3	-9.7	-11.1	-13.2
F_W	5.8	-29.6	-16.6	-46.3	4.9
L	-3.8	-6.5	-5.5	-7.7	-3.0
X_M	0.5	-1.2	-0.6	-2.0	1.6

	FG_{GG}: deficit financing through deposit withdrawal				
	(1)	(2)	(3)	(4)	(5)
	FG_{GG} in Table 4	a_{DHC}: -.05 a_{FHC}: +.05	a_{LBD}: -.10 a_{FBD}: +.10	(2)&(3)	$tv_i = 0.0$ $(i=7\ldots16)$
GDP	-0.1	-1.2	-0.5	-1.5	0.2
PGDP	-4.0	-4.9	-4.4	-5.2	-3.7
C_H	-1.1	-2.2	-1.6	-2.5	0.5
PC_H	-2.3	-3.5	-2.8	-3.8	-2.3
Y_{GG}	-7.9	-9.5	-8.6	-9.9	-12.1
F_W	19.3	12.3	5.7	-20.3	29.5
L	-2.8	-5.2	-3.8	-5.8	-1.1
X_M	1.2	-0.4	0.5	-0.8	2.8

Table 7 (continued)

	(1)	(2)	(3)	(4)	(5)
	FF_{GG} in Table 4	a_{DHC}: -.05 a_{FHC}: +.05	a_{LBD}: -.10 a_{FBD}: +.10	(2)&(3)	$tv_i = 0.0$ $(i = 7...16)$

FF_{GG} : deficit financing through foreign borrowing

	(1)	(2)	(3)	(4)	(5)
GDP	0.9	-0.1	0.3	-0.5	1.9
PGDP	-3.2	-4.0	-3.7	-4.4	-2.2
C_H	-0.2	-1.1	-0.8	-1.6	2.2
PC_H	-1.3	-2.3	-1.9	-2.8	-0.5
Y_{GG}	-6.5	-7.9	-7.4	-8.5	-9.7
F_W	42.0	17.1	26.3	5.3	72.0
L	-0.7	-2.8	-2.0	-3.8	2.8
X_M	2.5	1.2	1.6	0.5	5.2

$C_G n$: deficit financing by consumption curtailment

	(1)	(2)	(3)	(4)	(5)
	$C_G n$ in Table 4	a_{DHC}: -.05 a_{FHC}: +.05	a_{LBD}: -.10 a_{FBD}: +.10	(2)&(3)	$tv_i = 0.0$ $(i = 7...16)$

	(1)	(2)	(3)	(4)	(5)
GDP	-1.0	-2.3	-1.8	-2.9	-1.5
PGDP	-4.8	-5.9	-5.5	-6.4	-5.2
C_H	-2.1	-3.3	-2.9	-3.9	-1.2
PC_H	-3.3	-4.7	-4.2	-5.3	-4.2
Y_{GG}	-9.1	-10.8	-10.2	-11.6	-14.0
F_W	7.0	-27.5	-15.0	-43.8	7.0
L	-5.0	-7.8	-6.8	-9.1	-5.1
X_M	0.7	-0.9	-0.3	-1.7	2.0

*See footnotes to Table 4 for notation. See text for the meaning of shocks (columns (2) to (5)).

As far as the results of comparative statics in column (5) of Table 7 are concerned, it is difficult to say definitely whether or not the introduction of VAT mitigated the negative impacts of the reverse oil shock. What is definite is that the introduction of VAT did prevent the government revenue (Y_{GG}) from decreasing further, and this seems quite natural by the nature of the new tax. Only in the case of deficit financing by consumption curtailment ($C_G n$), did the introduction of VAT seem to significantly lessen the decreasing tendency of real GDP. Even in this case, its effect of improving the employment situation (L)

is negligibly small. Its effects on real consumption, prices, and total manufacturing output are generally negative for any of the four means of government deficit financing. This is because the VAT is levied on consumption of manufactured goods, and the burden is borne mainly by consumers who face higher prices. It seems, natural therefore, to evaluate the positive effects of the tax reform (VAT in particular) more as a contribution to the improvement of government fiscal position rather than the betterment of economic performance in general, at least in the short run.

