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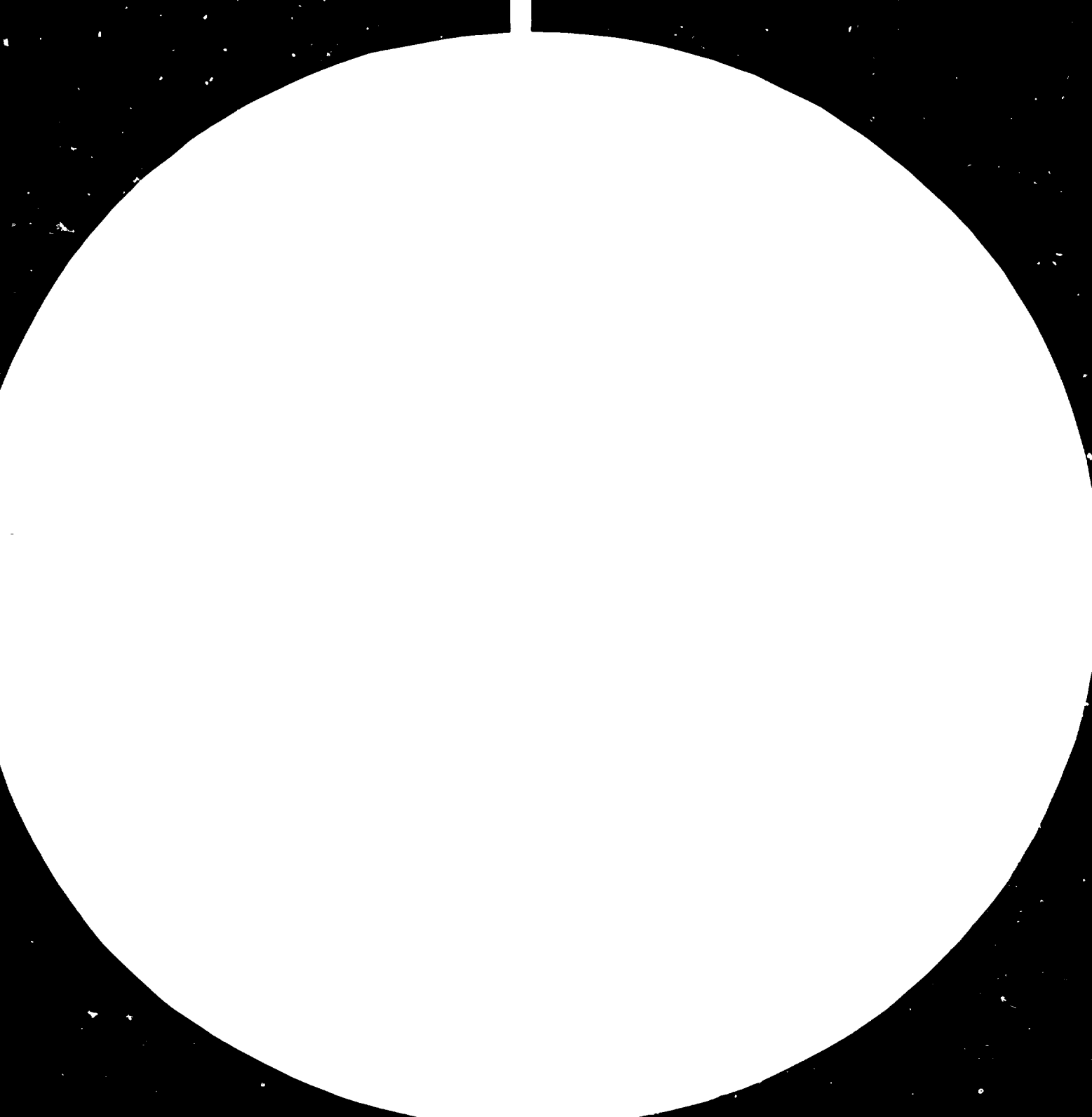
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28

25

22

22



20

20

18

1.25 

1.4 

1.6 

MEASUREMENT OF RESOLUTION

Resolution is the ability to distinguish between two points.

11680

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ENGLISH

THE UNIDO WORLD INDUSTRY CO-OPERATION MODEL\*  
INTERACTIVE USER'S OPERATION MANUAL .

J. Fox

Prepared by the  
Global and Conceptual Studies Branch

World Modelling Working Paper.

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## FOREWORD

This User's Handbook has been prepared in order to summarize the UNIDO World Industry Co-operation Model in its interactive computerized form. It provides information on how a new user at a computer terminal can experiment with the model system. By so doing, the manual illustrates two important features of the model: first that it is intended to be used by those concerned with national and international economic issues but perhaps unfamiliar with computers, and secondly, that the model is intended to be used in a set of repeated experiments, which give information on the range of possibilities for solution of international economic policy issues.

The basic philosophy of the model itself can be summarized as follows:\*/ it is a system to derive the implications of national macroeconomic plans and strategies in the light of the international economic environment. The implications can be those for world development targets, such as the Lima target, for international commodity trade, and for individual sectors of the national economy.

A document is in preparation summarizing the structure of the model and presenting numerical results from a sensitivity analysis of the system.

The interactive version of the model was constructed by A. Ratnatunga and modified by J. Fox, who prepared this manual.

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\*/ See "Constructing the UNIDO World Industry Co-operation Model" UNIDO/ICIS.24, 1977 and "The UNIDO World Industry Co-operation Model" in S. Krcevinac (ed.) "Global Modelling" Lecture Notes in Control and Information Sciences No. 35. Springer Verlag, 1981.

## CHAPTER I: INTRODUCTION

No prior knowledge of computers or computer programming languages is required for the user and none is assumed in this manual. Experienced users and novices may use the programme. The novice may request help at any time without disturbing the actions of the programme. Experienced users can move through the programme at their own speed without having to answer the same sequence of questions seen many times before.

### The Primary Menu

To achieve this goal the programme presents a diagram, or menu, describing the various capabilities of the model. The user is provided with a pointer (or cursor) which may be moved around the screen by means of a pair of keys. Depressing these keys ("Tab" and "Backtab") will cause the cursor to move, in turn, to the different items of the menu. By stopping the cursor on a desired item and pressing the "Enter" key, the user may cause the programme to execute the action described.

### "Help"

If the user is baffled at any stage help may be requested by pressing the "Help" key (PF1). This will give general information pertaining to the current stage of the programme. More detailed information may sometimes be obtained by pressing the "Selective Help" key (PF4). The user may request help at any time. The action being performed at the moment of the "help" request is suspended while the "help" information is read. When he has sufficient information, the user is returned to his original action in the same state he left it, as if he had not interrupted the programme by the "help" request.

In addition to selecting actions by choosing items on menu lists, the user may be requested to provide items of information. The programme will stop at some stages until the user provides the required information.

