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INDOSAM: A BALANCED AND DISAGGREGATED 1993 SOCIAL ACCOUNTING MATRIX FOR INDONESIA

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between

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CASER/CSIS/CIES/ANU joint research project on policy analysis of linkages between Indonesia's agricultural production, trade and environment

Rapid economic growth in Indonesia has been accompanied by significant structural changes, including for its agricultural sector and its unique natural environment. Recently questions have been raised about the impact of Indonesia's agricultural, industrial, trade and environmental policies on sustainable rural development. The nature of interactions between the economic activities of different sectors and the environment are such that an intersectoral, system-wide perspective is essential for assessing them. An international perspective also is needed to assess the impact on Indonesia of major shocks abroad, such as the implementation of the Uruguay Round agreements, APEC initiatives, or reforms in former centrally planned economies. There is increasing pressure on supporters of liberal trade to demonstrate that trade reforms at home or abroad affecting countries such as Indonesia will not add to global environmental problems (e.g., deforestation, reduced biodiversity). Again, this requires system-wide quantitative models of the economy and ecology, because typically there are both positive and negative effects at work, so the sign of the net effects ultimately has to be determined empirically.

To begin to address these issues, the Australian Centre for International Agricultural Research (ACIAR) has generously provided funds for a collaborative 3-year project (to mid-1999) involving the University of Adelaide's Centre for International Economic Studies (CIES) as the lead institution, Bogor's Centre for Agro-Socioeconomic Research (CASER) which is affiliated with the Ministry of Agriculture, Jakarta's independent Centre for Strategic and International Studies (CSIS), and the Economics Division of the Research School of Pacific and Asian Studies (RSPAS) at the Australian National University in Canberra. Being based on Indonesia with its rich diversity of environmental resources (and on which there are relatively good data) and its rapid economic growth, the project could also serve as a prototype for similar studies of other developing countries in Southeast Asia and elsewhere.

The key objective of the project is to assess the production, consumption, trade, income distributional, regional, environmental, and welfare effects of structural and policy changes at home and abroad particularly as they will or could affect Indonesia's agricultural sector over the next 5-10 years. Among other things, the analysis will focus both on the effects of economic changes on the environment, and on the impacts on Indonesia's agricultural production and trade of resource and environmental policy changes. The implications of regional and multilateral trade liberalization initiatives and Indonesia's ongoing unilateral trade reforms will be analysed, along with other potential domestic policy changes and significant external shocks such as the entry of China and Taiwan into the World Trade Organization. The analysis will draw on and adapt computable general equilibrium (CGE) models such as the national INDOGEM Model (built as part of an earlier ACIAR project) and the global GTAP Model.

The project is being undertaken in close collaboration with the Indonesian Ministry of Agriculture and ministries involved in trade, planning, and the environment. A Research Advisory Committee has been established to encourage close collaboration of representatives from those and other ministries.

ACIAR INDONESIA RESEARCH PROJECT

WORKING PAPER 97.06

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This is a revision of the earlier titled paper, "A Disaggregated Data Base for General Equilibrium Analysis of the Indonesian Economy", first presented at the Post-Conference Workshop "Linkages Between Agricultural Production, Trade and the Environment", 41st Annual Conference of the Australian Agricultural and Resource Economics Society, Gold Coast, Queensland, 25 January, 1997. Please note that this paper (and all subsequent papers in this Working Paper Series) can be downloaded from the project's website, http://www.adelaide.edu.au/cies/indon1.htm

SUMMARY

This paper provides a description of INDOSAM: a disaggregated social accounting matrix (SAM) for use in economic analysis of the Indonesian economy with a 1993 base. This SAM is intended, in part, to serve as the data base for a static general equilibrium (GE) model of the Indonesian economy, but it has other potential uses as well. The year 1993 is currently the latest for which it is possible to assemble the information required for construction of a social accounting matrix for Indonesia. The issues discussed in the paper include the set of internal balancing relationships that a static GE model must satisfy, and second, a series of checks designed to confirm that the version of the model to be used for simulation satisfies all these conditions. To lay the foundation for these issues, a macroeconomic accounting framework is presented, consistent with the accounting concepts used within INDOSAM. The paper then summarises the methods used in the construction of INDOSAM. The Indonesian data sources used are described in detail, along with the operations performed to achieve balance of the data base. The paper then provides direct checks that the INDOSAM data base is properly balanced and does indeed represent an equilibrium which can serve as the basis for applied general equilibrium analysis.