4. Concluding Remarks

In this paper, the positive impacts on the Indonesian economy of two important institutional reforms in 1983 have been made clear by attempting comparisons of comparative statics based on a static CGE model for 1980 and 1985. Since 1986, however, the Indonesian economy has entered a new phase which requires further structural changes and structural adjustments. The oil price, which had declined from 35 to 29 dollars per barrel in March 1983, maintained its level around 28 dollars until the end of 1985. But it fell again drastically to less than 10 dollars in August 1986. Since then, it has been fluctuating at low levels between 10 to 18 dollars until recently. Facing this volatility at low levels in the price of oil and considering the possible exhaustion of oil resources in the not-distant future, Indonesia has been (and is still) in the urgent process of restructuring its economy away from an oil-dependent one. The government has issued, continuously since 1986, a variety of policy packages for structural adjustments basically along the lines of liberation, deregulation, and the market mechanism. Those policy packages aimed at increasing non-oil exports, promoting private domestic investment, attracting foreign direct investment, and so on. The major ones are the package of May 1986 (PAKEM), the rupiah devaluation of September 1986, a series of follow-up policies in 1986-87, the package of December 1987 (PAKDES), and the recent liberalization policies for banking, transportation and commerce (Creative Reform Package of 1988).[21] These policy packages cannot be directly nor easily incorporated into the framework of CGE modelling for the analysis of their impacts and effects on the Indonesian economy. However, a dynamic CGE model or a dynamized version of the present 1985 model seems to be one of the indispensable analytical tools with which to analyze the future course of Indonesian economic development which will be brought about by these policy packages.

---

[21]For details, see CAFI (1986a, 1986b, 1988), various issues of the *Bulletin of Indonesian Economic Studies* and *Far Eastern Economic Review*, etc.

References

Arndt, H. W. (1983), "Survey of Recent Developments," *Bulletin of Indonesian Economic Studies,* Vol. XIX, No. 2 (August): 1-26.

Bautista, Romeo (1988), "Macroeconomic Models for East Asian Developing Countries," *Asian-Pacific Economic Literature,* Vol. 2, No. 2 (September): 1-25.

Behrman, J. R., Lewis J. D. and Lotfi, S. "The Impact of Commodity Price Instability: Experiments with a General Equilibrium Model for Indonesia," mimeo., June 1988. (Forthcoming in *Essays in Empirical Economics,* ed. L. R. Klein and J. Marquez, Kluwer Academic Publishing Company, 1989.)

Booth, A., and McCawley, P., eds. (1981), *The Indonesian Economy During the Soeharto Era,* Oxford University Press.

CAFI (Commercial Advisory Foundation in Indonesia), *May 6, 1986 Package,* Yayasan C.A.F.I., May 1986 (a)

CAFI, *Follow-up of May 6, 1986 Package,* Yayasan C.A.F.I., June 1986 (b).

CAFI, *24th December 1987 Package (PAKDES),* Vol. I, Vol. II and Vol. III, Yayasan C.A.F.I., January 1988.

CBS (Central Bureau of Statistics), *General Government Sector Account of Indonesia, 1975-1982,* October 1984.

CBS, *Table Input-Output Indonesia, 1980,* Julid I, March 1985.

Central Bureau of Statistics, Institute of Social Studies and Center for World Food Studies (1986), *Report on Modelling: The Indonesian Social Accounting Matrix and Static Disaggregated Model,* Central Bureau of Statistics.

Dervis, K., De Melo, J. and Robinson, S. (1962), *General Equilibrium Models for Development Policy,* Cambridge: Cambridge University Press.

Ezaki, M. (1983), "An Econometric Model of Indonesia with Particular Reference to the Monetary Sector: 1970-1980," *Tonan Ajia Kenkyu (Southeast Asian Studies),* Vol. 21, No. 2 (September): 141-163.

Ezaki, M. ed. (1987), *Development Planning and Policies in ASEAN Countries,* Center for Southeast Asian Studies, Kyoto University.

