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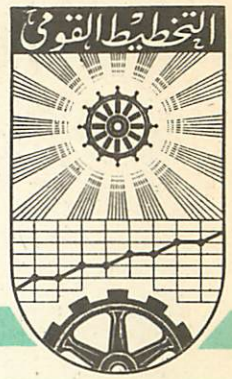

Memo No.(1329)

An Economic Date Base in A Social Accounting Frame Work

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October 1982

CAIRO
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A Paper Submitted to the Economy Wide Modeling & SAM Updating Project

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The purpose of this paper is two fold. First, to describe the design and management of a data base for the Egyptian economy. Second, to explain how the stored information is retrieved in a way to serve different modeling purposes. The proposed computer data system consists of a set of tables stored according to three levels of disaggregation. These tables are linked together through computer programs which are used to assamble different social accounting matrices (SAM,s). This modular design is justified from both techmical and economic point of view. It permits the creation of a flexible data system with better space utilization and provides the necessary base for building various policy-oriented SAM,s or any selected subset of them.

1. Introduction

A social accoundting matrix (SAM) provides a systematic and consistent way of identifying the intital conditions which exist in an economy. It allows also a better understanding of the major linkages in an economy for purposes of modeling and policy analysis.

Consequently, a computer data system based on a SAM framework must provide the policy-maker or the model builder with the appropriate informations needed, either to identify the initial structure of the economy or to run his particular model.

In this paper, a modular design is proposed. The idea behind this design is not to store the whole SAM on the computer but rather to create a file containing a number of smaller tables or input matrices. These input matrices and a set of computer programs are used to assemble different policy-oriented SAM,s. In that way any SAM can be identified by two files :

- A file containing the set of input matrices.
- A control matrix specifying the relative location of each input matrix in the SAM.

This modular design is justified from both technical and economic point of view. Technically four points support our choice.:

First, the SAM is a sparse matrix containing many blank areas. Then an efficient computer space utilization implies its partitioning into a number of smaller matrices.

Second, storing the whole SAM will reduce the degree of flexibility of the data system which is an impartant feature of the database design process.

Third, the proposed modular approach allows any updating, modification or addition of any account with minor changes in the data base structure.

Fourth, since it is not possible to manipulate the whole SAM in the Computer main storage(1), a data system storing the whole SAM will be inappropriate for modeling purposes as a partitioning scheme will be needed for each model structure.

From the economic view point it is a general practice to build a model focusing in a detailed way on some national accounts, while keeping an aggregate picture of the others. The propesed modular design provides this possibility by using some file management programs to create a new control matrix and to assemble the desired SAM. This possibility increases the degrees of freedom that the economist has when selecting his appropriate model.

The data base user may wish also to investigate a selected subset of the SAM. In that case the modular data system provides him with this subset in any desired form.

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(1) In particular the most disaggregated SAM.

Data collection and organization phase are based on three levels of disaggregation:.

- "An aggregate SAM", designated SAM1, that presents an overall and compact picture of the Egyptian economy.
- "A medium SAM", designated SAM2, that disaggregates along some selected accounts and provides basis for preliminary work on modeling.
- "A disaggregated SAM",designated SAM3, which contain the most detailed economic information.

Accordingly, the input data necessary for assembling these three SAM,s will be stored permanently on the computer files. While the data needed to build any particular policy oriented SAM will be created by a computer pregram.

In the following sections, the data base design and management will be explained in detail and a particular attention will be devoted to its linkage with the modeling precess.

2. DATA BASE STRUCTURE AND MANAGEMENT:

In any computer data system, the principal components are a set of files containing the input information and a set of programs designed to create, update, and manage these files. The system components interact in order to provide database user with the required information. We discuss in datail three program types:

- File creation programs
- File management programs
- Output printing programs.

2.1 File creation

For each level of disaggregation (SAM1,SAM2 and SAM3), two files are created.

- A file containing the set of input matrices used to assemble the SAM.
- A file containing the control matrix which determines the location of each input matrix in the SAM

In addition an aggregation scheme file is created. It provides the way by which any account is aggregated from the most detailed SAM to the least detailed one

The selection of the input matrices was governed by three criteria :

i- Each input matrix should have an economic identity or meaning, i.e, it can be used separatly in economic analysis.

ii- The input matrices can easly be manipulated to assemble the SAM or any subset of it.

iii- The partitioning scheme of the SAM should provide a good space utilization of the computer storage.

In table 1 the selected input matrices are classified by the type of notional accounts. Figure 1 shows the location of each

I) Factors of Production

VAP: Value added from production activities

VAG: Government Payment to labor

II) Institution Current Account

DFI: Distribution of income from factors to institutions.

ICT: Institutions intertransfers (current account)

III) Institution Capital Account

ISV: Institution savings

IKT: Institution intertransfers (capital account)

IV,V) Activities & Commodities Accounts

DCS:: Domestic commodity supply.

CGS: Consumption of goods and services.

IDG: Investment demand of goods and services.

ICD: Intermediate commodity demand.

VI) Taxes account

DTI : Direct taxes payment by institutions

ITTA: Indirect taxes & tariffs payment by activities

ITTC: Indirect taxes & tariffs payment by commodities

GRT : Government income from taxes

GTT : Government trade subsides, price differencial

Table 1 input matrices specification,

VII) Rest of the World

FIP: Factors income Paid abroad

FIR: Factors income Paid from abroad

ITP: Institution transfers abroad.