### Giving Commands

At some stages the user can give commands to the programme; e.g., "Display Japan" will cause the programme to display information regarding Japan (precisely what information will be displayed depends, of course, on which stage of the programme the user is currently in). A list of available commands is



given at the top of the screen in each stage. One of these commands may be selected by placing the cursor at the beginning of the field containing the commands (by pressing the "reset cursor" button, for example), pressing "Erase EOF" and typing in the desired command.<sup>1/</sup>

If for any reason the requested action cannot be performed a flashing message to that effect will be displayed.

After each command has been executed the user may proceed to give another command. If the programme has not yet completed an operation, the new command will be held in abeyance while the programme completes the previous operation. Then the new command will be obeyed.

#### Lexical Errors

When numeric data are being modified by the user the programme checks for so-called "lexical" errors: these include 1) placing more than one decimal point in a single number; 2) placing more than a single "minus" sign in a single number; and 3) embedding a space within a number. If any such error is made the erroneous item will be made to flash, the cursor will be placed at its location, and an error message will be displayed. If a letter should be placed in a numeric field, the place occupied by the letter will be ignored (e.g., 50k0.00 is read and interpreted as 500.00). Numbers should be right-justified within each field or they should be terminated with a decimal point.

If the numeric values supplied by the user exceed certain limits which are considered economically meaningful, the user will be warned and given the chance to correct the value. At this point the user may either change the value or can force the programme to accept the value by pressing the "Enter" key.

---

<sup>1/</sup> At some stages of the programme the command list is not automatically printed: pressing "Enter" in these cases will cause the list to appear.

The primary menu displaying the major stages of the UNIDO World Industry Co-operation Model is shown in Figure I-1. The user is required to select an operation from this diagram. The diagram itself is protected and cannot be overwritten. The cursor may be moved to the unprotected points just left of the => locations by means of the "Tab" or "Back Tab" keys. Upon pressing the "Enter" key, the requested action is taken. The "Help" location requests help (this is the same as pressing the "PF1" key) and the "Exit" location terminates the run. At the end of each stage the diagram is redisplayed and the pointer is automatically placed in the next position. The user may return to this diagram at any time by pressing the "Test Request" key.

Upon completion of any stage the user may choose any other stage. However, when moving to a stage without completion of previous stages only the results of past runs can be examined.

The detailed operation of each stage is described in the following chapters.

#### General Information

The following information is general and valid at any stage of the UNIDO World Industry Co-operation Model:

1. When help is needed press the "PF1" key.
2. Three asterisks ("\*\*\*") at the bottom of the screen means that the programme is waiting until you have read the information on the screen. Press the "Enter" key to proceed. Owing to certain peculiarities of the computer operating system the three asterisks may appear even when no new information is being displayed. Press the "Enter" key. Should the displayed information vanish or be partly erased after this action press the "PA2" key and a fresh screen will be displayed.
3. If you accidentally erase the display by pressing the "Clear" key or the "Erase Input" key the information may be recovered by pressing the "PA2" key (this key can also be used to remove messages sent by the computer operations staff).

U.N. I. D. O World Industry Model.

=====  
Select an operation with the "TAB" key and Press "ENTER"

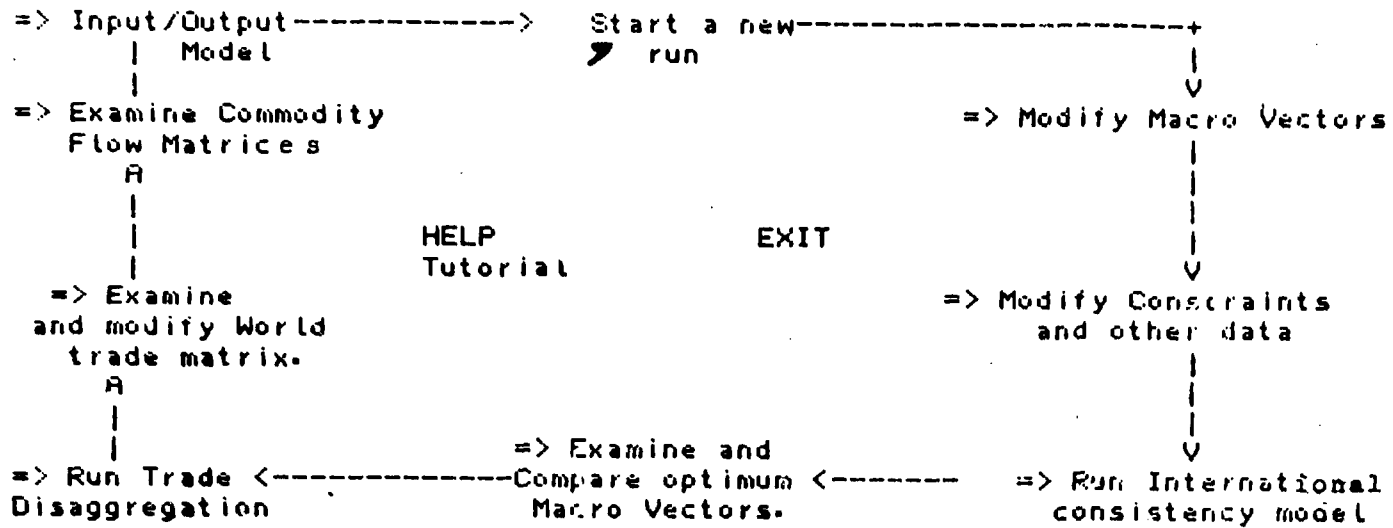


Figure I-1

4. Pressing the "PA1" key will immediately end the programme. Therefore, this key should be carefully avoided. If you should accidentally press this key, avoid pressing any other key, wait until a "READY" appears on the screen, press "PA1" again and then "PA2". This should return you to the programme. If it does not you must restart the programme as described in Chapter II.
  
5. Pressing PF9 causes the currently-appearing screen to be printed.

CHAPTER II: STARTING AN INTERACTIVE RUN OF THE WORLD INDUSTRY  
CO-OPERATION MODEL

In order to start the model, log on the computer at an ITT terminal and type "EX 'UWM.WORLDMDL.CLIST'". (If you are logged in under user-name UT this may be shortened to "EX WORLDMDL"); then press the "Enter" button. A number of messages, all of them irrelevant to the user of the model, will appear, along with a request that the user wait patiently until the "primary menu" is displayed. At length the primary menu (Figure I-1) will appear on the screen with the cursor stationed at the item "Start a New Run". Repeated pressing of the "Tab" or "Back Tab" buttons will cause the cursor to move from one menu item to another. However, at this point the user may choose from only three of these items: "Exit", causing the model to stop; "Help" (same as pressing the "PF1" key), causing information about this stage of the model to be printed on the screen; and "Start a New Run", which causes a new screen (Figure II-1) to appear, with the cursor positioned next to the words "Current Run Identifier". At this point, the user must type in some name to be used to identify this particular run. The model will also assign a number to the run so that the same name can be used for more than one run without fear of over-writing previous results: the distinct numbers of the two identically-named runs will prevent confusion.