Ezaki, M. (1987a) "A CGE Analysis of the Thai Economy," in Ezaki (ed.) 1987, pp. 185-234.

Ezaki, M. (1987b) "A CGE Analysis of the Indonesian Economy," in Ezaki (ed.) (1987), pp. 235-247.

Ezaki, M., and Ito, S. (1988), "Macro-impacts of Oil Price Changes and Tax Reforms – An International Comparison of Indonesia, Philippines, Thailand, and Japan based on the CGE Modelling," *Keizai Kenkyu (Economic Studies),* Vol. 39, No. 1 (January): 13-26 (in Japanese).

Gelb, A. "Oil Windfalls and Development Strategies Exercises with a Model of Indonesia," mimeo., World Bank, 1983.

Glassburner B. and Poffenberger M. (1983), "Survey of Recent Developments," *Bulletin of Indonesian Economic Studies,* Vol. XIX, No. 3, (December): 1-27.

Ichimura, S., ed. (1988), *Indonesian Economic Development: Issues and Analysis,* Japan International Cooperation Agency, (May).

International Monetary Fund, "Indonesia: Recent Economic Developments," May 7, 1984.

Kaneko, Y. and Nidaira, K. eds. (1988), *Industrialization in Indonesia '88,* Research Report on Indonesian Industrialization, Hiroshima University of Economics.

Rosendale, P. (1984), "Survey of Recent Developments," *Bulletin of Indonesian Economic Studies,* Vol. XX, No. 1 (April): 1-29.

World Bank, "Indonesia: Policies and Prospects for Economic Growth and Transformation," April 26, 1984.

Yanagi, E. "Industrial Forecast for the Years of REPELITA V by Input-Output Analysis with Employment Forecast," JICA Report for the Ministry of Industry, December 1986.

Appendix Table A – Notation of the Model

Variables (with super-bars for exogenous ones)
Price Variables

PD_i	=	domestic price of industry i
PN_i	=	price of net product (value added) of industry i
P_i	=	price of composite goods for domestic products and imports of industry i
PM_i	=	import price of industry i (including tariffs)
$\overline{PWM_i}$	=	import price of industry i (in US dollars)
PWE_i	=	export price of industry i (in US dollars)
$\overline{PW}_i$	=	world price in the export market of industry i (in US dollars)
PC_H	=	deflator of private consumption expenditures
PC_G	=	deflator of government consumption expenditures
PI	=	deflator of gross domestic fixed capital formation
PJ	=	deflator of inventory investment
PE	=	deflator of exports of goods and services
PM	=	deflator of imports of goods and services
$PGDP$	=	deflator of gross domestic products (GDP)
W	=	wage rate for average labor (national average)
$\overline{W}$	=	minimum wage level for average labor
W_i	=	wage rate for average labor (sectoral average)
ER	=	exchange rate (rupiah/dollar)
$ER°$	=	central rate for ER
r_D , r_G , r_L, r_B, r_O, r_F	=	interest rates for financial assets (not explicitly used in the model)

Quantity Variables:

X_i	=	domestic production (supply) of industry i
X_i^o	=	total demand for domestic production of industry i
Q_i	=	total demand for composite goods of industry i
M_i	=	imports of industry i
E_i	=	exports of industry i
D_i	=	domestic demand for domestic production of industry i
d_i	=	rate of domestic supply in total demand for composite goods of industry (i) (D_i/Q_i)
L_i	=	employment in industry i (in terms of efficiency units)

L_i^*	=	employment in industry i (in terms of original numbers)
UL	=	unemployment (in terms of efficiency units)
UL^*	=	unemployment (in terms of original numbers)
$\bar{L}^s$	=	total supply of labor (in terms of original numbers)
r_{UL}	=	rate of unemployment (in terms of efficiency units)
r_{ul}^*	=	rate of unemployment (in terms of original numbers)
C_H	=	private consumption expenditures in real terms
C_{Hi}	=	real consumption demand for composite goods of industry i
$\bar{C}_G$	=	government consumption expenditures in real terms
I	=	gross domestic fixed capital formation in real terms
I_{HC}	=	gross investment in real terms of sector HC
I_G	=	gross investment in real terms of sector G
J	=	inventory investment in real terms
E	=	exports of goods and services in real terms
M	=	imports of goods and services in real terms
GDP	=	gross domestic products in real terms (real GDP)

