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EFFECTIVENESS OF EXPORT PROMOTION POLICIES IN A GENERAL EQUILIBRIUM FRAMEWORK: THE CASE OF THE PHILIPPINES

*Khosrow Doroodian and Roy Boyd**

INTRODUCTION

The conventional wisdom in the 1950s was that foreign trade could not serve as an engine of growth. Given the demand for imported consumer goods, it was easy to justify the rationale for industrialization through home replacement of these finished goods. This inward-looking strategy was intended to improve the terms of trade, offset the wage distortion in a dual labor market, or promote infant industries.

Import substitution policy, however, became increasingly difficult to follow beyond the "easy" consumer phase. With each successive import-substitution activity rose the capital intensity of the projects, resulting in higher import content of investment. The projects also required increasingly large domestic markets to achieve efficient scale economies.

A series of studies calculate the welfare effects of the import substitution policies in the 1960s and early 1970s. Barriers are found to cause significant welfare losses on Argentina, Chile, Colombia, Egypt, Ghana, India, Israel, Mexico, Pakistan, the Philippines, South Korea, Taiwan, and Turkey. Such calculations, however, assume that all the

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relevant effects are captured by measures of consumer and producer surplus, without allowing protection any chance to lower cost curves over time.[1]

Disenchanted by the results of import substitution policies, and still pessimistic about commodity trade on the basis of comparative advantage, the developing countries are now giving increasing attention to the export-led growth strategy. One obvious advantage of export-promoting policies is that they rest on exogenous world demand. Therefore, their markets are not limited to a narrow home market as with import-substitution. The prospect of exporting tends to stimulate a larger inflow of foreign investment than does import substitution. Many studies, using cross-country data and adopting the aggregate growth rate as an indicator, find that export promotion schemes perform better than import substitution policies (see, for example, Balassa 1981).

Most existing studies in the literature examine the effects of export subsidies within a partial equilibrium framework (Jung and Gyu 1986, Heitger 1987, Warr 1987, Rotemberg 1987, and Chu 1988). There is also literature utilizing the computable general equilibrium (CGE) model (Levy 1989 and Boyd et al. 1993). In this paper, the effects of different measures of export promotion (subsidies and devaluation in particular) on the change in real output, consumption, imports, and exports in the Philippines using a CGE model is analyzed. Because the Philippines exports mainly agricultural goods and lumber, it is equally important to analyze the environmental effects of such subsidies and devaluations.[2]

EXPORT PROMOTION POLICIES

There are a variety of ways that exports can be promoted. One method is through government involvement which may take one or more of the following forms:

1. For a discussion of these issues, see Bhagwati and Krueger (1973-1976).
2. The ten principal exports of the Philippines are copra, sugar, bananas, logs and lumber, desiccated coconut, coconut oil, pineapples (canned), gold, abaca (unmanufactured), and copper concentrates.

- Fiscal incentives, which tend to produce a biased sectoral distribution. This form, however, involves favorable treatment with respect to importation of intermediate goods, tax breaks to designated export industries, and freedom from industrial regulations applicable elsewhere. These measures, however, are basically cost- reducing schemes.
- Credit policy (export financing or price support program) which is a supplement to fiscal incentives. This policy involves export credit systems, export shipment financing, financing exports on credit, and others.
- Devaluation of the exchange rate to lower the foreign currency price of the country's export products.

This, however, may bring about deleterious effects on trade. Deterioration in terms of trade in an export-biased growth scheme can lead to a loss in welfare. A typical household's wealth, for example, may be adversely affected by devaluation. While the prices of traded goods rise, prices of non-traded goods would increase less proportionately, and holdings of domestic currency and securities whose yields are valued in domestic prices suffer reduced purchasing power. There is also evidence that the elimination of export subsidies may not have a harmful effect on the trade balance. It may even improve fiscal position and generate economic efficiency. Hoffmaister uses the 1980 data for Costa Rica and shows that although the export subsidy scheme leads to an increase in exports, the direct fiscal costs of the scheme are substantial (Hoffmaister 1992). Furthermore, the subsidy scheme leads to a substantial increase in imports.

It is worth noting that the Philippines is actively committed to promote the exports of non-traditional manufactured goods. To this end, the government has established export processing zones. According to Warr (1987), these zones are enclaves within the domestic economy and enjoy favorable treatment from the government. However, they are subject to one restriction: Their goods are not to be sold in the domestic market.

Although the Philippines does not provide "income tax holidays" to investing firms, they are exempted from paying tariffs on imported raw materials, capital equipment, and intermediate goods. Other exemptions include municipal and provincial taxes (except real state taxes). The government also pays back the tax components of locally purchased raw materials and intermediate goods. Investing firms are likewise free to employ foreign nationals (who are not subject to personal income taxes) in supervisory, technical, and advisory positions.

GENERAL EQUILIBRIUM MODEL

Introduction

The use of a general equilibrium approach to modeling export promotion effects is a logical decision.[3] The interaction between export subsidies and devaluation on agricultural and the wood industries and the economic efficiency, both within the markets for these goods as well as between these markets and the rest of economy, is quite significant. Thus, changes in export subsidies affect the agricultural and wood sectors, and changes in these two sectors have important effects on the economy.

The use of a general equilibrium model is not unique to this study. Levy (1989), for example, examines the effects of export subsidies on the trade balance in a small least developed country (LDC). He constructs a three-sector economy with two tradeable and one non-tradeable goods. In another study, Clarete and Roumasset (1987) look at the Philippines and make assumptions similar to that of Levy (1989).

The CGE model developed in this study is unique in several respects. First, it covers 14 industries in the manufacturing, service, and resource sectors. Second, in addition to allowing for substitutability between

3. For a general discussion on the general equilibrium model, see Shoven and Whalley (1984).

capital and labor, it includes land as an input. Because ownership of land is heavily skewed toward higher income groups, the effect of agricultural subsidies on income distribution can be observed. Furthermore, because the extensive removals of lumber and planting of root crops (as opposed to rice and coconut) lead to increased soil erosion, by inference, the study sheds light on environmental effects of export promotion policies.

The model presented below follows the tradition of the Shoven and Whalley (1972) tax analysis. As such, it recognizes that consumers' preferences are a function of their incomes and relative prices, and specifies a distinct demand function for each group of households. A neo-classical microeconomic model of producer behavior is also employed. The model of consumer behavior is integrated with the model of producer behavior (which contains a price-responsive input-output coefficients) to provide a comprehensive framework for policy simulations.