Once a name is chosen, pressing "Tab" one time will move the cursor alongside the statement "Initial Strategy Selection. Select an Initial Strategy from Menu Shown Below by Number-". On the bottom half of the screen is a list of previous runs, each with its name, a number and an indication of whether the macrovectors associated with each run are optimum macrovectors. Any of these runs may be chosen as a starting point for a new run by simply typing the run number (complete with decimal point) and then pressing "Enter". Or, by omitting to provide a run number and simply pressing "Enter", more previous runs (if any more exist) are displayed and one of these may be chosen as a starting point. In either case, after a run has been chosen and "Enter" pressed the original menu (Figure I-1) is displayed with the cursor next to "Modify Macrovectors".

U N I T U WORLD INDUSTRY COOPERATION MODEL  
 =====

USE "TEST REQ"  
 TO RETURN TO  
 DIAGRAM.

USER NAME ==> UT  
 CURRENT RUN IDENTIFIER ==>  
 PLEASE GIVE NAME AND COUNTRY.  
 INITIAL STRATEGY SELECTION.  
 SHOWN BELOW BY NUMBER ==> 1  
 RUN IDENTIFIER

START DATE ==> 18 DECEMBER 81

SELECT AN INITIAL STRATEGY FROM MENU  
 IF

	USER.	OPTIMIZED?	DATE OF RUN	
1. FOX3	UT	YES	16 DECEMBER	81
2. FOX3	UT	NO	16 DECEMBER	81
3. FOX2	UT	YES	14 DECEMBER	81
4. FOX1	UT	YES	11 DECEMBER	81
5. FOX	UT	YES	10 DECEMBER	81
6. FOX	UQ	YES	09 DECEMBER	81
7. DEMO DR. NAIR	UQ	YES	25 SEPTEMBER	81
8. EOIN		NO	19 JUNE	81
9. OMV AGAIN	UT	YES	30 APRIL	81
10. TEST 2	UT	YES	30 APRIL	81

IF NO INITIAL SELECTION IS MADE, OLDER RUNS (IF ANY) WILL BE DISPLAYED.

Figure II-1

CHAPTER III: EXAMINING AND MODIFYING THE NATIONAL MACROVECTORS

Examining the Macrovector

At this point the macrovectors belonging to the older run chosen in the previous step are to be examined and, usually, modified before being used as inputs to the International Consistency Model. By pressing "Enter" with the cursor next to "Modify Macrovector" on the main menu the user can cause a new screen (Figure III-1) to appear. At the top of the screen appear the words "Command Input" and after this a list of legal commands, separated one from another with a "/". A brief description of each command can be got by erasing the command list, typing "HELP", and pressing "Enter".<sup>2/</sup> The screen of Figure III-2 will appear.

Displaying the Macrovector on the Screen

Going back to Figure III-1 we see that the command "Display Egypt" has been selected. This results in the screen of Figure III-3, where it is seen that the various components (GDP, Manufacturing Value-Added, etc.) of the macrovector describing the Egyptian economy in 1975 are displayed at the far right. Also, three other macrovectors, each representing a particular arrangement of the Egyptian economy in 1985 are shown. These three macrovectors were taken from the output of the older run selected in the previous stage (see Chapter II): in this case the previous run has the name "ORIGINAL MACROVECTORS". The values on the screen are at this point protected and cannot be overwritten by the user.

The user will presumably wish to alter these macrovectors to represent up to three possible or desirable arrangements of the Egyptian economy. The International Consistency Model will then take these strategies, along with strategies proposed for all other countries represented in the model, and by means of linear programming return a set of strategies, one for each country, which, taken together, satisfy the imposed constraints and maximize world GDP.<sup>3/</sup>

---

<sup>2/</sup> Henceforth, it is assumed that all commands are given by erasing the command field, typing a legal command, and pressing "Enter".

<sup>3/</sup> Such a "feasible" solution may not always exist. See Chapter V.

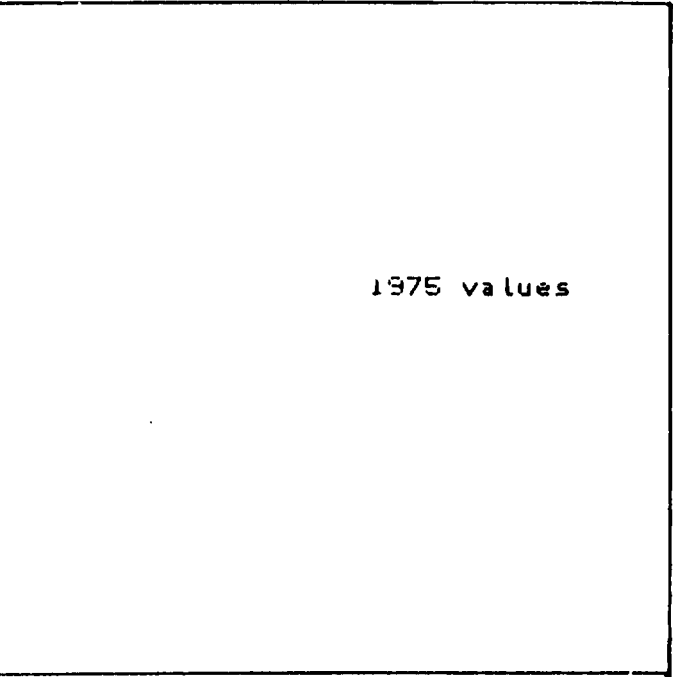
COMMAND INPUT ==> display egypt  
These are a set of projections for  
For the year 1985

Macro Vector.  
-----

STRATEGY

Gross Domestic Product =  
Manufacturing value add=  
Merchandise Exports =  
Merchandise Imports =  
Services Exports =  
Services Imports =  
Total Final Consumption=  
Domestic Savings =  
Investment Required =  
Deficit on current A/C =  
Labour Required 1000men=





1975 values

Figure III-1

HELP for displaying and modifying macro vectors.

=====  
Commands available.  
=====

display " country name " display macro vectors. Values protected.  
" cc... " or ... the standard UN country code(with leading  
modify " country name " same as display but values can be changed.  
save saves modified macro vectors.  
%gdp Displays the macro vectors as a % of GDP  
growth gives the implied growth rate from the base year(1975) as a %  
NOTE macro vectors may be modified in terms of \$ or %gdp or growth rates.  
return returns to diagram.  
GO run has been setup request to move to optimizing stage.  
PF5 display older version of macro vector for current country.  
PF3 display later version of macro vector.  
Each depression of PF5 will climb down 1 generation. PF3 will climb up  
Current display may be saved if in modify mode.  
\*\*\*

\*\*\* Press the "enter" key to return to the original screen.