INDOSAM:
A Balanced and Disaggregated 1993
Social Accounting Matrix for Indonesia*

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1. Introduction

This paper provides a description of INDOSAM: a disaggregated social accounting matrix (SAM) for use in economic analysis of the Indonesian economy, with a 1993 base. This SAM is intended, in part, to serve as the data base for a static general equilibrium (GE) model of the Indonesian economy, but it has other potential uses as well. The year 1993 is currently the latest for which it is possible to assemble the information required for construction of a social accounting matrix for Indonesia. The issues discussed in the paper include the set of internal balancing relationships that a static GE model must satisfy, and second, a series of checks designed to confirm that the version of the model to be used for simulation satisfies all these conditions. This is an aspect of GE modelling that is often ignored by practitioners anxious to obtain simulation results. It is all too common for the models used to be hastily assembled with the result that the basic properties required of a GE structure are not checked and often are not met. The results of simulations with such models are invalid and their economic properties cannot be trusted. Accordingly, the paper reviews checks that can be performed to ensure that internal inconsistencies of this kind are not present.

To lay the foundation for these issues, a macroeconomic accounting framework, consistent with the accounting concepts used within INDOSAM, is presented in Section 2.

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This review of accounting concepts leads to the derivation of the concept of *Walras' law* - that GDP at market prices on the expenditure side is equal to GDP at market prices on the income side, or equivalently, that total savings is equal to total investment. Section 3 summarises the methods used in the construction of INDOSAM. The Indonesian data sources used are described in detail, along with the operations performed to achieve balance of the data base. Section 4 provides direct checks that the INDOSAM data base is properly balanced. These checks are vital to ensure that the data base does indeed represent an equilibrium which can serve as the basis for applied general equilibrium analysis.

2. Macroeconomic accounting

We shall divide all agents in the economy into four groups:

- the household sector,
- the government sector,
- the commercial firm sector, and
- the foreign sector.

These four agents will be denoted by the superscripts H, G, C and F, respectively. Transfers among these four groups of agents will be an important element in our account. We will use the notation L^{ij} to denote total transfers from agent *i* to agent *j*. Thus, for example, L^{GH} will denote total transfers from the government to households, L^{FH} will denote total transfers from foreigners to domestic households, and so forth.

We shall derive the required macroeconomic relationships by first considering in turn the budget constraints of each of the three sectors - households, the government and foreigners. Commercial firms are assumed to have zero savings - their incomes and expenditure are equal in that all net revenues are distributed to the owners of factors of production. While firms may invest, these investments are financed and owned by other agents. Transfers involving the commercial firm sector are also assumed to be zero. That is, this sector is assumed neither to give nor to receive transfer income.

The household sector

Household income, Y^H, is given by

$$Y^H = Y^F + L^{GH} + L^{FH}, \qquad (1)$$

where Y^F denotes total factor income. The sum of these two transfer items L^{GH} and L^{FH} denotes total transfers *from* all other agents *to* domestic households, subsequently denoted L^{*H}. Household expenditure is given by

$$E^H = C + N^P + L^{HG} + L^{HF} \qquad (2)$$

where C denotes private consumption as before and N^P denotes personal income tax revenue. The sum of L^{HG} and L^{HF} is thus total transfers *from* domestic households *to* all other agents, L^{H*}.

Total household savings, S^H, is now given by

$$\begin{aligned} S^H &= Y^H - E^H \\ &= Y^F - C - N^P - L^{H*}, \end{aligned} \qquad (3)$$

where $L^{H*} = (L^{HG} - L^{GH}) + (L^{HF} - L^{FH})$ denotes total *net* transfers *from* domestic households to all other economic agents.