The general equilibrium nature of the model is reflected by its attempt to determine a vector of prices for consumer goods and services, and producer goods and services that will clear all markets. The equilibrium prices determine the optimal allocation of resources, given the endow-ments of labor, capital, and natural resources (land).

On the production side, technologies are represented by production functions that exhibit constant elasticities of substitution. Technological progress (both embodied and disembodied) is assumed not to occur during the period of investigation (see, for example, Uri 1984).

On the demand side, the model captures the behavior of consumers, producers who invest, the government, and foreigners. Consumers are grouped according to income and a demand system is specified for each group. Each income group has an endowment of land, labor and capital. Given a vector of prices, consumers decide the amount to save and invest and the amount of each good and service to consume (purchase).

Investment, consequently, is determined by savings. Saving equal investment provides closure for the model. The government levies taxes

on both production and consumption[4]—taxes on factors of production, output, income, and consumption. Tax revenues are used to distribute income back to consumers and to purchase goods and services, as well as capital and labor. The trade balance deficit is assumed to be financed by the government.

The foreign sector produces imports and consumes exports. The trade balance deficit is the same as the actual deficit in 1984 (the year for which the data are available). As a result, foreigners can be regarded as consumers who purchase the Philippines exports with income from the sale of imports to the Philippines.Table 1 presents the specific producing sectors, types of consuming sectors and services, and different import classification considered in the general equilibrium model. The various household categories (classified by income) are shown in Table 2. The choice of the level of disaggregation is dictated by the availability of data and economic variables (producing, consuming, and importing sectors and income categories) that are of interest.

THE MODEL

Production

The production of the general equilibrium model is comprised of an input-output model with some flexibility with regard to the substitution of the factor inputs. The degree of flexibility depends on the choice of functional form for the production function.

In the current model, each sector is assumed to have a constant elasticity of substitution (CES) production function where the real value added by the specific sector is a function of labor and capital.[5] In this

4. The government has three functions: raises and redistributes taxes, consumes goods and services, and produces goods.
5. Little is gained by explicitly writing out the functional form of this production function since it is so well-known. The interested reader, however, can refer to, for example, Arrow *et al.* (1961).

TABLE 1
Classification of Producing Sectors, Consuming Goods and Services, and Imports

Producing Sector	Consuming Goods and Services	Imports
1. Manufacturing	1. Saving	1. Manufacturing
2. Logging	2. Housing	2. Logging
3. Rice	3. Transportation	3. Rice
4. Service	4. Education	4. Service
5. Root crops	5. Milk and meat	5. Root crops
6. Metal mining	6. Alcohol and tobacco	6. Metal mining
7. Energy	7. Miscellaneous food	7. Energy
8. Fishing	8. Household furnishings	8. Fish
9. Sugar	9. Processed food	9. Sugar
10. Forest products	10. Clothing	10. Forest products
11. Coconuts	11. Fish	11. Coconuts
12. Coffee	12. Medical care	12. Coffee
13. Non-metal mining	13. Cereal	13. Non-metal mining
14. Corn	14. Fuel	
	15. Miscellaneous	

TABLE 2
Household Categories Based on Income

Category	Income Range (Pesos)
1. Low income	0-14,999
2. Middle income	15,000-29,999
3. High income	30,000 and above

paper, land, a third factor of production is added to our model. This is done because of the special importance of this input to the agriculture and forestry sectors (Heady and Dillion 1961).

The incorporation into the production function of this factor is accomplished by nesting the CES production function. In particular, a composite input is defined as a function (in CES form) of land and capital. This composite input, in turn, takes the place of a simple capital input in the original production specification. Although it would be possible to simply add land as an explicit input in the production function, this would implicitly assume that the elasticity of substitution between all pairs of inputs is the same. By nesting, however, the substitution elasticities are permitted to vary between different inputs.[6]

Demand

The value added of the 14 producing sectors accrues to the owners of the factors of production which the owners sell. With the proceeds from these sales, these individuals either consume domestic or foreign goods and services and save, or pay taxes to the government. The savings are used for investment and the taxes are ultimately returned to these individuals.

The demand for final goods and services comes from four primary sources. First, final goods and services may be directly consumed by individuals. Second, they may be purchased by the government. Third, investment (which is equal to savings) consumes some of the goods and services produced. And finally, foreign demand (in the form of exports) consumes a portion of the goods and services produced.

A review of Table 1 shows that the composition of the consumer goods and services sectors does not match that of the producing sectors because the final goods and services produced by the producing sector

6. All such elasticities are derived from statistical estimates and their values can be obtained from the authors upon request.

must go through various channels (i.e., transportation and distribution) before they can be consumed. To address this problem, a transformation matrix is introduced which defines the contribution of each producing sector to the composition of each of the final goods and services.

For each category of households (refer to Table 2), real income is assumed to be a weighted Cobb-Douglass function of the 15 consumer goods and services.[7] The weights on these goods and services (which are household category specific) are computed as the share of total purchases going to a specific consumer good or service. The nature of the CES utility function implies that the elasticity of substitution is the same between any pair of goods and/or services. Because reliable estimates of the respective substitution elasticities across pairs of goods and/or services are difficult to obtain, they are initially assumed to equal one for all agents.

A household's budget constraint is defined so that expenditures on goods and services must be less than or equal to its income which is defined to equal its portion of the returns to labor plus the returns to capital plus the returns to land. Maximizing utility subject to this expenditure constraint gives the demand for the various goods and services by household categories (see, for example, Mixon and Uri 1985, Chapter 5, for a discussion of this). Because savings is one of the items in an individual's utility function, the choice between consumption and savings is made explicit, that is, intertemporal tradeoffs are an integral part of the model.

The second component of the demand for goods and services is investment. Like the final demand by individuals, total investment is disaggregated (through a transformation matrix) by the sector of the economy that demands it. For the purpose of constructing the general equilibrium model and calibrating it, investment is taken directly from

7. This assumption can later be relaxed in sensitivity analysis to allow for CES utility functions with elasticities of substitution other than one.

the *1989 Philippine Statistical Yearbook*, and because savings are assumed to equal investment, personal savings are scaled to equal the gross investment observed (measured) for each of the 14 producing sectors.