ITR: Institution transfers from abroad.

CIM: Commodity imports

CEX: Commodity exports.

Table 1 Input matrices specification (cont.)

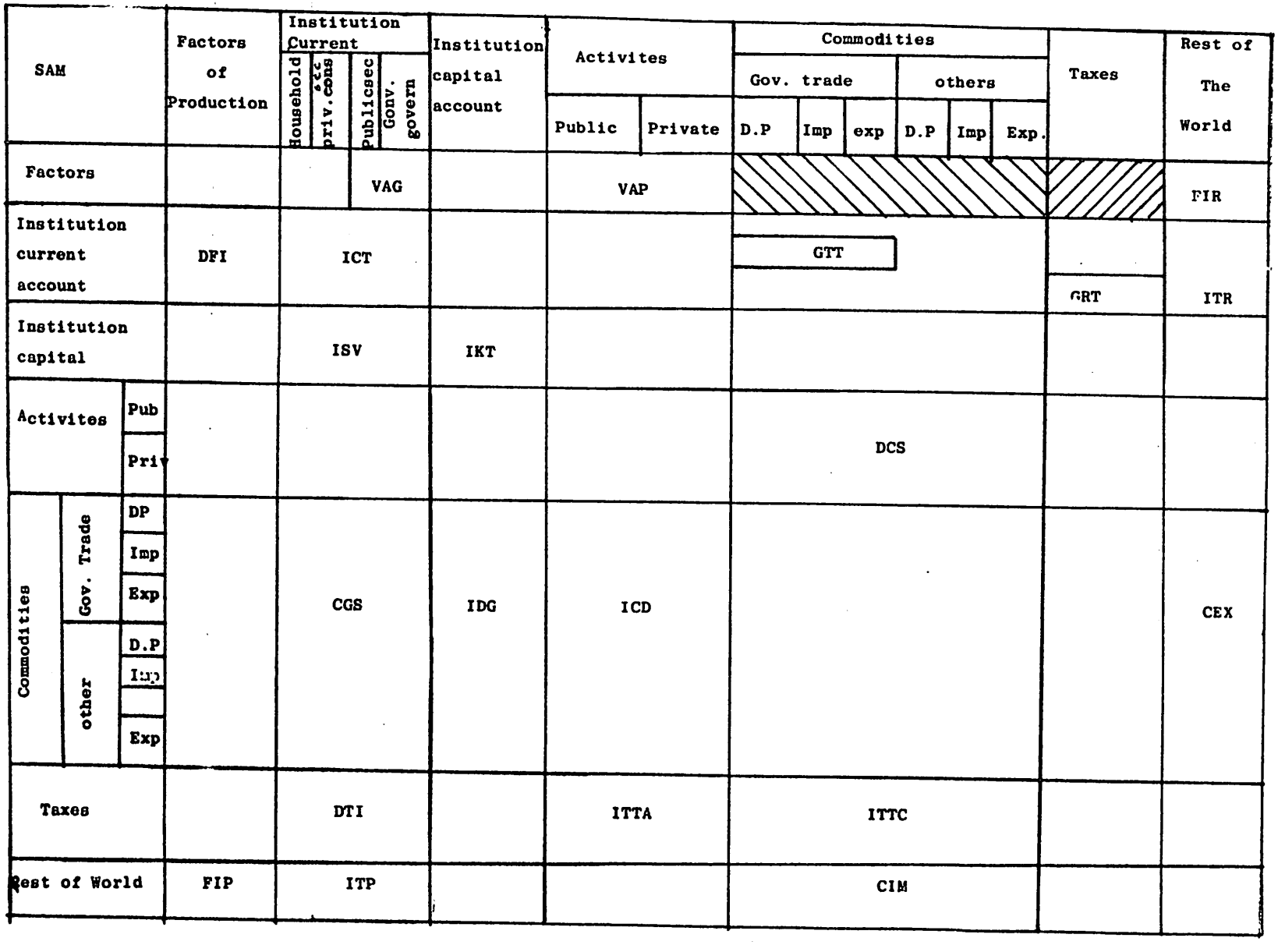

Fig. 1 Modular design o SAM,s

Input Matrices		SAM1				SAM2			
		Matrix Dimension		Location in SAM		Matrix Dimension		Location in SAM	
		No.of raws	No.of columns	First raw	First column	No.of raws	No.of columns	First raw	First column
1	VAP	3	1	1	11	3	18	1	19
2	VAG	3	2	1	8	3	5	1	9
3	DFI	6	3	4	1	10	3	4	1
4	ICT	6	6	4	4	10	10	4	4
5	ISV	1	6	10	4	5	10	14	4
6	IKT	1	1	10	10	5	5	14	14
7	DCS	1	1	11	12	18	54	19	37
8	CGS	1	6	12	4	54	10	37	4
9	IDG	1	1	12	10	54	5	37	14
10	ICD	1	1	12	11	54	18	37	19
11	DTI	-	-	-	-	5	10	91	4
12	ITTA	1	1	8	11	5	18	91	19
13	ITTC	1	1	8	12	5	54	91	37
14	GRT	-	-	-	-	1	5	12	91
15	GTT	-	-	-	-	1	27	9	37
16	FIP	2	3	13	1	2	3	96	1
17	FIR	3	2	1	13	3	2	1	96
18	ITP	2	6	13	4	2	10	96	4
19	ITR	7	2	4	13	15	2	4	96
20	CIM	2	1	13	12	2	54	96	37
21	CEX	1	2	12	13	54	2	37	96

Table 2 Control matrices for SAM1 and SAM2

of them in the general social accounting structure.