The government sector

Total receipts of the government are given by

$$Y^G = N^P + N^I + L^{HG} + L^{FG} \qquad (4)$$

where N^P and N^I denote total direct (personal income) and total indirect tax revenues, respectively. The sum of the two transfer items L^{HG} and L^{FG} is thus total transfers *to* the government. Total government outlays is given by

$$E^G = G + L^{GH} + L^{GF}, \qquad (5)$$

where G denotes total government expenditure on goods and services. The sum of the transfer items L^{GH} and L^{GF} denotes total transfers *from* the government. Total government savings is now given by

$$\begin{aligned} S^G &= Y^G - E^G. \\ &= N^P + N^I - G - L^{G*} \end{aligned} \qquad (6)$$

where $L^{G*} = (L^{GF} - L^{FG}) + (L^{GH} - L^{HG})$ denotes total net transfers from the government to all other economic agents.

The foreign sector

Total receipts of foreigners from domestic agents is given by

$$Y^F = M + L^{GF} + L^{HF}, \tag{7}$$

where M denotes total imports. The sum of the two transfer items L^{GF} and L^{HF} is thus the total transfers from domestic agents to foreigners. Total payments from foreigners to domestic agents is now

$$E^F = X + L^{FG} + L^{FH}, \tag{8}$$

where X denotes total exports. The sum of the two transfer items L^{FG} and L^{FH} is thus total transfers from foreigners to domestic agents. Equations (7) and (8) are both measured in domestic currency, and *M* and *X* in these two equations are measured in *c.i.f.* and *f.o.b.* prices, respectively. Foreign savings are now given by

$$\begin{aligned} S^F &= Y^F - E^F \\ &= M - X - L^{F*}, \end{aligned} \tag{9}$$

where $L^{F*} = (L^{FG} - L^{GF}) + (L^{FH} - L^{HF})$ denotes total *net* transfers from foreigners to domestic agents.

Macroeconomic aggregates

We shall now derive the implications of the identities summarised above. Summing equations (3), (6) and (9) we obtain

$$S^H + S^G + S^F = Y^F - C + N^I + G + M - X. \tag{10}$$

We now substitute the identity that GDP at market prices is given, on the income side, by

$$Y = Y^F + N^I, \tag{11}$$

where Y^F denotes GDP at factor cost. Equation (10) now becomes

$$S^H + S^G + S^F = Y - C - G + M - X. \tag{12}$$

Now, from the definition of GDP at market prices on the expenditure side,

$$Y = C + I + G + X - M, \tag{13}$$

equation (12) becomes the familiar relation

$$I = S^H + S^G + S^F. \qquad (14)$$

The left hand side of (14) thus corresponds to the total value of gross investment at market prices, while the right hand side represents the total funds available for investment: private sector saving + government saving (the government budgetary surplus) + foreign saving (the trade account deficit minus net transfers *from* foreigners). Total savings from all sources must be exactly sufficient to finance total investment. Equation (14) is the counterpart of Walras' Law within INDOSAM. This above discussion, and in particular this equation, will serve as the basis for discussion of data base balance within INDOSAM.

3. Construction of the Data Set

Three principle data sources, all compiled by the government's principal statistical agency, the Central Bureau of Statistics, BPS[1], were used to construct INDOSAM-93: (i) the 1990 input-output tables (subsequently referred to as IO 90); (ii) the updated input output table for 1993 (subsequently IO 93); (iii) the 1993 social accounting matrix (subsequently SAM 93). The IO 90 and SAM 93 are available from BPS in published form. The IO 93 is an unpublished and preliminary update of the 1990 input output tables, kindly provided to the authors by BPS. The table specifies 66 sectors. Other, supplementary, data sources were also used in the construction of specific tables, as described below. Abbreviations are used for these supplementary sources in the text and full references are provided at the end of the paper.[2]

The principal sources

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[1] BPS is an Indonesian abbreviation for *Biro Pusat Statistik* (Central Bureau of Statistics), Jakarta.

[2] The final two references listed, [Statistical Year Book 95] and [IFS 96], were also used to verify some data contained in the Indonesian sources cited when the meaning or accuracy of published data seemed to require checking.

The 1993 social accounting matrix produced by BPS (SAM 93) is a very useful useful document and provided the starting point for our work. Substantial additions to the information in SAM 93 were undertaken. SAM 93 contains 22 production sectors, which is indufficient for the purposes of our work. In addition, the SAM 93 does not include the detail of tax payments and household sources of income that we require. The updated 1993 input output table (IO 93) is a revision of the 1990 IO table (IO 90), published previously, and specifies 66 production sectors. For the purposes of the present study, modifications to the data contained in IO 93 were needed for the following reasons.