The final component of demand for goods and services is the demand by foreign consumers. In the model, exports (i.e., foreign demand) are delineated by the producing sector. That is, a trans-formation matrix analogous to that used for the consumption of final goods and services is not used. A similar delineation is employed for imports (i.e., foreign supply). By employing both demand and supply elasticity estimates [taken from contemporary studies including Coyle *et al.* (1986), Gardiner and Dixit (1987), Koshal *et al.* (1990), Roe *et al.* (1986), Sharples and Dixit (1988), and Stern *et al.* (1976)] export and import demand relationships are constructed for each producing sector.

Taxes

Although not used explicitly in the analysis, the government and its tax receipts do enter into the general equilibrium model specification and impact the model results with regard to factor use, factor prices, and output.

First, there is a question of how to treat the government in a general equilibrium model. For the purpose at hand, it is treated as a separate sector with a Dobb-Douglas utility function—in a fashion analogous to one of the household sectors. The elasticity of substitution is assumed to equal one. (This means that the utility function collapses to a Cobb-Douglas-type utility function.)

The government collects tax revenues in various forms, namely: personal income tax, labor taxes (e.g., social security tax), capital taxes (e.g., corporate income tax), property taxes, tariffs, and sales and excise taxes. All taxes are treated as ad valorem taxes and a marginal rate is used for each household category, consumer good or service, producing sector and factor input. (Note that in this model, labor is treated as a

variable commodity that is subject to taxation.)[8] In this respect, the model is a distinct improvement over earlier general equilibrium models which simply employed lump sum transfer schemes or used average tax rates.

With the taxes collected, the government produces public goods and redistributes income. Hence, the tax revenues are eventually returned to consumers in two forms: transfer payments or subsidies, and payments for capital or labor services (the two factors of production used by the govemment).

MATHEMATICAL STATEMENT OF THE MODEL

Given these foregoing considerations, it is useful to state precisely the conditions that the model must satisfy for a general equilibrium to exist. First, there cannot be positive excess quantities demanded. That is,

$$\sum_{j=1}^{m} a_{ij}M_j - E_i(p, Y) \geq 0 \text{ for } c.s.\ p_i \geq 0 \qquad (1)$$

where:

i (i = 1,2, ..., n)	=	the consumer goods and services;
M_j (j = 1,2, ..., m)	=	the activity levels;
a_{ij}	=	the ijth element in the activity analysis matrix;
Y	=	a vector of incomes for the k consumers;
p	=	a vector of prices for the n consumer goods and services; and
E_i	=	the excess demand for good or service i.

The notation *c.s.* implies that complementary slackness holds for each consumer good and service. Thus, if the expression (for a specific good or service i) is multiplied by p_i, then the relationship will hold with equality (see, for example, Takayama and Uri 1983).

8. Capital and land, however, are assumed to remain fixed due to the intermediate time length of the analysis.

The second requirement for general equilibrium is that the profits associated with a given activity are not positive. That is,

$$-\sum_{i=1}^{n} a_{ij} p_i \geq 0 \text{ for } c.s. \; M_j \geq 0 \qquad (2)$$

Finally, all prices and activity levels must be non-negative. That is,

$$p_i \geq 0, \; i = 2, \ldots, n \qquad (3a)$$

and

$$M_j \geq 0, \; j = 2, \ldots, m. \qquad (3b)$$

The model is solved for a general equilibrium using the iterative algorithm formally referred to as the Sequence of Linear Complementary Problems (SLCP) developed by Mathiesen (1985a and 1985b). A complete listing of the equilibrium conditions together with relevant definitions are found in the Appendix.

Data for the 1984 Base Year

The general equilibrium model is calibrated for 1984. For the producing sectors (the 14 as enumerated in Table 1), data on capital receipts and taxes are computed from data taken from the *1989 Philippine Statistical Yearbook* and an unpublished article by Habito (1989). The various elasticities of substitution employed in the analysis are obtained from a variety of sources in the literature on estimating production functions.[9, 10]

9. Boyd (1988) has the details on where the values of the elasticities of substitution are taken from.
10. *The 1989 Philippine Statistical Yearbook* is the latest reference that the authors are aware of.

Capital income (earnings) and labor income are obtained from the *1989 Philippine Statistical Yearbook* and Habito. Land income is estimated using factor shares derived from Habito and applied to the capital income component noted above.

Data on expenditures on each of the 15 goods and services by each of the three household categories are likewise sourced from the *1989 Philippine Statistical Yearbook*. By combining this information with the number of households in each household (income) category (these data come from the *1989 Philippine Statistical Yearbook*), the aggregate expenditures on each category of consumer goods and services by each household category are computed.

The various tax rates used in the analysis are obtained from the *1989 Philippine Statistical Yearbook* and Habito. The input-output coefficients are taken from Interindustry Accounts of the Philippines: 1989 Update, and from Habito (1991). The value of exports and imports in 1984 are taken from the *1989 Philippine Statistical Yearbook* with the exception of the energy data which come from Koshal et al. (1990) and the agriculture data which are obtained from Habito (1991).

METHODOLOGICAL CAVEAT

Before discussing the results obtained from the general equilibrium model, a short digression—on the advantages and shortcomings of the particular modeling approach opted for—is in order.

The primary advantage of the general equilibrium modeling approach is that, with all economic entities maximizing their utility (subject to the relevant constraints), all markets are required to clear. No transactions are conducted at prices other than equilibrium prices, and for every factor of production and every good and service consumed, the quantity supplied must exactly match the quantity demanded. All interactions among markets are taken into account and, consequently, all interrelationships between sectors (both consuming and producing) are explicitly considered.

Another advantage of this modeling approach is that it performs the analysis at a disaggregated level and, hence, can identify sector-specific impacts of the issue being addressed. Frequently, small aggregate effects perplex the larger impacts at the sectoral level. Thus, for example, at the aggregate level a change might have little effect on income but at the household level, the distributional impacts on income might be fairly substantial.

The general equilibrium model also includes a treatment of all taxes. These taxes can introduce a considerable differential between prices paid by consumers and those received by producers. This can create distortions in market signals that lead to market failure, such as the inefficient use of factors of production [see, for example, Friedman (1984), for an analysis of this issue].

The model is solved numerically and, after any change in the exogenous (e.g., policy) variables, a new, independent (i.e., independent of the previous solution) equilibrium is computed. As a result, any conclusions do not depend on first or second order approximations or the assumption of an infinitesimally small change in one or more of the variables.