The control matrix file specifies the dimension and relative location of each input matrix. The control matrices for SAM1 and SAM2 are shown in table 2. Note that, the information stored in the database concern only the three specified SAM,s. For any special SAM the new control and input matrices files will be created by the management programs. This is achieved using the aggregation scheme file.

2.2 File Management

In a modular design, like the proposed one, an efficient and flexible file management programs are needed to assemble the desired informations. Three programs will be used to handle the data:

- SAM building program
- Sub-matrix building program
- New file creation program

2.2.1 SAM Building Program

This program uses input matrices file and the control matrix to assemble assemble a social accounting matrix. This program can build one of the specified SAM,s or any other issue oriented one (see fig 2).

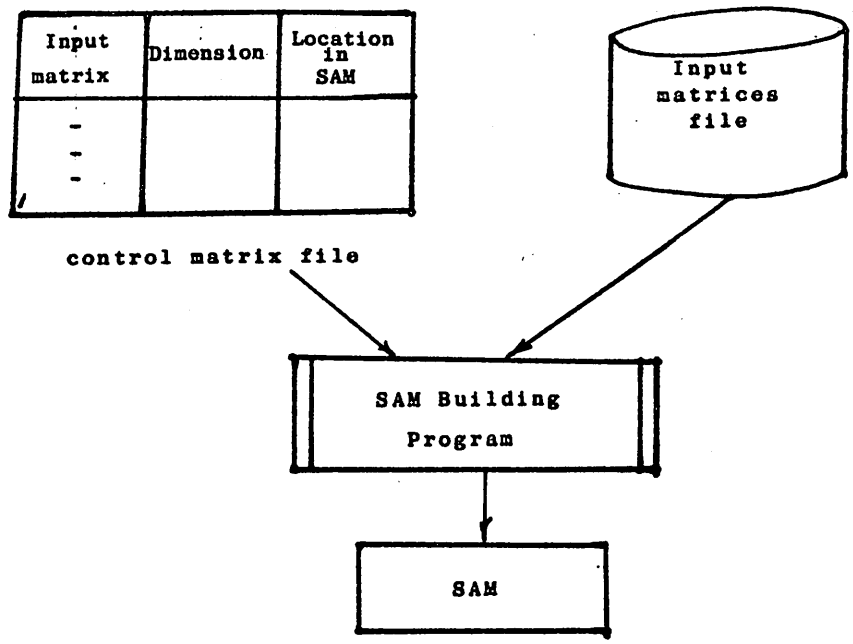

Fig. 2 SAM Building Program.

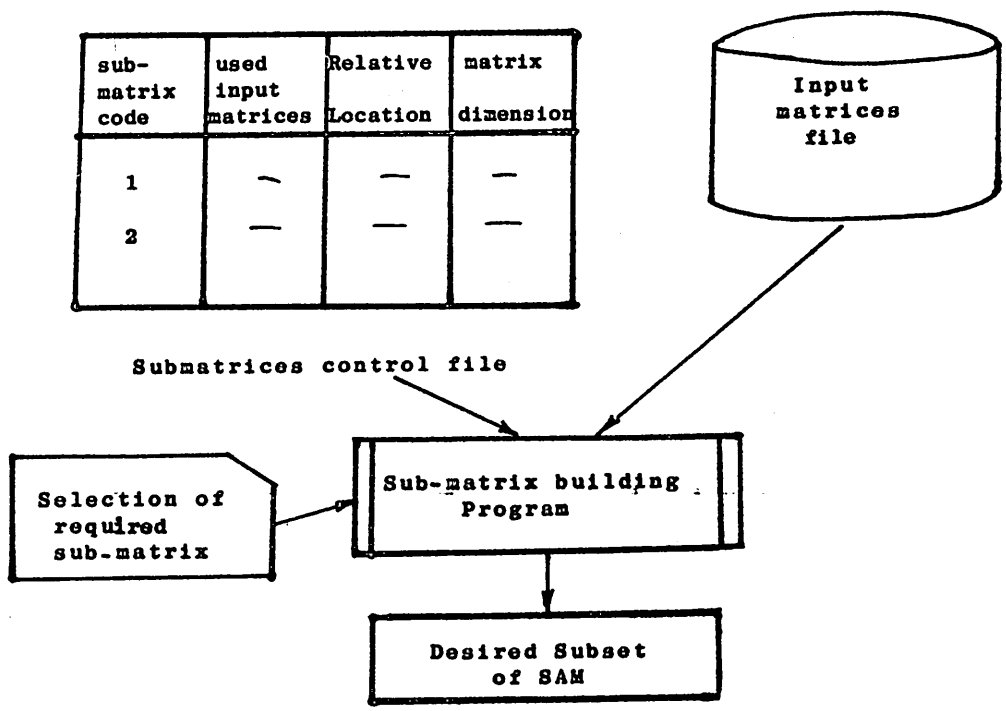

Fig. 3 Sub-matrix building Program

2.2.2 Sub-matrix Building Program

The policy-maker may wish to use a subset of the SAM for a particular modeling purpose. For example, he may require to examin in detail households expenditure, government trading policies or foreign trade issues. In that case, the data system provides him with this information through a sub matrix building program.