Value Variables:

RL	=	labor compensation (including imputation for self-employed and unpaid family workers)
RK	=	operating surplus in gross terms (excluding imputation of labor compensation)
RK_k	=	operating surplus in gross terms of sector k (k=HC, GG)
RA_k	=	net property income of sector k (k=HC,GG)
RA_W	=	net property income of sector W (in US dollars)
RT_k	=	net transfer receipts of sector k (k=HC,GG)
TD_{OC}	=	oil company tax
TD_{NO}	=	direct tax other than oil company tax
Y_k	=	disposable income of sector k (k=HC, GG)
S_k	=	gross saving of sector k (k=HC, GG)
GDP^n	=	gross domestic products (nominal GDP)
F_W	=	increases in net financial assets of foreign sector (in US dollars)
FM_k	=	increases in reserve money (currency) of sector k (with * for liabilities)
FD_k	=	increases in demand, time and foreign currency deposits of sector k (with * for liabilities)
FG_k	=	increases in government deposits of sector k (with * for liabilities)
FL_k	=	increases in loans of sector (with * for liabilities)

FB_k	=	increases in Bank of Indonesia lending to deposit money banks (with * for liabilities)
FO_k	=	increases in net other domestic financial assets of sector k (with * for liabilities)
FF_k	=	increases in net foreign financial assets of sector k
FN_k	=	increases in net financial assets of sector k

Parameters

Taxes and Subsidies:

$\overline{tm}_i$	=	import tariff rate of industry i
$\overline{tm}_i^\circ$	=	benchmark level of $\overline{tm}_i$
$\overline{te}_i$	=	export subsidy rate of industry i
$\overline{te}_i^\circ$	=	benchmark level of $\overline{te}_i$
$\overline{td}_i$	=	indirect tax rate of industry i (net of subsidies)
$\overline{ty}_k$	=	direct tax rate $(k = OC, NO)$
$\overline{tv}_i$	=	value added tax rate for industry i

Functional Parameters:

$\overline{a}_{ji}$	=	intermediate input coefficient from industry i to industry j
$\overline{A}_i^*, \alpha_i, \beta_i$	=	parameters of Cobb-Douglas production function for industry i
$\overline{B}_i, \delta_i$	=	parameters of Cobb-Douglas aggregation function for composite goods of industry i
$\overline{E}_i^\circ, \eta_i$	=	parameters of export demand function of industry i
$\overline{a}_{lk}$	=	constant shares for asset choice functions $(l=M,D,L,F; k=HC,GG,BI,BD)$
$\overline{s}$	=	saving rate for households and corporate business sector

Shares and Ratios:

θ	=	maximum discrepancy rate of ER from the central rate
$\overline{r}_R$	=	average reserve ratio at deposit money banks
ω_i	=	profit markup rate for industry i
λ_i	=	sectoral relative wage rate in industry i (W_i / W)
$\overline{v}_R$	=	share of operating surplus for sector GG
$\overline{v}_D$	=	share of depreciation for sector GG
$\overline{u}_A$	=	ratio of net property income in sector HC

$\bar{u}_T$ = ratio of net transfer receipts in sector HC

$\bar{s}_{CH}$ = 'value' share of industry i's product in private consumption expenditures

$\bar{s}_{CG}$ = quantity share of industry i's product in government consumption expenditures

$\bar{s}_{Ii}$ = quantity share of industry i's product in gross domestic fixed capital formation

$\bar{s}_{Ji}$ = quantity share of industry i's product in inventory investment

Appendix Table B – Indonesia Model: System of Equations

Price Identities

(1) $PM_i = \overline{PWM}_i (1+\overline{tm}_i) ER$ where $\overline{PWM}_5 \, \alpha \, \overline{PW}_5$