The general equilibrium modeling approach is not devoid of deficiencies. For example, the values of the various parameters used in the model are not estimated directly by econometric means. Rather, as noted, they are taken from the literature and represent a consensus among researchers with regard to appropriate values. This does not mean that a complete set of econometric results cannot be generated at some future date. Such an undertaking is not attempted here, given its enormous complexities.[11]

Another limiting assumption is that consumer and producer behavior is modeled with full and complete adjustment between perturbations. This means that the distributed lags associated with the adjustments of the various factors are not overtly modeled, although the magnitude of the

11. The reader interested in exploring these complexities is referred to Jorgenson (1984) and MacKinnon (1984).

full adjustment by each producing and consuming sector is captured. Thus, no analysis of the J-curve associated with the adjustment of imports and exports to changes in the exchange rate is possible.[12] In addition, there is the implicit assumption that all economic agents know the vector of final equilibrium prices, thus allowing for full adjustment on their part.

Finally, the model does not, as noted, make any provision for technological innovation and hence, is not suitable for addressing policy issues that will take a long time to reach their full (cumulative) impact.

These model limitations imply that the results of the subsequent modeling effort should not be unequivocally accepted. Instead, they should be interpreted in the context of offering an improved, but not perfect, analysis of the impact of a change in the exchange rate on various agricultural and manufacturing sectors, and the commodities it produces.

GENERAL EQUILIBRIUM RESULTS

Before discussing the results of the general equilibrium model, it is important to note that the model is solved by the Series of Linear Complementary Programs (SLCP) algorithm of Mathiesen. The model is based on 1984 data. Reference prices for all activities (producing, consuming, and importing sectors) are normalized to one and are in real terms.

It must also be noted that changes in the model from this reference calibration (called the reference case or the benchmark) in response to some perturbation(s) are not fully exhausted (that is, the cumulative total impact is not reached) for three to five years. This is due to the intertemporal optimization on the part of consumers which is incorporated into the model. Therefore, in assessing say, the impact of a subsidy, the model equilibrium (i.e., the equilibrium vector of prices and quantities) represents the cumulative effect of that subsidy between 1984 and 1989.

12. For further discussion on this concern see, for example, Meade (1988) and Rosensweig and Koch (1988).

Tables 3 to 6 give the general equilibrium prices and quantities that actually occurred in 1984. Note that these tables are referred to as the benchmark case. To obtain the values shown in these tables, the ad valorem tariff rates is first lowered to 19 percent (the lowest rate that the Philippines had imposed in 1984). The above CGE model is then applied to this reduced tariff situation. The nominal values of the quantities are in hundreds of billions of 1984 pesos.

In the following analysis, the impact on the general equilibrium is simulated assuming that the Philippines uses two separate export promotion policies (subsidies and real devaluation of peso) for development purposes. To achieve economic growth in the intermediate run as well as to promote export growth, the export subsides and the compensated devaluation sufficient to eliminate the initial imbalance in the trade balance account is applied.

TABLE 3
Reference Case-Equilibrium Prices (Normalized to One) and Quantities (in hundreds of billions of pesos) for the Producing Sectors

Producing Sector	Price	Quantity
1. Manufacturing	1.000	24.39120
2. Logging	1.000	0.92001
3. Rice	1.000	1.59301
4. Service	1.000	28.40140
5. Root crops	1.000	0.30031
6. Metal mining	1.000	0.75163
7. Energy	1.000	5.27229
8. Fishing	1.000	2.15961
9. Sugar	1.000	5.01861
10. Forest products	1.000	1.66664
11. Coconuts	1.000	0.65609
12. Coffee	1.000	0.25339
13. Non-metal mining	1.000	0.25065
14. Corn	1.000	0.50837

As indicated earlier, the government is assumed to finance the trade balance deficit. Since our model involves the removal of tariffs, the government will experience significant reductions in its overall operating revenues. Moreover, for neutrality purposes the aggregate export revenues going to manufacturers are the same in each policy scenario. Tables 8 through 12 present the percentage change from benchmark for prices and quantities in the producing sectors, consuming sectors, exporting sectors, importing sectors, and households, respectively, for subsidies and real devaluation, respectively. For ease of comparison, changes under each scenario are placed side by side.[13]

TABLE 4
Reference Case-Equilibrium Prices (Normalized to One) and Quantities (In hundreds of billions of pesos) for the Consuming Sectors

Producing Sector	Price	Quantity
1. Saving	1.000	4.72468
2. Housing	1.000	4.02987
3. Transportation	1.000	1.73759
4. Education	1.000	1.15816
5. Milk and meat	1.000	0.78122
6. Alcohol and tobacco	1.000	0.97202
7. Miscellaneous food	1.000	2.15152
8. Household furnishings	1.000	1.45040
9. Processed food	1.000	10.46500
10. Clothing	1.000	1.24712
11. Fish	1.000	2.05611
12. Medical care	1.000	1.43131
13. Cereal	1.000	0.09831
14. Fuel	1.000	1.72313
15. Miscellaneous	1.000	1.86990

13. The actual general equilibrium quantities and prices obtained by running these two comparative static experiments can be obtained from the authors upon request.

TABLE 5
Reference Case-Equilibrium Prices (Normalized to One) and Quantities (In hundreds of billions of pesos) for Imports

Imports	Price	Quantity
1. Manufacturing	1.000	7.97782
2. Logging	1.000	0.01201
3. Rice	1.000	0.00002
4. Service	1.000	1.05633
5. Root crops	1.000	0.00001
6. Metal mining	1.000	0.00319
7. Energy	1.000	0.41741
8. Fish	1.000	0.00139
9. Sugar	1.000	0.36688
10. Forest products	1.000	0.01327
11. Coconuts	1.000	0.00549
12. Coffee	1.000	0.01980
13. Non-metal mining	1.000	0.00695

First, all tariffs are kept at 19 percent and then subsidize all exportables by 20 percent over a three-year period.[14] The result of these changes is an increase of 1.87 percent and 5 percent in the relative price of capital and land, respectively, and a decrease of 4.52 percent in the price of labor when compared with the benchmark.[15]

The findings in Table 8 show that the production of all exportables, except services, increased.[16] The range of increase in production is from 0.35 percent (for root crops) to 44.91 percent (for metal mining). The absolute effects are less than what these numbers indicate, however, since sectors such as logging, wood products and coconuts are not

14. Different subsidies and time periods were tried to determine the amount and the number of years required for the balance of payments to go back to equilibrium. CGE results show that the appropriate subsidy is 20 percent and the time period is three years.
15. All prices given by the solution output are relative prices where manufacturing is the numeraire.
16. All sectors, except staple crops such as corn, are exportable.

nearly as large (in terms of volume) as manufacturing and services. As can be seen, manufacturing experiences only moderate gains, while services actually experiences a slight cutback in production. This is because raw resources are diverted into more profitable sectors such as those listed above.