As input to the program, the user selects one of the following possibilities:

ii- Retrieving one of the input matrices

ii- Assembling more than one input matrix (model 1)

iii- Retrieving a subset of an input matrix or assembling a number of these subsets (model 2)

The program uses this information, input matrices file, and a sub-matrix control file to build the required subset of the SAM (see fig. 3). The obtained sub-matrix can be either printed or stored on a file in order to be the input of a particular model.

Figures 4 and 5 show some examples of the assembled input matrices. A full specification of the assembled subsets of the SAM are reported in the appendix, figures A1 and A2.

2.2.3 New File Creation Program

The most attractive feature of the proposed modular approach is the possibility to build various policy-oriented SAM,s. This can be achieved via two programs, the new file ceration

Fig. 4 Combined Matrices

(Model 1)

			Activities		Commodities						Rest of the World
					gov. trade			others			
			Pub	Priv	D	Im.	EX.	D.	Im	EX.	
activities		Pub			(DCS) Domestic Commodity Supply						
		Pr.									
Commodities	Others	D	Intermediate Commodity demand (ICD)								Commed-ities export matrix (CEX)
		Im.									
		EX.									
	Gov. trade	D									
		Im.									
		EX.									
Taxes			Non-Comm. Indirect tax (ITTA)		Commodity indirect taxes (ITTC)						
Rest of the World					Imports matrix (CIM)						

Activities/commodities matrix

		Institution	Activities		Rest of the World
		government	Public	Private	
Factors	L	government bill (AVG)	Value added matrix (VAP)		Factor income from abroad (FIR)
	C				
	R				

Total factor income matrix

			Institution current account	Institution capital account	Activites		Rest of the World
					Public	Private	
Commodities	others	D.	Institution consumption of goods and services (CGS)	Investment demand of goods and services (IDG)	Intermediate commodity demand (ICD)		comm-edity exports (CEX)
		Im.					
		EX.					
	gov. trade	D.					
		Im.					
		EX.					

Total commodity demand matrix

Fig. 4 Combined Matrices

(Model 1)