(2) $PWE_i = PD_i / (1+te_i) / ER$ $(i \neq 5)$

     $PWE_5 = \overline{PW}_5$

(3) $P_i = (PD_i + PM_i M_i / D_i) / g_i (M_i/D_i, 1)$

     where $g_i (M_i, D_i) = \overline{B}_i M_i^{\delta_i} D_i^{1-\delta_i}$ $(i \neq 17, 18)$

     $P_i = PD_i$ $[M_i = 0]$ $(i = 17, 18)$

(4) $PN_i = PD_i - \sum_j P_j \, \overline{a}_{ji} - \overline{td}_i PD_i$

Production Functions (to be combined with eqs. (6) & (32))

(5) $X_i = f_i (K_{io}, L_i)$

     $= \overline{A}_i K_{io}^{a_i} L_i^{\beta_i}$ where $a_i + \beta_i = 1$

     $= \overline{A}_i^* L_i^{\beta_i}$ where $\overline{A}_i^* = \overline{A}_i K_{io}^{\alpha_i}$

Labor Market

(6) $PN_i (\partial X_i / \partial L_i) = W$ or $L_i = \beta_i PN_i X_i / W$

(7) $L_i^* = L_i / \lambda_i$ where $\lambda_i = W_i / W = $ constant

(8) $L^S = \overline{L}^S$

(9) $W = \overline{W}$ and $\sum L_i \leq L^S$,   or $\sum L_i = L^S$ and $W = \tilde{W}$

     where $\tilde{W} = \sum \beta_i PN_i X_i / L^S \geq \overline{W}$

(10.1) $UL = L^s = \sum L_i$ $(UL^* = L^S - \sum L_i^*)$

(10.2) $r_{UL} = UL / L^S$ $(r_{UL}^* = UL^* / L^S)$

Distributed Income

<u>Factor compensation:</u>

(11.1) $RL + W(L^S - UL)$

(11.2) $RK = \sum (PN_i X_i - W L_i)$

(11.3) $DK = \sum \bar{b}_{Di} PD_i X_i$

(12.1) $RK_{HC} = (1 - \bar{v}_R)(RK - DK)$

(12.2) $RK_{GG} = \bar{v}_R (RK - DK)$

(12.3) $DK_{HC} = (1 - \bar{v}_D) DK$

(12.4) $DK_{GG} = \bar{v}_D DK$

<u>Net property and transfer income:</u>

(13.1) $RA_{HC} = \bar{u}_A (RL + RK_{HC})$

(13.2) $RA_{GG} = (RA_{HC} + \overline{RA}_W ER)$

(14.1) $RT_{HC} = \bar{u}_T (RL + RK_{HC})$

(14.2) $RT_{GG} = -RT_{HC}$

<u>Tax and disposable income:</u>

(15.1) $TD_{OC} = \overline{ty}_{OC} PD_5 X_5$

(15.2) $TD_{NO} = \overline{ty}_{NO}(RL + RK_{HC} - TD_{OC})$

(16.1) $Y_{HC} = RL + RK_{HC} - TD_{OC} - TD_{NO} + RA_{HC} + RT_{HC} + DK_{HC}$

(16.2) $Y_{GG} = (TD_{OC} + TD_{ON}) + \sum \overline{tm}_i \overline{PWM}_i ER_i M_i - \sum \overline{te}_i PWE_i ER E_i$

$+ \sum \overline{td}_i PD_i X_i + \sum \overline{tv}_i P_i CH_i + RA_{GG} + RT_{GG} + DK_{GG}$