TABLE 6
Reference Case-Equilibrium Prices (Normalized to One) and Quantities (In hundreds of billions of pesos) for Exports

Exports	Price	Quantity
1. Manufacturing	1.000	3.302430
2. Logging	1.000	0.068546
3. Rice	1.000	0.009467
4. Service	1.000	2.921430
5. Root crops	1.000	0.000350
6. Metal mining	1.000	0.614395
7. Energy	1.000	0.160763
8. Fish	1.000	0.022203
9. Sugar	1.000	0.184170
10. Forest products	1.000	0.391006
11. Coconuts	1.000	0.004238
12. Coffee	1.000	0.042644
13. Non-metal mining	1.000	0.005371

TABLE 7
Reference Case-Equilibrium Utility Levels (In hundreds of billions of pesos) by Household Categories

Category	Household
1. Low Income	3.87445
2. Middle Income	8.36981
3. High Income	18.88470
Govemment	6.81170

TABLE 8
Subsidy and Real Devaluation Case: Percentage Changes in the Equilibrium Prices (Normalized) and Quantities in Producing Sectors with Respect to the Benchmark

Producing Sector	Subsidy		Real Devaluation	
	Price	Quantity	Price	Quantity
1. Manufacturing	0.00	3.23	0.00	1.22
2. Logging	1.93	9.16	2.25	5.17
3. Rice	−0.45	3.27	0.75	1.36
4. Service	−0.53	−0.56	1.07	0.67
5. Root crops	−0.29	0.35	0.81	0.80
6. Metal mining	0.60	44.91	1.90	22.24
7. Energy	−0.24	2.79	1.39	2.35
8. Fishing	−0.53	0.66	1.19	0.45
9. Sugar	−0.06	0.38	0.88	−0.15
10. Forest products	0.69	10.95	1.73	4.86
11. Coconuts	−1.19	3.34	0.30	1.14
12. Coffee	0.22	5.27	1.12	3.89
13. Non-metal mining	1.02	3.47	2.27	3.06
14. Corn	1.91	0.52	−50.34	1.20

As to the effects of subsidies on different income groups, the results in Table 12 show that all income classes are worse off: welfare in the low-income group declines by 1.3 percent, the middle-income group experiences 0.87 percent decrease, and the high-income group faces 0.02 percent loss. The low-income group is hardest hit because the price of labor decreases relative to that of land and capital. The high-income class, on the other hand, experiences the lowest reduction in income because land and capital intensive industries such as fishing, logging, manufacturing and others are helped by subsidies, while services (relatively labor intensive industries) are adversely affected by the promotion policies of the government.

With respect to the consumption effect of the subsidy, CGE findings indicate that the consumption of all various commodity groups decreases (Table 9). Only savings increases marginally by 0.01 percent (P36 million) compared to the reference case. Among those that show sharp decreases are alcohol and tobacco by 0.75 percent (P727 million), milk and meat by 0.70 percent (P514 million), clothing by 0.55 percent (P688 million), and processed food by 0.51 percent (P5.38 billion).

The government, however, strapped with subsidies loses the most; its revenues (defined as taxes net of subsidies) are reduced by 48.75 percent (P332.06 billion). This is accomplished via austerity program whereby it decreases expenditures to balance its fiscal budget. Such an

TABLE 9
Subsidy and Real Devaluation Case: Percentage Changes in Equilibrium Prices (Normalized) and Quantities in Consuming Sectors with Respect to the Benchmark

	Subsidy		Real Devaluation	
Consuming Sector	**Price**	**Quantity**	**Price**	**Quantity**
1. Saving	−0.31	0.01	0.75	0.48
2. Housing	−0.41	−0.13	1.08	0.12
3. Transportation	−0.28	−0.20	0.56	0.67
4. Education	−0.36	−0.15	0.71	0.50
5. Milk and meat	0.0	−0.70	0.04	1.03
6. Alcohol and tobacco	0.00	−0.75	0.00	1.05
7. Miscellaneous food	−0.12	−0.58	0.42	0.66
8. Household furnishings	−0.13	−0.38	0.26	0.96
9. Processed food	−0.21	−0.51	0.42	0.64
10. Clothing	−0.03	−0.55	0.07	1.09
11. Fish	−0.48	−0.25	1.15	−0.08
12. Medical care	−0.22	−0.35	0.44	0.73
13. Cereal	−0.23	−0.47	0.40	0.67
14. Fuel	−0.34	−0.33	1.27	−0.16
15. Miscellaneous	−0.07	−0.54	0.74	0.38

TABLE 10
Subsidy and Real Devaluation Case: Percentage Changes in the Equilibrium Prices (Normalized) and Quantities in Exporting Sectors with Respect to the Benchmark

	Subsidy		Real Devaluation	
Exporting Sector	**Price**	**Quantity**	**Price**	**Quantity**
1. Manufacturing	−16.67	55.26	0.00	29.34
2. Logging	1.92	27.03	2.32	25.52
3. Rice	−0.45	30.00	0.79	28.38
4. Service	−0.53	30.07	1.06	27.97
5. Root crops	−0.29	29.84	0.87	29.53
6. Metal mining	−16.17	54.32	1.88	26.93
7. Energy	−0.24	29.68	1.39	27.56
8. Fishing	−17.11	56.08	1.17	27.82
9. Sugar	−0.06	29.50	0.91	28.22
10. Forest products	−16.09	54.22	1.75	27.14
11. Coconuts	−17.67	56.40	0.34	28.96
12. Coffee	0.22	29.18	1.18	27.91
13. Non-metal mining	1.02	28.06	2.25	26.47

action, not unlike that advocated by organizations like the International Monetary Fund, is the only sustainable alternative in the long run.

As to the effects of subsidies on exports, Table 10 shows that the exports of all 13 sectors increase significantly. The exports of manufacturing increases by 55.26 percent (P1.82 billion), metal mining by 54.32 percent (P350 million), fishing by 56.08 percent (P12 million), forest products by 54.22 percent (P210 million), and coconuts increase by 56.4 percent (P2 million). The range of increase in the exports of all other sectors is between 27 percent and 30 percent. As far as the price effect is concerned, the results suggest that subsidies reduce the price of most exports.