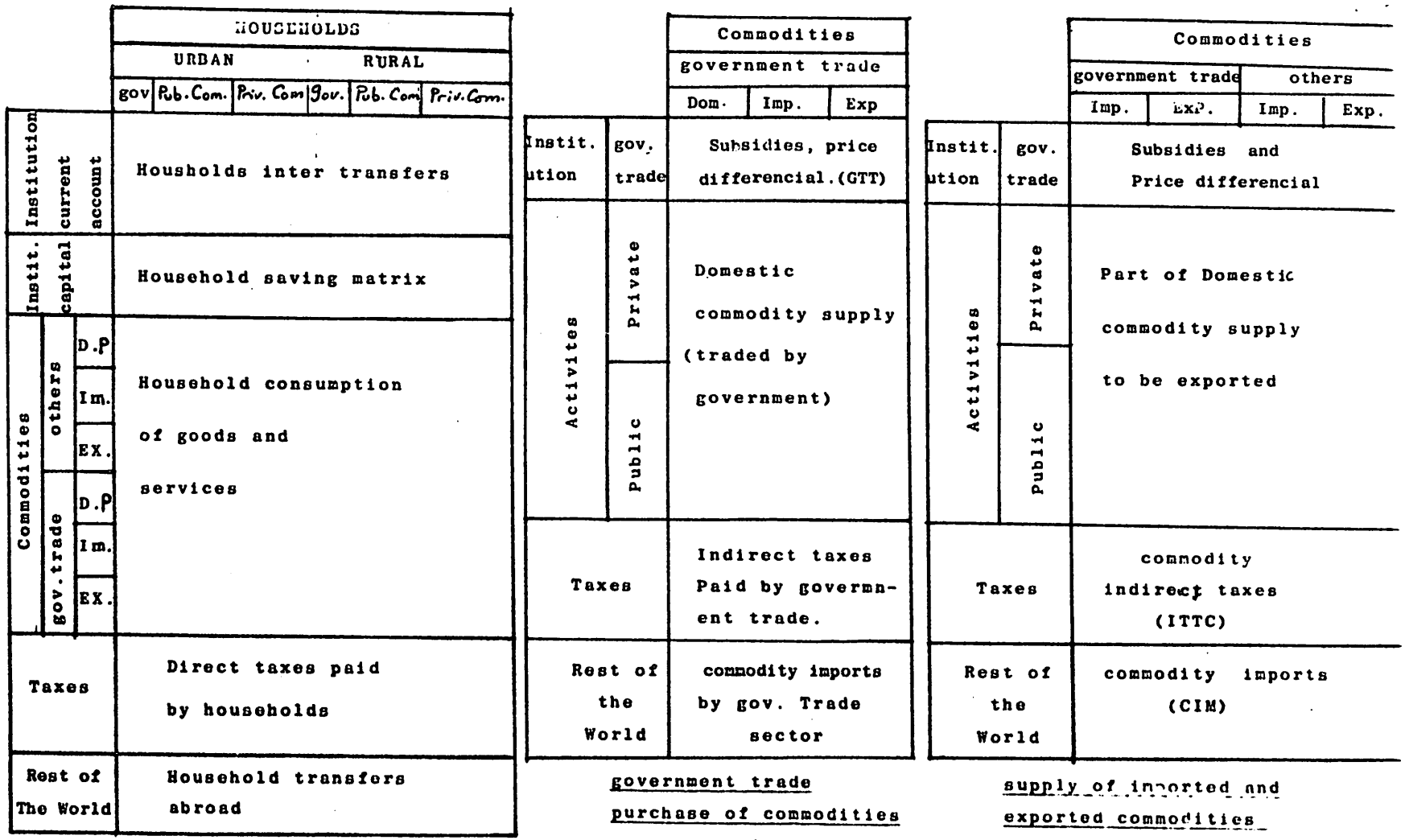

Fig. 5 Combined matrices(model 2)

program and SAM building program. Fig.6 shows the steps needed to assemble a special case SAM which we summarize as follows:

i- In the beginning the data base user specifies the characteristics and level of aggregation of the new SAM.

ii- The aggregation scheme and input files are linked to the previous information to allow the creation of the input matrices file and control matrix which correspond to the new SAM. This process is realized via the input file creation program.

iii- In the last step, the new control matrix and input files are used to assemble the special case SAM by means of SAM building program.

In order to understand the new SAM creation process, suppose that a modeler wishs to use a social accounting matrix that all its accounts correspond to the SAM2 level except the institution current account which correspond to the SAM3 level.

In that case the new SAM can be divided into three sets of input matrices

- A set that belongs to SAM2 level of aggregation
- A set that belongs to SAM3 level of aggregation.
- A set that can be biuld by an aggregation process applied to some matrices beloning to the SAM3 level. This set will be designated SAM3*.