Final Domestic Expenditures and Savings

<u>Real consumption expenditures:</u>

(17.1) $C_{Hi} = \bar{s}_{CHi} (1 - \bar{s}) Y_{HC} / (1 + \bar{tv_i}) P_i$

(17.2) $C_H = \Sigma \, C_{Hi}$

(17.3) $C_G = \bar{C}_G$

<u>Deflators:</u>

(18.1) $PC_H = (1 - \bar{s}) Y_{HC} / C_H$

(18.2) $PC_G = \Sigma \, \bar{s}_{CGi} P_i$

(18.3) $PI = \Sigma \, \bar{s}_{Ii} P_i$

(18.4) $PJ = \Sigma \, \bar{s}_{Ji} P_i$

<u>Gross savings:</u>

(19.1) $S_{HC} = \bar{s} \, Y_{HC}$

(19.2) $S_{GG} = Y_{GG} - PC_G \, C_G$

<u>Gross capital formation in real terms:</u>

(20.1) $I_{HC} = (S_{HC} - FN_{HC} - PJ \, J) / PI$

(20.2) $I_G = \bar{I}_G$

(20.3) $I = I_{HC} + I_G$

(20.4) $J = \bar{J}$

Financial and Foreign Exchange Markets

<u>Asset choice by households and corporate enterprises:</u>

(21.1) $FM_{HC} / S_{HC} = \bar{a}_{MHC}$

(21.2) $FD_{HC} / S_{HC} = \bar{a}_{DHC}$

(21.3) $FO_{HC} = - (FO_{GG} + FO_{BI} + FO_{BD})$

$$(21.4) \quad FF_{HC} / S_{HC} = \bar{a}_{FHC}$$

$$(21.5) \quad FL_{HC}^* = \overline{FL}_{GG} + \overline{FL}_{BI} + FL_{BL}$$

$$(21.6) \quad FN_{HC} = FM_{HC} + FD_{HC} + FO_{HC} + FF_{HC} - FL_{HC}^*$$

<u>Asset choice by general government:</u>

$$(22.1) \quad FN_{GG} = S_{GG} - PI\ I_G$$

$$(22.2) \quad FO_{GG} = FN_{GG} - (\overline{FG}_{GG} + \overline{FL}_{GG} + \overline{FF}_{GG})$$

<u>Asset choice by financial institutions:</u>

$$(23.1) \quad FM_{BD} = \bar{r}_R\ FD_{BD}^*$$

$$(23.2) \quad FL_{BD} = \bar{a}_{LBD}\ [(1 - \bar{r}_R)\ FD_{BD}^* + FG_{BD}^*] + FB_{BD}^*$$

$$(23.3) \quad FO_{BD} = \overline{FN}_{BD} + FD_{BD}^* + FG_{BD}^* + FB_{BD}^* - (FM_{BD} + FL_{BD} + FF_{BD})$$

$$(23.4) \quad FF_{BD} = \bar{a}_{FBD}\ [(1 - \bar{r}_R)FD_{BD}^* + \overline{FG}_{BD}^*]$$

$$(23.5) \quad FD_{BD}^* = FD_{HC} - \overline{FD}_{BI}^*$$

$$(23.6) \quad FG_{BD}^* = \overline{FG}_{GG} - \overline{FG}_{BI}^*$$

$$(23.7) \quad FB_{BD}^* = \overline{FB}_{BI}$$

$$(24.1) \quad FF_{BI} = \overline{FF}_{BI} \text{ and } F_W = -(FF_{HC} + \overline{FF}_{GG} + FF_{BI} + FF_{BD}) / ER$$

$$\text{if } (1 - \theta) \cdot \overline{ER}\ ^\circ < ER < (1 + \theta) \cdot \overline{ER}\ ^\circ$$

$$FF_{BI} = (F_W ER + FF_{HC} + \overline{FF}_{GG} + FF_{BD}) \text{ if } ER = (1 \pm \theta) \cdot \overline{ER}\ ^\circ$$

$$(24.2) \quad FM_{BI}^* = \overline{FL}_{BI} + \overline{FB}_{BI} + \overline{FO}_{BI} + FF_{BI} - \overline{FD}_{BI}^* - \overline{FG}_{BI}^* - \overline{FN}_{BI}$$

<u>Market clearing for money and foreign exchanges:</u>

$$(25.1) \quad FM_{HC} + FM_{BD} = FM_{BI}^* \qquad \text{[See Walras' Law]}$$

(25.2) $\sum \overline{PWM}_i M_i + \overline{RA}_W = \sum PWE_i E_i - F_W = 0$ and $ER = \tilde{ER}$

if $(1-\theta) \cdot \overline{ER}^\circ < \tilde{ER} < (1+\theta) \cdot \overline{ER}^\circ$ $\tilde{ER}$ = equilibrium rate)