As to imports, the findings in Table 11 show that imports of various commodity groups sometimes change significantly. Generally, import sectors that were formerly highly protected, however, tend to experience

increases. Hence, imports of manufactured goods increase by 2.1 percent (P16.7 billion), fish by 26.75 percent (P30 million), logging by 9.81 percent (P117 million), forest products by 6.9 percent (P915 million), sugar by 16.69 percent (P6.12 billion), root crops by 16.38 percent (P200 million), coffee by 16.98 percent (P336 million), and coconuts by 20.99 percent (P115 million).

On the other hand, imports of goods and services which are lightly protected decrease. Services, for example, decrease by 18.75 percent (P19.8 billion), metal mining by 17.82 percent (P57 million), nonmetal mining by 17.48 percent (P122 million), energy by 18.51 percent (P7.725 billion), and rice by 2.47 percent (P100 thousand).[17] Although there are both losses and gains, in the aggregate an equilibrium is restored and a trade balance is achieved.

As far as the price effect of a subsidy is concerned, the CGE results suggest that because of tariff reductions and subsidies aimed at tradeables, imports are subject to a greater price effect than the consuming and the producing sectors. Almost 50 percent of import prices increase and some like non-metal mining are doubled.

The real exchange rate for pesos is next devalued by 100 percent over a three-year period, maintaining all tariff rates at 19 percent, and removing all subsidies.[18] Following Edwards (1986), the real exchange rate is defined as the ratio of tradables to non-tradables and alter the prices of the two accordingly. The results are shown in the last two columns of Tables 8 to 12. The CGE findings show that the effects of real devaluation on various sectors are less pronounced and more evenly distributed than those of subsidies; exportables like manufacturing are

17. The reason for a reduction in imports of services, despite a fall in their prices, is the presence of other changes on the demand side. For example, the real income decreases, as shown in Table 12.

18. Like subsidies, different time periods and different devaluation rates were tried to determine how many years it would take to bring about equilibrium in the trade balance. CGE results show that the appropriate real devaluation rate is 100 percent and the time period is three years.

not promoted as much but losing sectors like services are not hurt as much. Because such a policy involves no direct subsidization of industries, it is also not as hard on the government.

As to the effects of real devaluation on factor prices, the results indicate that because exportables tend to be land and capital intensive, the prices of land and capital increase and those of labor decrease. The prices of land and capital increase by 3.46 percent and 3.02 percent, respectively while that of labor decreases by 1.51 percent compared to the benchmark.

With regard to the effect of real devaluation on production sectors, all sectors (except sugar and metal mining) show a modest increase ranging from 0.45 percent to 5.17 percent. Metal mining shows a large increase of 22.24 percent (or P16.72 billion) and sugar reveals a decline of 0.15 percent (or P762 million).[19] Sectors that show increases of less than 1 percent are fishing (by 0.45 percent or P1 billion); services (by 0.67 percent or P19.17 billion); and root crops (by 0.80 percent or P24 million). Again the increase in the production of root crops and logging (by 5.17 percent or P4.75 billion) trigger increased soil erosion and degradation of the environment in the short and medium terms. Although logging does not increase soil degradation per se, logging in the Phillippines is widely associated with a lack of reforestration and the increase in illegal trespass (see, for example, Hyde and Sedjo 1991). This, in turn, leads to the massive erosion experienced by the Philippines over the last two decades. The long-term effect, as discussed in the conclusion, seems debatable. After comparing these findings with those of the subsidies, it can be concluded that both would have somewhat harmful environmental effects in the short and medium terms.

Regarding the consumption effect, the real devaluation increases the consumption of all commodity groups (except fish and fuel). The consumption of the latter decreases by 0.16 percent (P284 million) and that of the former decreases by 0.08 percent (P167 million). The fuel use

19. The reason is that precious metals (mainly gold) are highly exportable, while rice is a staple which is mainly consumed by the local population.

TABLE 11
Subsidy and Real Devaluation Case: Percentage Changes in the Equilibrium Prices and Quantities in the Importing Sectors with Respect to the Benchmark

Imports	Subsidy		Real Devaluation	
	Price	Quantity	Price	Quantity
1. Manufacturing	27.62	2.10	27.33	1.86
2. Logging	47.84	9.81	48.46	9.99
3. Rice	16.57	−2.47	19.11	1.49
4. Service	−19.19	−18.75	−16.76	−17.64
5. Root crops	66.04	16.38	69.34	17.47
6. Metal mining	−17.35	−17.82	−15.39	−16.96
7. Energy	−18.71	−18.51	−16.22	−17.38
8. Fish	96.64	26.75	103.05	28.63
9. Sugar	66.83	16.69	69.56	17.55
10. Forest products	39.95	6.90	42.52	7.77
11. Coconuts	79.41	20.99	84.45	22.60
12. Coffee	67.76	16.98	70.39	17.83
13. Non-metal mining	−16.65	−17.48	−14.77	−16.66

decreases as most of it is imported and the currency is devalued. The consumption of fish decreases as they are mainly consumed by the poor who typically experience a precipitous fall in their income. The increase in the consumption of other commodity groups ranges from 0.12 percent (for housing) to 1.09 percent (for clothing). Saving increases by a larger amount under a real devaluation than under subsidies (the difference is about P2.27 billion) to finance investment in the manufacturing sector. Comparison between these results with that of the subsidies indicates that the consumption effects of a real devaluation are more favorable than those of the subsidies.

As to exports, devaluation increases the exports of all sectors by less than one-third of their benchmark values (Table 10). The exports of

manufacturing and root crops, for example, increase by 29.34 percent (P970 million) and 27.97 percent (P820 million), respectively. An interesting observation in this table is that the range of variation in exports of all sectors is quite limited—it varies between 25.52 percent and 29.34 percent. Currency devaluation would seem to cause a proportionate increase among all exports. In terms of price effect, currency devaluation increases all export prices by 2.30 percent or less.

With regard to imports, CGE results show a decrease in the importables such as services, metal minerals, non-metal minerals, and energy, while an increase is seen in exportables such as manufactured goods, logs, rice, root crops, fish, sugar, forest products, coconuts, and coffee when compared to the reference case (Table 11). In terms of percentage changes and peso values, imports of services decline by 17.64 percent (P18.63 billion), metal mining by 16.96 percent (P54 million), non-metal mining by 16.66 percent (P116 million), energy by 17.38 percent (P7.25 billion).