(a) The table specifies only total intermediate goods and services transactions for each pair of producing and purchasing industries, at producer prices. Unlike the 1990 table, these transactions are not divided into goods and services from domestic and imported sources.

(b) The table includes a sector (number 66, labelled "unspecified sector"), which is included as a balancing item. Sector 66 does not describe a true sector of the economy and in any case the data for this sector indicates negative final demand, an economic impossibility.

(c) The updated table (IO 93) derived from BPS was not fully balanced. The major imbalances were that: (i) for most industries defined in the table, the industry-specific elements of row 210 (total input) were not equal to those of row 600 (total output) and (ii) the elements of row 200 (total imports) plus row 600 (total output) were not equal to those of row 700 (total supply).

To overcome these problems we proceeded as follows:

(a) The shares of imported intermediate goods and domestically produced intermediate goods for each cell of the table, as implied by the published 1990 IO table, were used to divide intermediate goods transactions into domestic and imported components.

(b) Sector 66 was aggregated with the much larger sector 65 (labelled "other services"). This eliminated the problem of negative final demands. The resulting table thus has 65 sectors.

(c) The revised table was balanced using the RAS adjustment method to ensure that all required accounting identities were observed.

The data base tables

There are four types of economic agents described in the accounts tables: households, the government, firms and foreigners. Each of these agents must satisfy a budget constraint and the tables demonstrate that the data base describes a set of economic flows that do satisfy the budget constraints of each of these agents. In addition, the data base must satisfy the market clearing conditions for each commodity and each factor of production and the tables which follow demonstrate that these conditions are met by the data base as well. The data sources used are summarised in Appendix A and a schematic diagram of the full data base is provided in Appendix B.

Table 1: The Household Account

The household account specifies 10 household groups, labelled hh1 to hh10. Their definition follows the classification provided in SAM 93. In this classification, hh1 to hh4 are agricultural households classified according to size of land ownership: hh1 are landless; hh2 are land owners with less than 0.5 ha.; hh3 are land owners with 0.5 to 1.0 ha.; and hh4 are land owners with greater than 1.0 ha. of land. The categories hh5 to hh10 are non agricultural households: hh5 to hh7 are non agricultural households in rural areas, arranged by incomes - low, medium and high, respectively - and hh8 to hh10 are non agricultural households in urban areas, again arranged by incomes - low, medium and high, respectively.

The rows section describes allocation of household incomes and sources of incomes of each household. The split of wages and salaries, and incomes from capital and land were derived

from IO 93, to obtain total household incomes from these sources, and the split of these aggregates between households was based on the household proportions reflected in SAM 93.

Table 1a: The Household Account Shares

Expresses Table 1 data in terms of shares of household incomes and expenditures. This form of presentation is intended to facilitate inspection of the structure of Table 1.

Table 2: The Government Account

The government account describes government expenditure including consumption, transfers from the government to other agents (households, firms and foreigners) and saving. Government receipts include various forms of tax and transfers to the government from other agents (households, firms and foreigners) The sources for this table are SAM 93 and BI 94/95, as indicated in the table footnotes. The level of corporate income tax revenues was adjusted to achieve balancing of the table.

Table 3. The Firm Account

The firm account describes the expenditures and receipts of firms. Expenditures include transfers to other agents, saving and debt repayments. Receipts include the firm's operating surplus, described in the table as income from capital, and transfers to other agents. The sources for this table are SAM 93, and links to the other tables of the data base. Adjustment for debt payments was used for balancing the table.

Table 4. The Foreign Account.

The SAM treats all foreign agents as a single entity which must satisfy a budget constraint in so far as its transactions with Indonesia are concerned. The contents of this table are the expenditures and receipts of the foreign agent. Expenditures of the foreign agent include exports from Indonesia and transfers from foreign agents to Indonesian economic agents - households, firms or the government. Receipts of the foreign agent include imports into Indonesia and transfers from Indonesian agents to foreigners. The sources for the table were

SAM 93, IO 93 and IFS 96. Adjustment to the foreign agent's savings was used to balance the table.

Table 5. Resources for Investment

This table is intended to demonstrate that the data base satisfies the requirement that total investment is equal to total savings from all sources. All data are derived from other tables except net transfer income, which is computed to achieve balancing of the table.