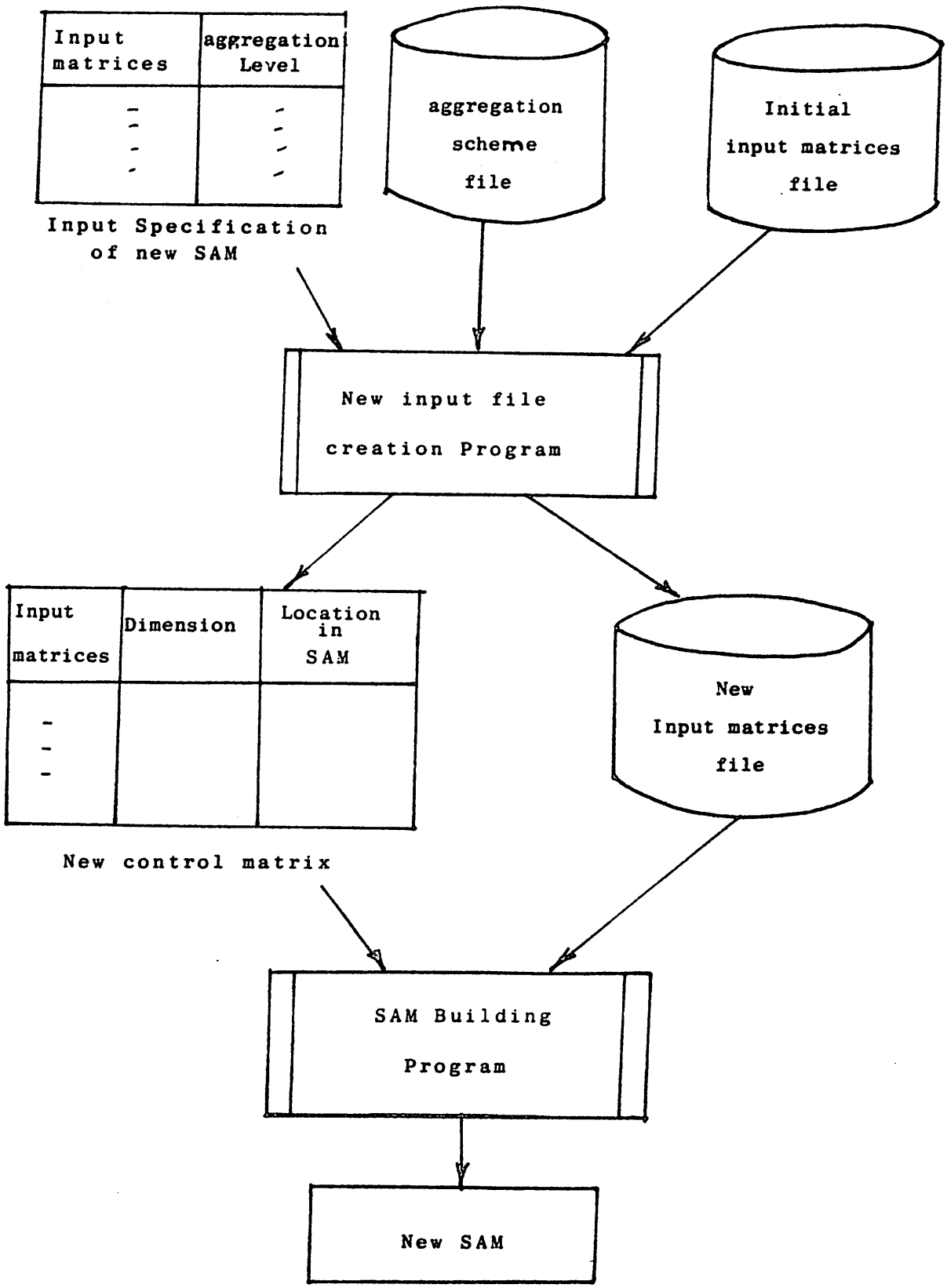

Fig. 6 Process of assembling a special case SAM.

Figure 7 shows the new SAM and the areas corresponding to the three previous sets of input matrices.

2.3. Output Printing Programs

The elaboration of printing programs is an important task of the data base design process. These programs should provide output documents in a form that satisfies the diversified requirement of the data base user. In this section we discuss two printing programs:

- A program printing the whole SAM
- A program printing a subset of the SAM

These two programs are linked to SAM and submatrix building programs.

Fig. 8 report the process of printing a SAM. This process requires the following additional files:

- Two files containing vertical and horisontal titles of the SAM accounts.
- A file containing printing parameters.

The second file is necassary due to the fact that the printing of the SAM and most of the assembled submatrices rquire more than the wedth of the computer output sheet. Hence, a print out of a SAM is divided into a number of slices. The slice wedth is determined by the number of characters per computer line printer sheet, while the slice

<table>
<tr><td></td><td>Factors</td><td>Institution accuont</td><td>Capital account</td><td>Acativities</td><td>Commodities</td><td>Taxes</td><td>Rest of World</td></tr>
<tr><td>Factors</td><td>SAM2</td><td>SAM3*</td><td colspan="5">SAM2</td></tr>
<tr><td>Insitution account</td><td>SAM3*</td><td>SAM3</td><td colspan="5">SAM3*</td></tr>
<tr><td>Capital account</td><td rowspan="5">SAM2</td><td rowspan="5">SAM3*</td><td colspan="5" rowspan="5">SAM2</td></tr>
<tr><td>Activities</td></tr>
<tr><td>Commodities</td></tr>
<tr><td>Taxes</td></tr>
<tr><td>Rest of World</td></tr>
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Fig. 7. New SAM specifications.