$ER = 1 \pm \theta \ \overline{ER}$ ånd $F_W = \sum \overline{PWM}_i M_i + \overline{RA}_W - \sum PWE_i E_i$

if $\tilde{ER} \le (1-\theta) \cdot \overline{ER}^\circ$ or $\tilde{ER} \ge (1+\theta) \ \overline{ER}^\circ$

Product Markets

<u>Demand for domestic products and imports:</u>

(26) $Q_i = \sum \overline{a}_{ij} Xj + \overline{s}_{CHi} (1 - \overline{s}) Y_{HC}/P_i + \overline{s}_{CGi} C_G + \overline{s}_{Ii} I + \overline{s}_{Ji} J$

(27) $D_i = d_i Q_i$

(28) $d_i = 1/g_i (M_i/D_i, 1) = 1\overline{B}_i = (M_i/D_i)^{\delta_i}$ $(i \ne 17, 18)$

   $d_i = 1.0$ $(i = 17, 18)$

(29) $M_i = h_i (PD_i / PM_i) D_i$

   $= \delta_i / (1-\delta_i) (PD_i/PM_i) D_i$ $(i \ne 17, 18)$

where h_i is the solution for M_i/D_i of the marginal condition:

   $(\partial g_i / \partial M_i)/(\partial g_i / \partial D_i) = PM_i / PD_i$

   $M_i = 0.0$ $(i = 17, 18)$

(30) $E_i = \overline{E}_i^\circ (\overline{Pw}_i / PWE_i)^{\eta_i}$ $(i \ne 17, 18)$

   $E_i = 0.0$ $(i = 17, 18)$

(31) $X_i^D = D_i + E_i$

<u>Market clearing for products:</u>

(32) $X_i = X_i^D$ and $PD_i = \tilde{PD}_i$ $(i = 1-4, 7-10)$

   where $\tilde{PD}_i$ is the equilibrium level of PD_i

   and $X_i (i = 1,2)$ is fixed

$$PD_i = PWE_i\,(1+\overline{te}_i)\,ER \quad \text{and} \quad X_i = X_i^D \quad (i=5)$$

$$PD_i = (1+\omega_i)\,[\Sigma\,P_j\,.\overline{a}_{ji} + W\,(L_i/X_i)]\,/\,(1-\overline{td}_i)$$

$$\text{and } X_i = X_i^D \qquad (i=6,\ 11\text{--}21)$$

<u>GDP Definitions</u>

(37) $GDP^n = PC_H\ C_H + PC_G C_G + PI\ I + PJ\ J + PE\ E - PM\ M$

(38) $GDP = C_H + C_G + I + J + E - M$

(39) $PGDP = GDP^n\,/\,GDP$

(40) $E = \Sigma\,(1/1 + \overline{te}_i^{\,\circ})\,E_i$ \qquad and $PE = \Sigma\,(1/1 + \overline{te}_i)\,PD_i\,E_i\,/\,E$

(41) $M = \Sigma\,(1/1 + \overline{tm}_i^{\,\circ})\,M_i$ \qquad and $PM = \Sigma\,(1/1 + \overline{tm}_i)\,PM_i\,M_i\,/\,M$

Walras Law'

$$\Sigma\,PD_i\,(X_i^D - X_i) \qquad (i = 1\text{-}4,\ 7\text{-}10)$$

$$+\,W\ [\,\Sigma\,L_i - L^S\,] \qquad (W \ge \overline{W})$$

$$+\,ER\,[\,\Sigma\,\overline{PWM}_i\,M_i + \overline{RA}_W - \Sigma\,PWE_i E_i - F_W\,]$$

$$((1-\theta)\bullet\overline{ER} \lessgtr ER \le (1+\theta)\bullet\overline{ER}\ ^{\circ})$$

$$+\,[\,FM_{HC} + FM_{BD} - FM^*_{BI}\,] = 0$$