Table 6. Cost Structure of Domestic Industries,

This table is based on IO 93, with agricultural industries disaggregated to 3 regions. These regions are: Region 1 (Java and Bali), Region 2 (Sumatra) and Region 3 (Eastern Indonesia - Nusa Tenggara Barat, Nusa Tenggara Timur, Timur Timur (East Timor), Kalimantan, Sulawesi, Maluku and Irian Jaya), based on projections of the regional distribution of agricultural production, as provided in *Repelita* 88/89-93/94.

Table 7. Regional Composition of Agricultural Production

This table contains a detailed disaggregation of regional agricultural production by commodity, with national output totals derived from IO 93 and the proportional distribution by the three regions derived from *Repelita* 88/89-93/94.

Table 7a. Regional Composition of Agricultural Production - Shares

Presents the data in Table 7 in terms of the proportional distribution of the production of each agricultural commodity by region (first three columns) and the proportional distribution of total agricultural production by commodity (fourth column).

Table 8. Sales of Domestic Commodities by Users

This table shows which users demand the output of each domestic industry. The users are: total intermediate demand by both the producing industry and by other industries (current production), consumption (divided into household and government), capital creation, changes

in stocks, and exports. The sum of these categories is total sales. The data were derived from IO 93 with the proportional distribution of domestic and imported commodities derived from IO 90.

Table 9. Sales of Imported Commodities by Users

This table presents similar data to table 8, for imported commodities. The data are also derived from IO 93, with the proportional distribution of domestic and imported commodities from IO 90.

Table 10. Costs and Sales Revenues of Consumer Goods Industry

The consumer goods defined in the SAM 93 are based on the consumer goods identified in the *Susenas* consumer expenditure surveys. In SAM 93, 20 such commodities are defined. They are defined quite differently from the set of producer goods, as is usual in data based on consumer expenditure surveys. For the purposes of the present study, to integrate these commodities into the rest of the data base, a fictional industry is postulated which purchases the 65 producer goods, both domestically produced and imported, and converts them into the 20 consumer goods, which are then sold to the 10 households. In doing so, this industry earns zero profit. Its costs (purchases of producer goods) are equal to its revenues (sales of consumer goods). These transactions are summarised in tables 10 and 11. ,Table 10 summarises the overall costs and revenues of this fictional industry. The concordance between the IO and SAM sectors described under Table 11 below, was used to divide costs between domestic and imported goods, as shown in this table.

Table 10a. Shares of Cost and Sales Revenue of Consumer Goods Industries

This table presents the data from Table 12 in share form.

Table 11. Linking Matrix Between Producer and Consumer Goods

This table links the set of 65 producer goods, both domestically produced and imported, with the set of 20 consumer goods, as presented in tables 10 and 10a, above. This table is

essentially the input-output structure of the fictional consumer goods industry, described above. It should be noted that each column of the table sums exactly to unity. Each column of the table thus represents the production of a particular consumer good and shows the values of the various producer goods required to produce one Rupiah's worth of that consumer good.

Table 12. Composition of Sales of Domestic and Imported Goods by User

This table summarises the sales of both domestically produced and imported goods by user, using data derived from previous tables.

Table 13. Gross Domestic Product From Income and Expenditure Sides

This table draws upon data from previous tables to show that GDP from the income and expenditure sides are exactly equal.

Table 14. Uses of GDP

This table summarises the final uses of GDP between consumption and saving, each divided between household and government, and shows the importance of transfers from abroad.

Tables 15 to 20. Household Ownership Matrices for Primary Factors

These tables summarise the ownership of factors of production by the 10 households. This information is vital if the data base is to be used to support income distributional studies. To maximise the flexibility with which the data base may be used, the ownership of factors of production is disaggregated by household (10), by type of factor (6), and by the industry in which the factors are employed (65). Operating surplus and depreciation by industry were used to produce two primary factors, land and capital. Proportions derived from the SAM 93 were used to distribute returns to land and capital. The factors are capital (table 15), agricultural land (table 16), and four types of labour (tables 17 to 20). These four types of labour are based on the classification provided in the SAM 93: agricultural labour (table 17), production labour (table 18), administration labour (table 19), and professional labour (table

20). The tables were derived from IO 93 and distributed into the 65 sectors based on shares of primary factors employed in each of these sectors.