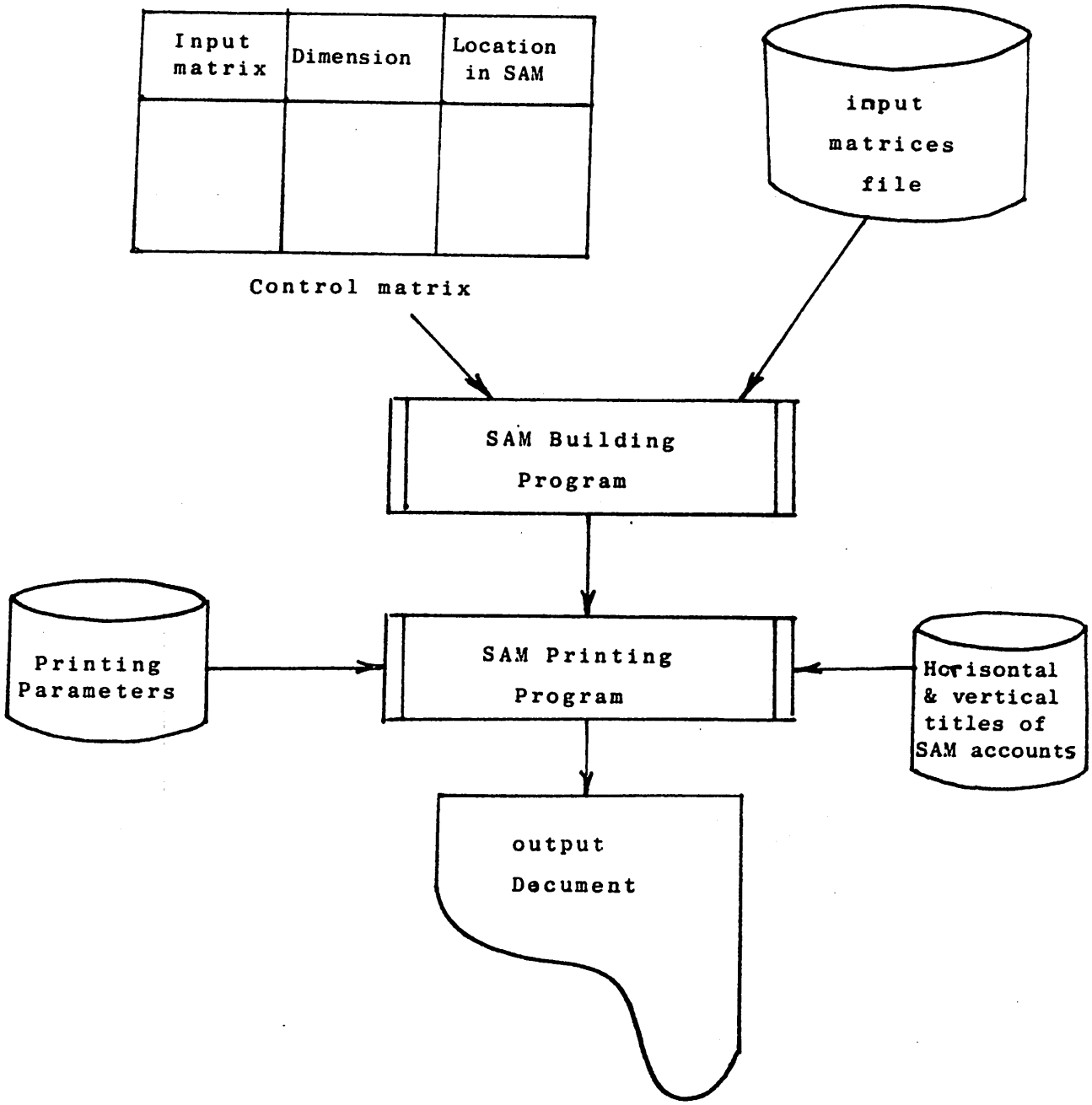

Fig. 8 SAM Printing Prccess

length is a function of the number of raws of the SAM. The output document will take then the form of a number of slices which are assembled to give the SAM or subset of it.

3. USING DATA BASE FOR ECONOMIC MODELING

The purpose of this section is to explain the way by which economic data system is linked with the modeling process. Fig. 9 shows how can data base user extract the appropriate information for his particular model The data base communicates with user in an interactive way. This is achieved by providing him with a list of questions;the answer of which will orient file management programs towards the form and level of aggregation of the required information.

The data base user may use retrieved data either to identify the initial conditions of the economy or to run his model.

In the first case, the user should answer a number of questions about the form of output and level of aggregation in order to get a print out of the desired information.

If data is needed for modeling purposes two main questions emerge:-

- What level of aggregation is required?
- Will the whole information of the selected SAM be used?