Figure III-2

Source  
 COMMAND INPUT ==> display, modify/save, return, go/%gdp, dollars, growth/let/help  
 These are a set of projections for EGYPT  
 For the year 1985 in Millions of 1975 U. S. Dollars

3            Macro Vector.

	STRATEGY			1975 values
	1	2	3	
Gross Domestic Product =	18400.0	22905.0	18511.0	12431.0
Manufacturing value add=	3863.0	4809.0	3886.0	2610.0
Merchandise Exports =	2038.0	2038.0	2104.0	1473.0
Merchandise Imports =	6235.0	6235.0	6235.0	3828.0
Services Exports =	1401.0	1401.0	1445.0	1013.0
Services Imports =	1863.0	1863.0	1863.0	1144.0
Total Final Consumption=	17794.0	22180.0	17762.0	11561.0
Domestic Savings =	606.0	724.0	610.0	870.0
Investment Required =	5265.0	5383.0	5297.0	3356.0
Deficit on current A/C =	-3998.0	-3788.0	-3998.0	-3883.0
Labour Required 1000men=	9530.0	11864.0	9588.0	10517.0

Source ORIGINAL MACRO VECTOR

15-MAR-79 00.00

### Altering the Display Mode

But for the moment let us return our attention to Figure III-3. In this diagram all monetary values (e.g., GDP) are denominated in U.S. dollars. It is also possible to view the macrovectors in units of per cent of GDP for each strategy. This can be done by selecting the command "%GDP", causing the screen of Figure III-4 to appear.

Yet a third manner in which the macrovectors can be displayed is shown in Figure III-5, which can be got by means of the "Growth" command. Figure III-5 shows all macrovector components in terms of percentage growth per year, from 1975 to 1985, implied by that vector. Thus, for example, the GDP figure of 18,400 million dollars specified by strategy 1 (Figure III-3) corresponds to an average yearly growth of GDP between 1975 and 1985 of 4.0%.

As a final note on displaying macrovectors, the vectors can once again be obtained in dollars (Figure III-3) by selecting the "Dollars" command.

### Modifying the Macrovectors

In order to use a new set of macrovectors as input to the International Consistency Model it is necessary to modify an existing set of macrovectors. To do this the user selects the "Modify" command, after which the screen appears as Figure III-6, with the legend "Modify On". This signifies that the values contained in the macrovectors are no longer protected by the computer and may be overwritten by the user. This can be done by moving the cursor to any number and simply typing the desired value over it. (See Chapter I regarding possible "lexical" errors in this process).

### Internal Consistency Check

After all the desired changes have been made the newly-modified macrovectors can be made to replace the old ones by means of the "Save" command. However, not every possible macrovector is an acceptable one since each macrovector must satisfy the identity defining GDP, i.e.;

$$\begin{aligned} \text{GDP} = & \text{merchandise exports} - \text{merchandise imports} + \text{service exports} \\ & - \text{service imports} + \text{consumption} + \text{investment} \end{aligned}$$

COMMAND INPUT ==> %gdp

These are a set of projections for EGYPT  
For the year 1985 as a percentage of GDP

Macro Vector.  
-----

	STRATEGY	
	1	2
Gross Domestic Product =	100.0	100.0
Manufacturing value add=	21.0	21.0
Merchandise Exports =	11.1	8.9
Merchandise Imports =	33.9	27.2
Services Exports =	7.6	6.1
Services Imports =	10.1	8.1
Total Final Consumption=	96.7	96.8
Domestic Savings =	3.3	3.2
Investment Required =	28.6	23.6
Deficit on current A/C =	-21.7	-16.6
Labour Required 1000men=	9530.0	11864.0

Source ORIGINAL MACRO VECTOR

15-MAR

	1975 values
3	
100.0	100.0
21.0	21.0
11.4	11.8
33.7	30.8
7.8	8.1
10.1	9.2
96.0	93.0
3.3	7.0
28.6	27.0
-21.6	-31.2
9588.0	10517.0
-79 00.00	

Figure III-4

COMMAND INPUT ==> growth  
 These are a set of projections for EGYPT  
 For the year 1985 as a % per year growth from 1975

Macro Vector.

	STRATEGY			1975 values
	1	2	3	
Gross Domestic Product =	4.0	6.3	4.1	12431.0
Manufacturing value add =	4.0	6.3	4.1	2610.0
Merchandise Exports =	3.3	3.3	3.6	1473.0
Merchandise Imports =	5.0	5.0	5.0	3828.0
Services Exports =	3.3	3.3	3.6	1013.0
Services Imports =	5.0	5.0	5.0	1144.0
Total Final Consumption =	4.4	6.7	4.4	11561.0
Domestic Savings =	-3.6	-1.6	-3.6	870.0
Investment Required =	4.6	4.8	4.7	3356.0
Deficit on current A/C =	0.3	-0.2	0.3	-3883.0
Labour Required 1000men =	-1.0	1.2	-0.9	10517.0

Source ORIGINAL MACRO VECTOR

15-MAR-79 00.00

Figure III-5

COMMAND INPUT ==> display, modify/save, return, go/%gdp, dollars, growth/let/help  
 These are a set of projections for EGYPT  
 For the year 1985 in Millions of 1975 U.S. Dollars

Macro Vector.

MODIFY ON

	STRATEGY			1975 values
	1	2	3	
Gross Domestic Product =	18400.0	22905.0	18511.0	12431.0
Manufacturing value add=	3863.0	4809.0	3886.0	2610.0
Merchandise Exports =	2038.0	2038.0	2104.0	1473.0
Merchandise Imports =	6235.0	6235.0	6235.0	3828.0
Services Exports =	1401.0	1401.0	1446.0	1013.0
Services Imports =	1863.0	1863.0	1863.0	1144.0
Total Final Consumption=	1794.0	22190.0	17762.0	11561.0
Domestic Savings =	606.0	724.0	610.0	870.0
Investment Required =	5265.0	5383.0	5297.0	3356.0
Deficit on current A/C =	-3998.0	-3788.0	-3998.0	-3883.0
Labour Required 1000men=	9530.0	11664.0	9588.0	10517.0

Source ORIGINAL MACRO VECTOR

15-MAR-79 00.00

Figure III-6



If a proposed macrovector does not satisfy this identity then a warning appears on the screen (Figure III-7). At this point the user may, by using the cursor, modify the faulty macrovector to bring it into conformance with the identity. Numbers which appear as terms of this identity are highlighted on the screen and the identity may be "repaired" simply by moving the cursor to any highlighted number and pressing "Enter". The selected component of the macrovector will be adjusted so that the GDP identity holds true.

#### Capital Output Ratio Check

Once the macrovectors all satisfy this requirement of internal consistency, use of the "Save" command results in their acceptance as suitable input data for the International Consistency Model. If a modified macrovector implies an incremental capital output ratio (ICOR) exceeding a certain value, then a message to that effect will appear on the screen when the "save" command is given. In response the user may either press "Enter", causing the macrovector to be accepted in its present form, or may give the "Modify" command and alter the macrovector once again. The "Return" command can then be used to cause the main menu (Figure I-1) to be redisplayed, this time with the cursor next to "Modify Constraints and Other Data".