4. Checking directly for data base balance

General equilibrium applications of INDOSAM are intended to simulate the movement of the economy from one equilibrium to another. For this to make sense, two kinds of conditions must be met. First, the initial position described by the data base of the model must represent an equilibrium. Second, the results of the simulated changes away from this initial equilibrium must be internally consistent. The second of these conditions relates to the properties of the general equilibrium model which uses INDOSAM as its data base, and can be discussed only in relation to the model structure used. Consequently, this section deals with checks that the first condition is met.

For the initial position to be a valid equilibrium we require:

(a) that all agents are maximising their respective objective functions - consumers are maximising utility; firms are maximising profits (or, in a constant returns to scale world, minimising costs);

(b) that all agents satisfy their respective budget constraints;

(c) that all markets clear; and

(d) that all price and quantity variables described in the data base are non-negative.

Condition (a) is imposed by assumption but (b), (c) and (d) are non-trivial. Conditions (b) and/or (c) may not be met because data must be drawn from various different sources in constructing the data base. These data may not agree. Something must be done to make them agree and some arbitrariness is therefore inevitable. This section will primarily be concerned with checking that conditions (b) and (c) are met. Condition (d) is important as well, and we shall turn to it at the conclusion of this section. In the course of this discussion we also demonstrate that the various macroeconomic identities set out in section 2 are also satisfied by the data set.

INDOSAM may be viewed as containing 105 agents who receive income and spend it, and make choices in doing so. Conceptually, the immense size of the array of decision

making processes occurring within the Indonesian economy is collapsed within INDOSAM into the decision making process of these 105 simplified agents. These agents are:

- 10 *households* who own all the factors of production, purchase consumer goods and makes and receives transfer payments to and from the government and the rest of the world;
- 65 *industries* producing 65 producer goods;
- 65 *importers* importing 65 producer goods from the rest of the world;
- 1 *exporter* exporting Indonesian products to the rest of the world;
- 1 *investor* who creates capital;
- 1 *government* of Indonesia, which raises tax revenue, purchases producer goods and investment goods and which makes and receives transfer payments to and from the households and the rest of the world; and
- 1 *rest of the world*, which trades with Indonesia and makes and receives transfer payments to and from Indonesia.

In the following discussion the notation 'b' will be used to denote billions of Indonesian rupiah at 1993 prices. We shall first review the household sector and shows that it satisfies its budget constraint. Then we do the same for the government, the firms and the 'foreign' sector.

Budgets of the Ten Households

The sources of income and its allocation for each of the ten households are summarised in Table 1. Households together earn 241,511 b from factor incomes and 18,633 b from transfer incomes, amounting to the gross household income of 260,144 b. On the expenditure side, households together buy consumer goods worth 171,583 b, make transfer payments of 28,395 b, pay personal income taxes of 15,273, leaving household savings of 44,893 b. This allocation amounts to 260,144 b rupiah, which is equal to gross household income. The corresponding balance for each of the five individual households can similarly be seen by comparing the rows "total outlay" and "gross income" in Table 1. Each of the ten

households individually, as well as the aggregate of all five households, satisfies its budget constraint. Table 1a shows the individual household accounts as proportions of these aggregate data.

Budget of the Government

Table 2 summarises the receipts and outlays of the Indonesian government by broad categories. Total expenditure of the government is classified into consumption and transfer payments, the sum of which was 45,501 b. Total government savings was 25,285 b and debt repayment was 3,104 b. The total outlay of the government for the year, defined as the sum of government expenditure and government savings, was 73,890 b.

On the income side, the government received 38,628 b from tax revenues and 35,262 b from transfer payments from other agents (the rest of the world and domestic households). Total receipts thus amounted to 73,890 b. Total receipts and total outlays of the government thus balance, implying that the government satisfies its budget constraint.

Budget of the Firms

Table 3 shows similar balancing for the firm sector to that just described for the government.

Budget of the Foreign Sector

Table 4 shows that the sum of total export from Indonesia (an expenditure for the foreign agent), total transfers from Indonesian agents to foreigners, plus foreign saving, is exactly matched by total imports into Indonesia and total transfers from foreigners to Indonesian agents.