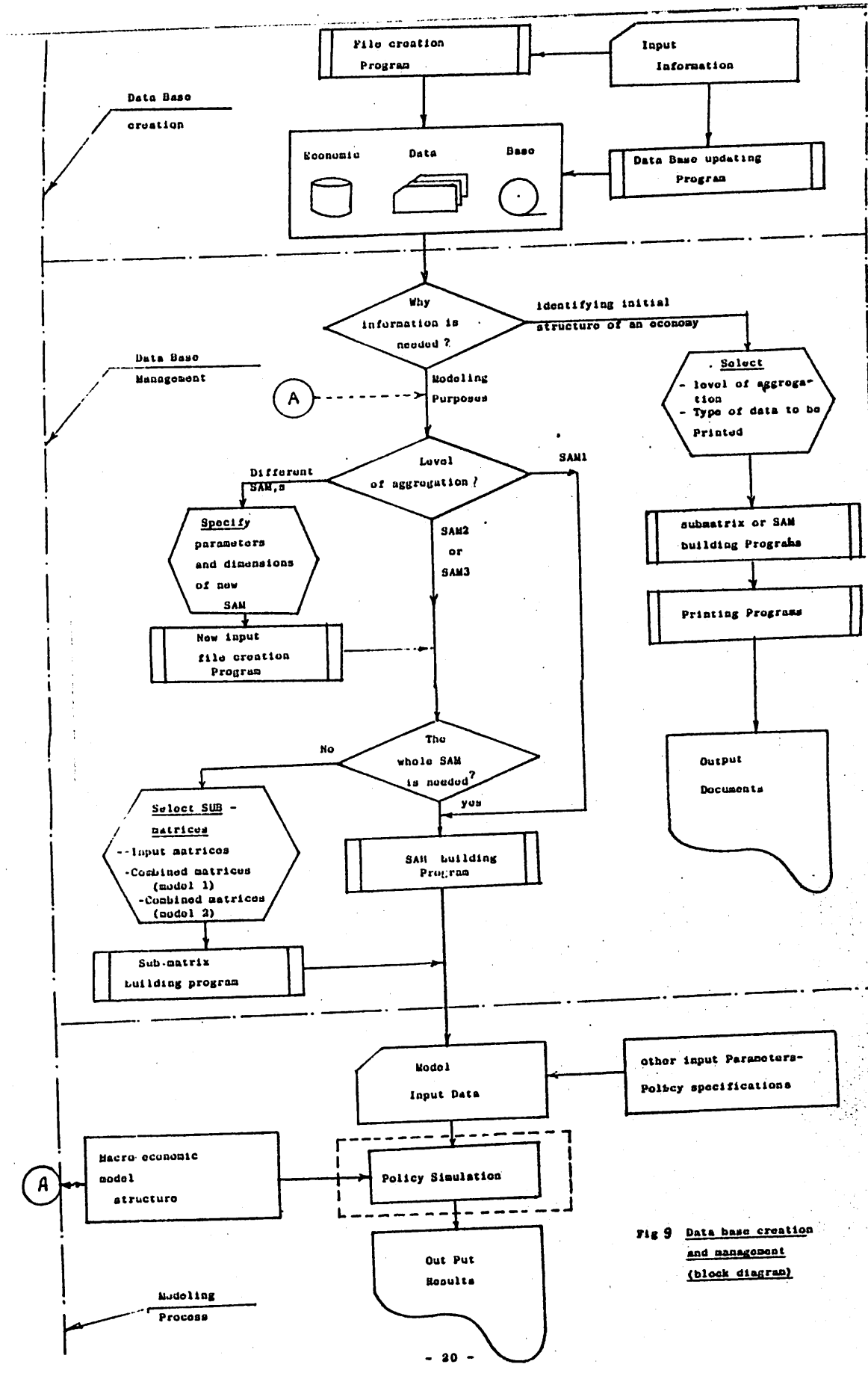

Fig 9 Data base creation and management (block diagram)

The answer to the first question may lead to the selection of one of the three specified SAM,s or a new policy-oriented SAM. If a new SAM is required,its parameters should be specified to create the new input files.

The answer to the second question may lead either to build a SAM or to answer further questions about the required subset of the SAM.

The extracted information is then stored on a separate file which is linked to model input parameters and policy specifications. This completes input data file or files needed to run the model on the computer.

CONCLUSION:

Any data base design process is a compromise between the ambitions of comprehensiveness and flexibility and the limitations of programming complexity and data availability. The economic data system presented here reflect to a great extend this fact. The ambitions are achieved by the design of a modular system which can build various policy oriented SAM,s or any subset of them, the flexibility of the file management progams, and the efficiency of data retrieval and printing. The limitations are due to the linkage which still exist between the data structure and the social accounting framework. Another limitation is that the data base cannot handle simultaniously the economic information belonging to more than one period. For this reason, a possible extension of this work can be to modify the system structure in order to link economic data of several periods.

In spit of these limitations the proposed data base is still to be an efficient and quick tool for handling economic information and an important base for modeling economic systems.

APPENDIX

Table A1 Combined Matrices
(Model 1)

Economic modeling Purposes	Matrix name	used input matrices
- Income Distribution Polices	1) Total Factors income	VAG, VAP, FIR
	2) Total Factors Payment	DFI, FIP
- Income distribution. - Institutions revenues. and expenditures	1)-Total institutions income	DFI,ICT,GRT,ITR
	2)-Total institutions expenditure.	VAG,ICT,CGS, DTI,ITP
	3)-Institution consumption of commodities	CGS,IDG
Production activites & commodities Supply and demand.	1)-Activites/commodities	DCS,ICD,ITT, CIM,CEX
	2)-Total commodity demand.	CGS,IDG,ICD,CEX
	3)-Gross input	VAP,ICD,ITTA

Table A2 Combined Matrices
(Model 2)

Economic modeling Purpose	Matrix name	used Partitions of input matrices.
Households Revenues and Expenditures. Polices	1) Household consumption of commodities	Intersection of households columns of the SAM with CGS input matrix.
	2) Households expenditures	Intersect of households columns of SAM with ICT,ISV,CGS,DTI, and ITP input matrices.
	3) Households incomes	Intersection of households raws of SAM with DFI,ICT, and ITR matrices.
Government sectors Revenues and expenditures (except government trade)	1) Government consumption of commodities.	Intersection of government columns of the SAM with CGS input matrix.
	2) Government expenditure.	Intersection of government columns of SAM with VAG,ICT,ISV,CGS,DTI and ITP input matrix
	3) Government incomes.	Intersection of government raws of the SAM with DFI,ICT,GRT, and ITR input matrix.

Combined Matrices

Model 2

(Continued)

Economic modeling Purpose	Matrix name	used Partitions of input matrices.
Government trade purchases and sales Polices	1) Government trade Purchases of commodities	Intersection of government trade commodities columns of SAM with GTT,DCS, ITTC and CIM matrices
	2) Government trade sales of commodities	Intersection of government trade commodities raws with CGS,IFG,ICD and CEX input matrices.
Foreign trade Polices (Imports and exports)	1) Demand for imported and exported commodities (government traded and others)	Intersection of imported and exported commodities raws in SAM with CGS,IDG,ICD and CEX input matrices.
	2) Supply of imported and exported commodities	Intersection imported and exported commodities columns in SAM with GTT, DCS,ITTC, and CIM input matrix.

Combined Matrices

Model 2
(continued)

Economic modeling Purpose	Matrix name	used Partitions of input matrices.
Domestic Production Polices	1) Domestically produced commodtities demand (government traded and others) 2) Domestically Preduced commodities Supply	Intersection of Domestic commodtities raws in SAM with CGS, IDG, ICD, and CEX input matrices Intersection of Domestic commodities columns with GTT, DCS, ITTC, and CIM input matrices
Public companies production Policies	1) Public companies output 2) Public companies intermediate demand and value added	Intersection of public activities raws in the SAM with DCS matrix. Intersection of public activites columns with VAP, ICD, ITTA input matrices
Private companies Production Policies	1) Private Companies output 2) Private companies intermediate demand and value added.	Interection of private activities raws in the SAM with DCS input matrix. Intersection of privat activites columns with VAP, ICD, ITTA input matrices.