It is possible to modify the macrovector in the "growth" mode or in the "per cent" mode as well as in the "dollars" mode. For example, if one is viewing a set of macrovectors in the "growth" mode and decides that a given macrovector component ought to reflect a certain growth rate, then it is possible to alter the growth rate figure directly, with the programme making the appropriate changes in dollars. The same is true with the "per cent" mode, in which macrovector components may be modified to represent desired percentages of GDP. A small amount of caution must be used, however, in performing these changes. Specifically, in order to make changes directly in terms of annual growth rates the command "Growth" must be given after the command "Modify" has been given and the "Modify On" message appeared. This is true even if the user was in "Growth" mode just prior to giving the "Modify" command. The same is true for making changes directly in the "per cent" mode.

GDP not = to EXPM-IMP+ENFS-INFS+CONS+INV  
 COMMAND INPUT ==> SAVE  
 Cursor select a bright field to take up the slack.  
 Error in equation = 1.0  
 These are a set of projections for EGYPT  
 For the year 1985 in Millions of 1975 U.S. Dollars

Macro Vector.  
 -----

	STRATEGY			1975 values
	1	2	3	
Gross Domestic Product =	18401.0	22905.0	18511.0	12431.0
Manufacturing value add=	3862.0	4809.0	3886.0	2610.0
Merchandise Exports =	2038.0	2038.0	2104.0	1473.0
Merchandise Imports =	6236.0	6236.0	6236.0	3828.0
Services Exports =	1401.0	1401.0	1446.0	1013.0
Services Imports =	1863.0	1863.0	1863.0	1144.0
Total Final Consumption=	17794.0	22180.0	17762.0	11561.0
Domestic Savings =	606.0	724.0	510.0	870.0
Investment Required =	6265.0	5383.0	6297.0	3356.0
Deficit on current A/C =	-3998.0	-3788.0	-3998.0	-3883.0
Labour Required 1000men=	9530.0	11864.0	9588.0	10517.0

Source DEMONSTR2

12 August 80

Figure III-7

CHAPTER IV: EXAMINING AND MODIFYING THE CONSTRAINTS

Pressing "Enter" with the cursor next to "Modify Constraints and Other Data" causes the screen of Figure IV-1 to appear. The right-hand sides of all those constraints which may be modified by the user appear on this screen. As was the case with the macrovectors, the right-hand sides may be modified by selecting the "Modify" command, waiting for the "Modify On" message to appear, then overwriting the value to be altered. Selecting the "Save" command will then cause the new values to take the places of the old in subsequent stages of computation.

Saving the Run

Selecting the "Runsave" command will cause the current set of macrovectors and constraints to be stored. At this point no optimization has taken place but the run may be optimized by executing the next stage (Chapter V) either directly after this stage or at some later time. After "Runsave" has been selected the screen of Figure IV-2 will appear, giving information about the run just saved. In the figure shown, for example, the name of the run is DEMONSTR2, it was saved on 12 August 1980, and it was created from the older run called ORIGINAL MACROVECTOR. Creating DEMONSTR2 involved modifying the macrovectors for Egypt from the run ORIGINAL MACROVECTOR. The constraints, however, were not modified.

At this point, in order to store the run on the computer either for future use or for immediate optimization through the International Consistency Model (next chapter) it is necessary to choose the "Save" command. If for any reason it should be decided at this point that the run should not be saved, simply select "Return" instead of "Save".

COMMAND INPUT ==> modify/save/runsave.return/regions

Region	Constraints -----	Regional share of manufacturing value added	Regional consumption lower limit. Billions of \$	Regional labour force upper limit (thousands of men)
AFRICA REGION	=	0.0050	45000	178905
ASIA REGION	=	0.0200	100000	530440
CENT & LATIN AMERICA REGION	=	0.0430	120000	135031
MIDDLE EAST REGION	=	0.0042	30000	70000
INDUSTRIALIZED COUNTRIES REGION	=	0.8300	1400000	714000

Developing=  
Developed =

General Data  
-----

LOWER LIMIT OF WORLD GDP	=	2600000 Billions of U.S. \$
SHARE OF MANUFAC. FOR DVLPG	=	0.095 share of mnf. value add.
FACTOR FOR CORRECT. I/E DIF	=	1.100 error factor in trade
MAXIMUM WORLD CURRENT ACCOUNT	=	600000 max world c/ac

Source ORIGINAL MACRO VECTOR

15-MAR-79 00.00

Figure IV-1

COMMAND INPUT==>

U N I D O World Industry Cooperation Model.

\*\*\*\*\*

End of interaction for international consistency model.

Run name- TEST

07 May

82

The Constraints were

The macro vectors for the following countries were modified.

Unmodified data will be taken from run of name-  
16 March 82

A

Figure IV-2

Displaying the Members of a Region

If the "Regions" command is selected the message "Cursor select a region name field to list member countries" will appear. At this point a list of countries contained within any region may be obtained by moving the cursor to a point anywhere on the same line as the desired region name and pressing "Enter". Selecting "Middle East Region", for example, results in Figure IV-3 appearing on the screen.

Selecting "Return" at any time returns the user to the main menu, Figure I-1.

At present no "Help" command exists for this stage of the model.

MEMBERS OF SET.

MIDDLE EAST REGION

-----> SUBSETS <-----

RESIDUAL DEVELOPING MIDDLE EAST

-----> COUNTRIES <-----

IRAQ

JORDAN

KUWAIT

LEBANON

SAUDI ARABIA

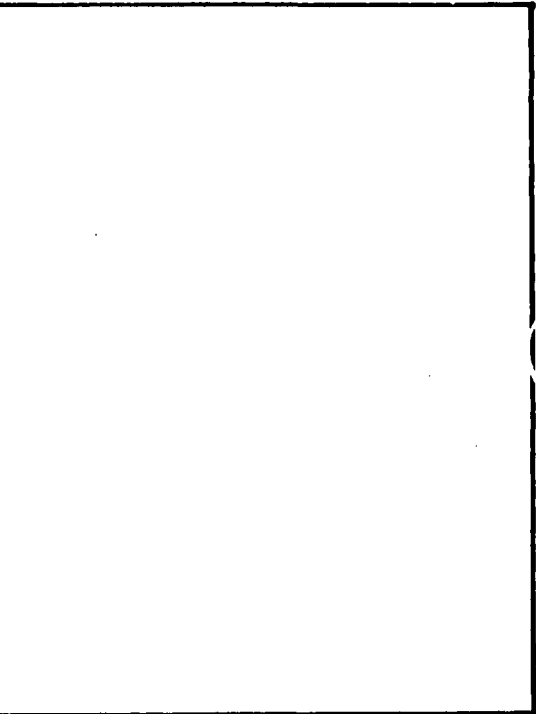
SYRIAN ARAB REPUBLIC

TURKEY

\*\*\*

- 22 -

Figure IV-3





CHAPTER V: RUNNING THE INTERNATIONAL CONSISTENCY MODEL

With the macrovectors and constraints modified to their desired values by means of the techniques described in Chapters III and IV, one is in a position to run the International Consistency Model and obtain the optimum set of macrovectors, along with the (maximized) value of world GDP which they imply.