Table 4

Sources and Use of Real Financial Resources

Table 5 describes the sources and use of financial resources generated by the real sector of the economy. Total expenditure on gross fixed capital formation (including changes in stocks) was 116,535 b. As noted above, the savings of the domestic households was 44,893 b, savings of firms was 46,243 b and the government's savings was 25,285 b. In addition, foreign savings of 113 b were absorbed (total imports minus total exports minus net transfer income) a total savings of 116,535 b. Thus total savings was equal to total investment.

Do Markets For the 66 Producer Goods Clear?

A necessary condition for a data set to describe an economic equilibrium is that domestic markets for all commodities clear. We now investigate whether the INDOSAM database exhibits this feature. The assumption that all industries operate under competitive environment implies that, in equilibrium, no industry will be able to make above-normal profit. The total cost of each industry will necessarily be equal to its sales revenue at basic prices. This equality is also an indication that the market for the commodity produced by the single product industry clears. We obtain the supply by dividing the total cost by the basic-price of the commodity and similarly we obtain the total demand by dividing total sales revenue by the basic-price.

Table 6 shows the cost composition of the 42 non-agricultural industries and the three agricultural regions, a total of 45 rows. The first three rows give the cost structures of the three agricultural regions. Table 7 shows the value of outputs of the 23 agricultural commodities sold by the three regional industries. A comparison of these two tables shows that total sales revenue of each of the regional industries is just equal to their respective total costs. That is, they satisfy the zero-profit conditions.

A decomposition of the total sales of the 65 domestic producer goods to the seven types of users defined in INDOSAM is shown in Table 8. These users are: (1) current production - intermediate demand, (2) household consumption, (3) government consumption, (4) capital creation, (5) stocks, (6) exports of goods, and (7) exports of services. A

comparison of the costs of the 42 non-agricultural industries given in Table 6 with their total sales revenue given in Table 8 shows that these non-agricultural industries also satisfy the zero profit condition. Further, a comparison of the row sums in Table 6 with Table 7 shows that the sum of the purchases made by different users is equal to the sum of sales revenues of the three regional agricultural industries. This equality also holds for each of the 23 agricultural commodities, which demonstrates that the market for each of the agricultural commodities clears. Clearly, the corresponding row sums in Table 4 and Table 6 show that the market for each of the 43 non-agricultural commodities clears.

Consumer goods industries

Tables 10 and 10a confirm that the market for each of the 20 consumer goods defined in INDOSAM is balanced.

Aggregate checks

Table 12 provides a convenient summary of the implications of Tables 6 to 10. It shows the total sales of imported and domestic producer goods to different users. Tables 6 to 9 together account for the allocation of imports and show that the total value of sales is just equal to the sum of the *c.i.f.* value of imports and tariff revenue. This equality shows that importing activities satisfy zero profit conditions, and the import of each commodity is properly accounted for. Similarly, the sixth and seventh columns in Table 8 provides the commodity composition of exports from Indonesia at basic-prices, the sum of which is equal to the value of exports at *fob* prices. This equality shows that there is no unaccounted discrepancy in our database regarding exports.

GDP From Income and Expenditure Sides

The calculation of Gross Domestic Product (GDP) from various sides provides a final but useful check of the database. We know that GDP can be defined either from the income side or from the expenditure side. It can also be defined by the ways the incomes of different agents are allocated. Do these different methods of computation lead to the same result? The

components of GDP, when calculated from the expenditure side are collected from the preceding tables and are provided on the left hand side of Table 13. Household consumption, expenditure on gross fixed capital formation, government consumption and net exports sum to 324,228 b.

Similarly, from the household account (Table 1) and the government account (Table 2) we obtain data for the required income categories. In the base year households received 300,872 b in factor incomes and the government collected 23,356 b in various taxes excluding personal income tax collections. These two amounts sum to 324,228 b , equal to the amount obtained by summing the aggregate expenditure categories.

Finally, GDP can also be calculated by adding household consumption, household saving, government consumption and government saving together and deducting net transfers received from abroad from that number. Table 14 shows the result of this calculation. The same value is obtained for GDP under all three methods.

Checking for negative values in the data base.