As to those imports that increase, the results show that manufactured goods increase by 1.86 percent (P14.86 billion), fish by 28.63 percent (P40 million), logs by 9.99 percent (P120 million), forest products by 7.77 percent (P1.04 billion), sugar by 17.55 percent (P6.44 billion), root crops by 17.47 percent (P200 thousand), coffee by 17.83 percent (P353 million), and coconuts by 22.60 percent (P124 million). The imports of rice remain virtually unchanged when compared to the benchmark. Since the model results in an equilibrium in the trade balance, one may conclude that the peso values of increases in exports exceed those of increases in imports, *ceteris paribus*.

On the price effect of a real devaluation, the results show that real devaluation causes drastic increases in most import prices when expressed in terms of pesos. The increase in prices range from 103.05 percent (for fish) to 19.11 percent (for rice). Findings also indicate that real devaluation leads to a very mild increase in prices in the producing and the consuming sectors. The price increases range from 0.25 percent (non-metal mining) to 2.27 percent (household furnishings). The extent of the

increase in domestic prices, however, is marginally more than that in the case of subsidies. The inflationary nature of real devaluation is partly the reason behind this.

As to the effects on various household groups, the CGE findings show that the utility of the lowest income group would drop by 0.09 percent (P360 million); the utility of the middle-income group would rise by 0.25 percent (P2.10 billion); and that of the high-income group would rise by 0.77 percent (P14.53 billion). These are shown in Table 12.

Comparing these findings with those of subsidy scenarios described above, one may conclude that devaluation affects employment and income favorably, while the government experiences a smaller reduction in revenues; they decline by 13.45 percent (P240.49 billion) compared to the benchmark.[20] In terms of the real income effect of a devaluation, the results are inconclusive. The rich and middle-income class seem to benefit from a real devaluation since the prices of land and capital increase. But the poor lose as the price of labor decreases, while most

TABLE 12
Subsidy and Real Devaluation Case Percentage Changes in Equilibrium Real Income Levels of Households and the Government

Category	Subsidy	Real Devaluation
	Household	Household
1. Low Income	−1.30	−0.09
2. Middle Income	−0.87	0.25
3. High Income	−0.02	0.77
Govemment	−48.75	−35.31

20. Note that under the subsidies, the reduction in government revenues is P332.64 billion (48.75%) compared to the benchmark. To keep the government budget in balance, expenditures are reduced by a sufficient amount.

other prices increase. As before, the loss in government revenues is offset by a reduction in expenditures through an austerity program to balance the budget and make the policy sustainable.

SENSITIVITY ANALYSIS

The foregoing discussion is based on a number of assumptions. No analysis is complete without an examination of the sensitivity of the results to key assumptions. A full examination and discussion of these assumptions would be very difficult, if not impossible. Consequently, only the results from the sensitivity analysis of one crucial assumption are discussed below.

The effects on the vector of equilibrium prices and quantities of the assumption concerning the elasticity of substitution between goods in each consuming agent's utility function is investigated. (Note that in the previous discussion, it is assumed that this elasticity is unity, a Cobb-Douglas-type utility function). Two separate sets of sensitivity tests are discussed here. The first set of results is for the case in which the elasticity of substitution is assumed to be one-half of the values used in the subsidies and real devaluation cases. In the second set, the elasticity is one and a half of the values used in the foregoing analysis.

The general equilibrium results is first considered assuming that the elasticity of substitution is 0.5 and subsidies are the same as before. According to the CGE results, the changes in the price of all three inputs (labor, capital, and land) are virtually the same as those in the foregoing analysis; the price of labor decreases by 4.52 percent, the price of land and capital increases by 5.06 percent and 1.87 percent respectively. The findings also show that the production of all exportables and consumption change by almost the same percentage as presented in the foregoing analysis; the differences between these results and those with the elasticity of substitution of one are consistently below 1 percent and, in most cases, below 0.5 percent. The same outcome is obtained with respect to imports. Next, the elasticity of substitution is increased to 1.5 and apply the same subsidies. Again the CGE results are basically the

same as before. Government is again the big loser in terms of revenues net of subsidies.

Now consider the change in the general equilibrium values if the government chooses to devalue the currency by 100 percent (in real terms) over a three-year period and lower all tariff rates to 19 percent. Assuming the elasticity of substitution of 0.5, results show that the prices of factors of production change by almost the same amount and percentage and in the same direction as discussed in the foregoing analysis. As to the effects of real devaluation on production, consumption, imports, various households, and the government, the CGE findings support the results obtained under the assumption of a unitary elasticity of substitution.

Finally, when the value elasticity of substitution among consumption goods is changed to 1.5 and devalue the peso by 100 percent, the general equilibrium results remain almost the same as those obtained under the elasticity of 0.5. Sector and household category specific changes move in a consistent fashion with no anomalous fluctuations. These sensitivity results suggest that the values of the elasticity of substitution, while important in the determination of the general equilibrium prices and quantities, are not quite pivotal to the CGE model, and that errors in its value would not lead to misleading results.

CONCLUSION

In this study, the general equilibrium effects of different export promotion policies on production of exportables, their consumptions, and imports was examined. Unlike other studies, land as a factor input in the production function was included. Thus, a three-factor production function was developed where value added depends upon the use of labor, capital, and land.

The effects of export policies on factor prices was also examined to trace their income redistribution effects on three broad income categories (low-, middle-, and high-income groups). Furthermore, the model also

investigated the outcome of these policies on the government utility. The analytical vehicle used in this study consists of a computed general equilibrium (CGE) model comprised of 14 production sectors, 15 consumption sectors, 13 import sectors, three household categories classified by broad income groups, and the government.

The authors choose two different simulations to promote exports to achieve economic growth and bring about an equilibrium in the trade balance: subsidies and real devaluation of the Philippine peso. Results suggest that subsidies lead to sharp increases in the production of exportables and reductions in domestic consumption. The price of labor decreases and that of land and capital increases. As a result, the lowest income group which mostly supplies labor, experiences a substantial reduction in income, while the middle- and high-income classes (who own the land and capital) gain from the government subsidies at the expense of a very large reduction in government utility.

When the government changes its export promotion policies from subsidies to a real devaluation, the CGE results show that real devaluation affects various sectors in the economy more evenly, and that the reduction in government utility drops from 48.75 percent (P332.64 billion) under subsidy to 35.31 percent (P240.49 billion) under a real devaluation. All sectors (except sugar and metal mining) show a mild increase in production ranging from 0.45 percent to 5.17 percent. A real devaluation also increases consumption of all goods (except fish and fuel). Unlike subsidies that show a reduction in incomes of all groups, the real devaluation increases the income of the middle- and high-income classes, while decreasing that of the low-income group. Comparing these results with those of subsidies, one may conclude that the consumption effects of the devaluation are more favorable than those of the subsidies.