The model is run simply by pressing "Enter" with the cursor alongside "Run International Consistency Model" on the main menu (Figure I-1). The menu of Figure V-1 will appear and at this point the user may decide which of several possible objective functions is to be used by the model and whether that objective function is to be maximized or minimized.

In order to select a desired objective function simply move the cursor next to that function and press "Enter". Then move the cursor alongside either "maximize given function" or "minimize given function" and press "Enter" once again. The International Consistency Model will then be executed using the objective function chosen by the user.

There is one exception to this procedure: if it is desired to maximize GDP for the entire world it is only necessary to press "Enter", immediately the menu of Figure V-1 appears on the screen.

In all cases, after the objective function has been chosen the screen will go blank and then some information regarding the size of the linear programming matrix will appear. At length the results of the optimization will be shown. The possible results fall into three classes:

1. Infeasible Problem: Not all the constraints could be simultaneously satisfied. The message "International Consistency Model has no feasible solution" appears and the user is returned to the main menu (Figure I-1). At this point the constraints may be modified and the model run once again.

**Objective Function Menu**

**=> DEFAULT--Maximize Total World GDP.**

- 1. World GDP.**
- 2. World Manufacturing Value-Added**
- 3. World Merchandise Exports.**
- 4. World Service Exports.**
  
- 5. GDP for Developing Countries.**
- 6. Manufacturing Value-Added for Developing Countries.**
- 7. Merchandise Exports for Developing Countries.**
- 8. Service Exports for Developing Countries.**

**Maximize Chosen Function.**

**Minimize Chosen Function.**

2. Unbounded Constraint Region: The maximum value of the objective function is infinite. Therefore, the constraints chosen were not sufficiently restrictive to provide an economically realistic answer. The message "Constraint Region Unbounded" is printed and the user is returned to the main menu (Figure I-1) from which the constraints may be modified and the model re-run.
  
3. Optimum Solution Found: In this desired case the message "International Consistency Model: Optimal Solution Found" is printed, followed by the maximized value of the objective function, as in Figure V-1. As can be seen in the figure, this is followed by a list of the countries included in the model along with the number which identifies each country, the number of the strategy (from 1 to 3) chosen for each country by the optimizing process and the "weight" given that strategy: 1.000 if only one strategy was chosen, less than unity if the optimum strategy is a weighted sum of more than one of the proposed strategies.

Following the list of country strategies is a list of all nonzero "slack" variables and their values. After all results have been shown (do not forget to press "Enter" each time "\*\*\*" appears at the bottom of the screen) the user is returned to the main menu (Figure I-1).

## CHAPTER VI: EXAMINING AND COMPARING THE OPTIMUM MACROVECTORS

### Displaying the Macrovector

The results of the International Consistency Model, as described in Chapter V, consisted only of a list stating which macrovector, or weighted combination of macrovectors, was chosen for each country through the optimization process. In order to examine the components of these optimum macrovectors it is necessary to select from the main menu (Figure I-1) the option "Examine and Compare Optimum Macrovector". The screen of Figure VI-1 will then appear. (If the command string shown at the top of Figure VI-1 is not present, simply press "Enter" and it will appear.) Several of the commands are identical to those of the "Modify Macrovector" stage (see Chapter IV). For example, selecting "Display Egypt" produces the screen of Figure VI-2. Once this screen has appeared the further commands "%GDP", "Dollars", and "Growth", have the same meanings as they did under "Modify Macrovector".

Figure VI-2 shows, on the left, the optimum macrovector for the Egyptian economy. On the far right is the macrovector showing the actual configuration of the Egyptian economy in 1975. Beneath the components of the macrovectors is a line of data giving the values of the "weights" given to the three macrovectors of Egypt. In this case the values printed tell the user that the optimum macrovector shown is the first of the three macrovectors originally provided as input to model. This can be seen by the fact that the first macrovector was given a weight of 1.000 while the other two have zero weights. Thus in this case the optimum macrovector is one of the three originally proposed macrovectors and not a weighted sum of more than one of them.

### Comparison with Previous Runs

It is possible to compare the optimum macrovectors of the run just completed with the optimum macrovectors of any previous run (previous runs for which the macrovectors have not yet been optimized are, however, not available for comparison). Once the macrovector for the desired country has been displayed by means of the "Display" command, previous macrovectors for the same country may be viewed by manipulating the "PF3" and "PF5" keys. Repeated pressing of the "PF5" key results in successively older runs being displayed.

COMMAND INPUT ==>

This is a projection for  
For the year 1985

Optimum Macro Vectors from International Consistency model.

---

	1975 Value
Source run =	
Objective Function =	
Gross Domestic Product =	
Manufacturing value add =	
Merchandise Exports =	
Merchandise Imports =	
Services Exports =	
Services Imports =	
Total Final Consumption =	
Domestic Savings =	
Investment Required =	
Deficit on current A/C =	
Labour Required 1000men =	
LPweights	
Source	

Figure VI-1

COMMAND INPUT ==>

This is a projection for EGYPT  
For the year 1985 in Billions of 1975 U.S. Dollars  
Optimum Macro Vectors from International Consistency model.

-----  
Source run = TEST ||  
Objective Function = 10080532 ||

		1975 Value
Gross Domestic Product =	18400.0	12431.0
Manufacturing value add =	3863.0	2610.0
Merchandise Exports =	2038.0	1473.0
Merchandise Imports =	6235.0	3828.0
Services Exports =	1401.0	1013.0
Services Imports =	1863.0	1144.0
Total Final Consumption =	17794.0	11561.0
Domestic Savings =	1206.0	870.0
Investment Required =	5265.0	3356.0
Deficit on current A/C =	-3998.0	-3883.0
Labour Required 1000men =	9530.0	10517.0
LPweights 1.000 0.000	0.000	

Source TEST 07 May 82

Figure VI-2

Pressing the "PF3" key causes newer runs to be printed on the screen. In addition to the optimized macrovector from the current run and from some older run the difference in each component between the new and older macrovectors is also shown. The "weights" associated with the two sets of macrovectors are also shown. Figure VI-3 gives an example of this type of display.

Selection of the "Return" command causes the user to be returned to the main menu (Figure I-1).

COMMAND INPUT ==>

This is a projection for EGYPT  
 For the year 1985 in Billions of 1975 U.S. Dollars  
 Optimum Macro Vectors from International Consistency model.