In assembling the components of a GE data base, information must be drawn from various different sources. If these data not agree, the result of the particular choices that are made to force them to do so may be that the data base values of some economic variables become negative. This outcome is especially likely if mechanical methods are resorted to for balancing the data base. If these errors are not discovered and corrected, the consequences may be serious.

There are two consequences of spurious negatives. First, negative values of the economic variable concerned simply may not make sense, but the second consequence is less obvious. When variables in the data base take negative values, and this fact is not recognised, the results of model simulations are likely to be misinterpreted. The solutions from model simulations appear in percentage change form. A positive value of the percentage change in a particular variable will of course be regarded as an *increase* in the value of that variable. But this intuition assumes that the data base value of the variable concerned is positive. If it is in

fact *negative*, a positive percentage change in its value really means a *decrease* in the value of the variable - a change to a larger negative number![3] If the negative base value is not recognised, simulation results may be totally misinterpreted. Checks must be made for negative data base values of variables which cannot logically take negative values. If examples are found, they must be corrected. Inspection of INDOSAM shows it to be free of spurious negative values.

[3] A numerical example may be helpful. Let the initial value of X be -10 and let the percentage change in X be 10. Then the new value of X must be -11, and not -9.

Appendix A: Data Sources:[4]

1. Central Bureau of Statistics, *The Indonesian Input-Output Table 1993, Updated* (unpublished), Jakarta. [IO 93]

2. Central Bureau of Statistics, *The Indonesian Input-Output Table 1990*, Jakarta. [IO 90]

3. Central Bureau Statistics, *Social Accounting Matrix, 1993*, , Jakarta. [SAM 93]

4. Bank of Indonesia , *Report for the Financial Year 1995/96*, Jakarta. [BI 95/96]

5. Badan Perencanaan Pembangunan Nasional (Bappenas), *Rencana Pembangunan Lima Tahun 1988/89-1993/94* (Five Year Plan 1988/89-1993/94), *Sector Pertanian* (Agricultural Sector), Jakarta. [Repelita 1989/90-1993/94]

6. Central Bureau of Statistics, Statistical Year Book of Indonesia, 1995, Jakarta. [Statistical Year Book 95]

7. International Monetary Fund, *International Financial Statistics*, 1995. [IFS 96]

[4] Abbreviations used in the text are included in parentheses [..] at the end of each reference.

Appendix B:

Figure 1 below summarises the overall structure of INDOSAM.

Identities

In addition to the macroeconomic identities described in the text, the following identities should be noted:[5]

T1.Q = G.T1
T2.M = G.T2
T3.Q+T3.M = G.T3
T4.Q+T4.M = G.T4
T5.H = G.T5
T6.Q+T6.M = G.T6
T7.Q = G.T7
T8.Q = G.T8

K.F + K.H + K.B + K.G (Aggegate savings) = Q.K + M.K (Aggregate investment)

[5] As is conventional, row names are stated first, followed by column names. Thus T1.Q refers to the cell at the intersection of row T1 and column Q.

Figure 1: Schematic Diagram of INDOnesian General Equilibrium Model

(**INDO**nesian **G**eneral **E**quilibrium **M**odel)

		Spending Units																	
		Q	**M**	**C**	**R**	**F**	**H**	**B**	**G**	**T1**	**T2**	**T3**	**T4**	**T5**	**T6**	**T7**	**T8**	**K**	**Sales**
Receiving Units	**Q**	■		■		■			■									■	■
	M	■		■					■									■	■
	C						■												■
	R	■																	■
	F		■			■	■	■	■										■
	H				■	■	■	■	■										■
	B					■	■	■	■										■
	G					■	■	■	■	■	■	■	■	■	■	■	■		■
	T1	■																	■
	T2		■																■
	T3	■	■																■
	T4	■	■																■
	T5						■												■
	T6	■	■																■
	T7	■																	■
	T8	■																	■
	K					■	■	■	■										■
Expenditure		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

Legend :

Q = Set of domestic production activities
M = Set of importing activities
C = Set of consumer goods
R = Set of primary factors
F = Rest of the world
H = Set of households
B = Firm / Company
K = Capital account
G = The Indonesian government

Tax Collections:

T1 = Corporate income tax
T2 = Tariff revenues
T3 = Capital income tax
T4 = Excise tax
T5 = Personal income tax
T6 = Value added tax
T7 = Export tax
T8 = Other tax