The production of root crops and logging increase by 0.35 percent and 9.16 percent, respectively, under subsidies and 0.8 percent and 5.17 percent, respectively, under a real devaluation. Furthermore, fishing and non-metal (primarily gravel) mining go up by 0.66 percent and 3.47 percent under subsidies, and 0.45 percent and 3.06 percent under devaluation. So,

in terms of the environment, the implementation of either policy is likely to increase the rate of soil erosion and over-fishing in the short to medium terms.

Indeed, such policies may be exacerbated by low-income workers (who lose under either scenario) leaving urban areas to practice shifting cultivation in rural areas. This is not to say, however, that policies such as these (which are favored by lenders) may not ultimately be beneficial to the environment. For one thing, the marked drop in imported energy use will not only ease air pollution in urban areas, but may also lead to the use of more capital intensive and environmentally disruptive harvesting techniques in the agriculture and forestry industries.[21]

Finally, if such policies lead to balanced long-term growth, the Philippine government may not have to rely on natural resources to generate foreign exchange. A full examination of such long-term effects, however, is highly speculative and beyond the scope of the present analysis.

As to which of these two export promotion policies is preferable, one can argue that either one is appropriate, depending on the objective of the policymaker. If the objective is to jump-start the economy by targeting specific industries such as manufacturing, metal-mining, forest products, and fishing, then a subsidy policy is the best avenue to raise economic activity and promote exports. The opportunity cost of such action, however, is severe government austerity, unbalanced growth among different industries, loss of consumer income, and a potential for increasing shifting cultivation.

On the other hand, if these costs seem unbearable, then real devaluation is the only viable alternative for promoting exports and, hence, achieving economic development. Since no specific industries are targeted for assistance, the main drawback of such a policy is the lack of control over development facing the policymaker and the uncertainty as to who the ultimate winners and losers will be.

21. For a more in-depth analysis of the environmental issues involved, see Cruz and delos Angeles (1988).

APPENDIX
Empirical Model

I. Overall Equilibrium by Sector

(1) $Y_j + GE_j + UM_i = \Sigma_l RAS_{jL} + GD_j + CD_j + UX_j + INV_j$
(2) $\Sigma_c SL_c = \Sigma_j DL_j + GDL$
(3) $\Sigma_c SK_c = \Sigma_j DK_j + GDK$
(4) $\Sigma_c SD_c = \Sigma_j DD_j + GDD$

where

(5) $GDL = \Sigma_j TL_j$
(6) $GDK = \Sigma_j TK_j$
(7) $GDD = \Sigma_j TD_j$

II. Consumer Goods and Services

(8) $CD_j = \Sigma_j Z_{ji} [GCE_j - TC_j]$
(9) $\Sigma_c RCS_{ic} = GCE_J$
(10) $\Sigma_j RCS_{ic} = SL_c + SK_c + SD_c + TRN_c - PIT_c$
(11) $GC_c = \Sigma_j RCS_{ic} - SAV_c + (1 - TAU_c) (ZTA_c - 1) SL_c$
(12) $GC_c = SL_c + SK_c + SD_c + TRN_c - PIT_c + (1 - TAU_c) (ZTA_c - 1)SL_c$
(13) $TE = \Sigma_c (SL_c ZTA_c TAU_c + SK_c TAU_c + SD_c TAU_c - (\phi_c + TRN))$

where

$\phi_c = SL_c TAU_c + SK_c TAU_c + SD_c TAU_c - PIT_c$

III. Foreign Sector Balance

(14) $\Sigma_k (UM_k (EM_k/(1 + EM_k)) + UM_k/(1 + EM_k)) = \Sigma_k (UX_k + FE_k)$

IV. Consistency

(15) $\Sigma_c (SL_c + SK_c + SD_c + TRN_c - PIT_c - TC_c) = \Sigma_c CG_c$
(Net household income equals household expenditures.)

(16) $\Sigma_j (GSK_j + GE_j + TL_j + TK_j + TD_j + TXO_j) + GTL = \Sigma_c TRN + \Sigma_j (GDK_j + GD_j) + GD_c$
(Government income plus endowments equals government outlays.)

(17) $\Sigma_j (UM_j - UX_j) = 0$
(Net exports equal zero.)

(18) $\Sigma_j (CD_j + GD_j + UX_j - GE_j - UM_j) = \Sigma_j (DL_j + DK_j + TL_j + TK_j + TXO_j)$
(The value of demand equals value added plus taxes.)

Y_j - Total production in section j (j = 1,2, ..., 14)
CD_j - Consumer demand for product j
GE_j - Government endowment of product j
UM_k - Imports of product k (k = 1, 2, ..., 13)
$E_L RAS_{jL}$ - RAS balanced input/output intermediate demands
GD_j - Government demand for product j
INV_j - Investment in sector j
UX_k - Exports of product k
SL_c - Supply of labor by household c (c = 1,2,3)
SK_c - Supply of capital by household c
SD_c - Supply of land by household c
DL_j - Demand for labor in the industry
DK_j - Demand for capital in the industry j
DD_j - Demand for land in industry j
GDL - Government demand for labor
GDD - Government demand for land
TL_j - Tax on labor in industry j
TK_j - Tax on capital in industry j
TD_j - Tax on land in industry j
GCE_j - Consumer demand for consumer product i (jk = 1,2, ..., 15)

Z_{ij} - A 14 by 14 transformation matrix
$RCSi_{c}$ - RAS balanced matrix of each household's demand for each consumer good
TC_{j} - Excise tax on consumer good *j*
TRN_{c} - Transfer payment to household *c*
PIT_{c} - Personal income tax payment for household *c*
TAU_{c} - Marginal income tax rate for household *c*
SAV_{c} - Savings in household *c*
GC_{c} - Gross consumption of household *c*
ZTA_{c} - Consumption plus leisure coefficient
TE - Total government endowments
EM_{k} - Demand elasticity of export demand
FE_{k} - Endowment/demand sector of adjusted elasticity of export demand
GSK_{j} - Government endowment of capital in industry *j*
GDK_{j} - Government demand for capital in industry *j*
GTL - Government wage taxes on its own employees
TXO_{j} - Government output on industry *j*
TC_{j} - Consumption taxes on household *c*
CG_{c} - Total government consumption by household *c*

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