	Source run = LYAKH	LYAKH1	\$ Difference	1975 Value
Objective Function =	10080532	78118	10002414	
Gross Domestic Product =	18400.0	18511.0	-111.0	12431.0
Manufacturing value add=	3863.0	3886.0	-23.0	2610.0
Merchandise Exports =	2038.0	2104.0	-66.0	1473.0
Merchandise Imports =	6235.0	6235.0	0.0	3828.0
Services Exports =	1401.0	1446.0	-45.0	1013.0
Services Imports =	1863.0	1863.0	0.0	1144.0
Total Final Consumption=	17794.0	17762.0	32.0	11561.0
Domestic Savings =	1206.0	1260.0	-54.0	870.0
Investment Required =	5265.0	5297.0	-32.0	3356.0
Deficit on current A/C =	-3998.0	-3998.0	-0.0	-3883.0
Labour Required 1000men=	9530.0	9588.0	-58.0	10517.0
LPweights 1.000 0.000	0.000	0.000	0.000 1.000	
Source LYAKH			10 May	82

Figure VI-3



CHAPTER VII: THE TRADE DISAGGREGATION STAGE

Trade disaggregation may be performed on any set of optimized macro-vectors. This stage takes the export and import components of the macro-vectors for each country and aggregates the various countries into approximately twenty "trade regions". At this point the trade between these regions is disaggregated, based on historical trade data, into seven commodity groups. The resulting trade matrix, containing numbers representing the flow of trade of the several commodity groups between the various trade regions, may be examined in the next stage of the model (Chapter VIII).

In order to run this present stage of the model simply press "Enter" with the cursor next to "Run Trade Disaggregation" on the primary menu (Figure I-1). A couple of messages will appear and, after the aggregation into trade regions has been performed, the exports (in millions of US\$) of each region will be displayed, along with the name of each region. Then the imports of each region will be similarly displayed.

After the stage has been completed the programme will return the user to the primary menu (Figure I-1) with the cursor next to "Examine Trade Matrix".

## CHAPTER VIII: EXAMINING THE TRADE MATRIX

Now that a trade matrix, representing the flow of several commodities between a number of "trade regions", has been prepared (see Chapter VII), the elements of this matrix may be examined in this stage of the model.

### The Trade Matrix Menu

In order to enter this stage, press "Enter" with the cursor next to either "Examine and Modify World Trade Matrix", or "Examine Commodity Flows" (the two stages are, at the moment, identical) on the primary menu (Figure I-1). Another menu, shown in Figure VIII-1, will now appear. The different options offered on this menu represent different formats in which the trade matrix data may be viewed. Thus, if it is desired to view the flow of trade between various trade regions for a given single commodity, the first option, "Any given commodity by exporting and importing country", should be chosen. As usual, move the cursor next to the desired option and press "Enter". The portion of the matrix shown in Figure VIII-2 will appear.

### Displaying the Various Commodity Groups

The legend "All Commodities" at the bottom signifies that the figures shown are part of the total trade matrix, summed over all commodities. If the corresponding figures for each commodity group are of interest, press the PF6 key and the individual commodity groups will be displayed in turn. Figure VIII-3, for example, shows the same portion of the trade matrix as in Figure VIII-2, but this time for the commodity group "Machines and Transport Equipment".

**Examine commodity flows**

=====

- => Any given commodity by exporting and importing country.
  
- => The exports of any given country by commodity and importing country.
  
- => The imports of any given country by commodity and source country.
  
- => Go to next step.

Figure VIII-1

COMMAND INPUT ==>

International Commodity flow

Source country.	SACU ( 1 )	Sink country --
		KENY ( 2 )
1 ) SACU	0.000	0.250
2 ) KENY	0.576	0.000
3 ) ZAMB	10.751	0.503
4 ) A/KZ	38.670	3.980
5 ) USA	566.893	34.196
6 ) NA/U	101.090	1.740
7 ) MEX.	0.371	0.000
8 ) OA/M	30.629	0.170
9 ) ISRL	10.690	3.654
10 ) JAPN	329.593	41.553
11 ) TURK	0.180	0.000
12 ) ME/T	245.000	36.930
13 ) KORR	3.930	1.256
14 ) AE/K	53.070	21.910
15 ) ASCP	0.000	3.400
16 ) AUST	20.073	1.786
Trade in Commodity=	ALL COMMODITIES	

ws in mill.US.\$

Z/AMB ( 3 )	A/KZ ( 4 )	USA ( 5 )
97.214	281.604	180.657
6.458	17.552	17.801
0.000	9.849	1.648
48.030	562.610	790.600
30.721	921.594	0.000
4.900	101.810	10578.277
0.000	0.729	846.821
1.589	112.530	4833.179
2.923	24.299	149.196
31.738	999.364	6015.460
0.000	8.750	56.230
11.830	337.070	223.800
0.000	11.856	390.056
17.900	422.090	2939.899
3.970	182.600	1.000
1.495	47.406	118.029

Figure VIII-2

COMMAND INPUT ==>

International Commodity flows in mill.US \$

Source country.	Sink country ---->				
	SACU ( 1 )	KENY ( 2 )	ZAMB ( 3 )	A/KZ ( 4 )	USA ( 5 )
1 ) SACU	0.000	0.090	29.217	13.710	1.031
2 ) KENY	0.000	0.000	0.370	0.014	0.000
3 ) ZAMB	0.000	0.000	0.000	0.000	0.000
4 ) A/KZ	1.000	1.340	1.630	24.640	1.000
5 ) USA	304.353	18.909	21.466	414.517	0.000
6 ) NA/U	30.550	0.951	3.770	15.430	4485.726
7 ) MEX.	0.171	0.000	0.000	0.012	97.435
8 ) QA/M	1.829	0.060	0.018	3.940	47.570
9 ) ISRL	1.056	0.228	0.138	4.870	7.841
10 ) JAPN	144.664	10.926	12.069	728.237	2422.722
11 ) TURK	0.000	0.000	0.000	0.650	0.000
12 ) ME/T	0.000	12.390	0.000	0.000	1.000
13 ) KORR	0.033	0.000	0.000	0.170	36.540
14 ) AE/K	1.970	7.350	1.000	47.450	333.500
15 ) ASCP	0.000	1.140	1.000	12.860	0.000
16 ) AUST	5.700	0.290	0.350	18.390	34.570
Trade in Commodity=	MACHINES, TRANSPORT EQUIPMENT				

Figure VII-3

### Displaying Various Parts of a Large Matrix

Owing to space limitations it is not possible to show the entire trade matrix, with all trade from each trade region to the others, at once. The terminal screen can here be viewed as a "window" of limited size, through which a portion of the larger trade matrix may be seen at any one time. In order to see other portions of the matrix one must move the window and this can be accomplished through manipulation of the PF7 and PF8 keys (move down to right and left, respectively) and the PF10 and PF11 keys (move window upward and downward).

### "Sorting" Matrix Columns

If for any reason it is desired to view the elements of any given column of the matrix in a "sorted" form, with the trade flows in that column shown in descending order, this may be accomplished by giving the "Sort" command. The legend "Cursor select the column you wish to sort" will appear and at this point the user should move the cursor under any digit of any number in the desired column, then press "Enter". The rows of the trade matrix will be rearranged to give the desired result (see Figure VIII-4), which is the sorted version of Figure VIII-3: the sorting has been carried out in the "ZAMB" column.

The "display", "modify", "save", "go", "ZX", "ZM", and "help" commands are at the present time not supported. The "Return" command returns the user to the menu of Figure VIII-1.

### Other ways of Viewing the Matrix

If it is desired to examine the exports of any given trade region broken down by commodity and importing trade region, the second option on Figure VIII-1 should be chosen. Similarly, the third option allows the user to examine the imports of any given trade region broken down by commodity and by the trade regions which were the sources of those imports. Since the operation of these two stages are virtually identical I shall only describe the operation of the first of them.

If the option "The exports of any given country by commodity and importing country" is selected, the portion of the trade matrix shown in Figure VIII-5 will appear. The columns represent the various commodity groups and the rows the trade regions which import these commodities from the given exporter (in

COMMAND INPUT ==>

International Commodity flows in mill.US \$

Source country.	Sink country ---->				
	SACU ( 1 )	KENY ( 2 )	ZAMB ( 3 )	A/KZ ( 4 )	USA ( 5 )
1 ) EM/A	1174.299	72.280	99.000	2469.719	4115.398
2 ) U.K.	468.090	67.000	45.868	444.988	815.476
3 ) SACU	0.000	0.090	29.217	13,710	1.031
4 ) USA	304.353	18.909	21.466	414.517	0.000
5 ) JAPN	144.664	10.926	12.069	728.237	2422.722
6 ) NA/U	30.550	0.951	3.770	15.430	4485.726
7 ) ER/H	1.000	2.630	1.730	401.370	11.700
8 ) A/KZ	1.000	1.340	1.630	24.640	1.000
9 ) ASTL	52.807	1.280	1.121	3.129	7.320
10 ) ASCP	0.000	1.140	1.000	12.860	0.000
11 ) AE/K	1.970	7.350	1.000	47.450	333.500
12 ) KENY	0.000	0.000	0.370	0.014	0.000
13 ) AUST	5.700	0.290	0.350	18.390	34.570
14 ) ISRL	1.056	0.228	0.138	4.870	7.841
15 ) DA/M	1.829	0.060	0.018	3.940	47.570
16 ) N.ZL	0.367	0.145	0.010	0.164	0.620
Trade in Commodity=	MACHINES, TRANSPORT EQUIPMENT				

Figure VIII-4



COMMAND INPUT ==>

International Commodity flows in mill.US \$

Sink country.	Commodity --->				
	Total ( 1 )	SITC 0+1 ( 2 )	SITC 2+4 ( 3 )	SITC 3 ( 4 )	SITC 5 ( 5 )
1 ) SACU	0.000	0.000	0.000	0.000	0.000
2 ) KENY	0.250	0.010	0.010	0.030	0.030
3 ) ZAMB	87.214	12.647	1.838	0.859	15.109
4 ) A/KZ	281.604	29.140	12.890	18.170	30.370
5 ) USA	180.657	24.664	54.337	0.851	2.248
6 ) NA/U	39.446	24.072	5.479	0.000	0.634
7 ) MEX.	15.628	3.071	8.949	0.000	3.442
8 ) JA/M	11.111	10.000	0.000	1.000	0.000
9 ) ISRL	5.509	0.814	1.876	0.000	0.083
10 ) JAPN	253.547	53.472	122.962	5.158	5.186
11 ) TURK	0.424	0.000	0.352	0.000	0.066
12 ) ME/T	0.000	0.000	0.000	0.000	0.000
13 ) KORR	1.810	0.001	0.168	1.611	0.017
14 ) AE/K	47.871	12.200	14.900	0.400	1.300
15 ) ASCP	0.000	0.000	0.000	0.000	0.000
16 ) AUST	8.650	1.676	3.301	0.001	0.704
The Exports of					
		SOUTH AFRICA INC.	NAMIBI		

Figure VIII-5

this case the South African Customs Union). As with all the options within this stage, the "window" may be moved so that otherwise unseen portions of the trade matrix may be examined. As before, the PF7, PF8, PF10, and PF11 keys accomplish this. On the other hand, if it is desired to view the same portion of the matrix but for a different exporting country, manipulation of the PF6 key will allow data for the various exporting trade regions to be displayed in turn.

The "sort" command functions precisely as described for the previous option.

The "Return" command returns the user to the menu of Figure VIII-1.

When the user is finished examining the trade matrix the "Go to next step" option should be selected. The World Model primary menu (Figure I-1) will then appear.

CHAPTER IX: THE INPUT-OUTPUT MODELS

To run the input-output model and examine its output press "Enter" with the cursor next to "Input-Output Model" on the main menu (Figure I-1). Another menu, as in Figure IX-1, will appear. The cursor will lie next to the command "Type in the country to be displayed" and the user should type in the name of the desired country,<sup>4/</sup> then move the cursor next to one of the seven options offered and press "Enter". The requested output will be displayed. For example, if the option "Total Output in Each Sector" is chosen the data shown in Figure IX-2 will appear. After the data have been examined, pressing "Enter" will return the user to Figure IX-1, at which point another option may be selected. It is not necessary to re-type the country name each time a new option is selected: so long as data for the same country are to be examined, only the new option need be selected.

To leave this stage simply choose the "Return" option and the primary menu (Figure I-1) will once again appear.

This concludes the execution of the UNIDO World Industry Co-operation Model. At this point the user may leave the programme by choosing the "Exit" item on the primary menu, or may start a new run by choosing the "Start a New Run" option and proceeding as in Chapter II. If the "Exit" option is chosen any screens which the user may have requested to be printed through use of the PF9 key will then be printed.

---

<sup>4/</sup> At the moment Kenya is the only country for which an input-output model is available.

### Input output model.

The commodity exports, together with consumption and investment from the international consistency and trade disaggregation, lead to a final demand for domestic production in each country.

From the input output relationship this domestic demand permits the calculation of the following information for those countries for which we have models.

1. Total output in each sector.
2. Value added in each sector.
3. Imports to each sector.
4. Number employed in each sector.
5. Investment in each sector.
6. All interindustry flows.
7. RETURN

Type in the Country to be displayed ==> KENYA  
Cursor select the information required using the TAB key. Press ENTER  
Source

**Total output by sector**

**Input Output model for KENYA  
In Millions of 1975 U.S. \$**

<b>Sector</b>	
Agriculture	1191.649
Mining & Mafg.	1463.896
Elect. & Water	39.603
Construction	1185.789
Trade	528.750
Transport & Com	294.096
Housing	288.631
Private Service	367.255
Govt. Services	1736.614

Figure IX-2

