Part? Explanatory Notes

PART I

EXPLANATORY NOTES

CHAPTER 1. GENERAL OUTLINE

1.1 Background

This project was initiated for the purpose of providing the public with comprehensive statistical data on the inter-industrial relationship between Singapore and Japan. The 1985 Singapore-Japan international input-output table is the first bilateral input-output table for Singapore and Japan and is expected to contribute to the studies on the economic relationship between the two countries.

The bilateral input-output table is designed so that it can systematically depict how the two countries are dependent on each other at the industrial level. For instance, we can see at a glance, from the bilateral input-output table, how each domestic industry used intermediate goods supplied by specific industries from the partner country as well as those supplied by the domestic industries. Furthermore, by assuming stability (or linearity) of the technical relationship between the input (imported as well as domestic) and the output figures, the table can serve as an effective analytical tool for the study of the economic repercussion effect between the two countries. For instance, we can estimate how an increase in final demand for a certain commodity directly and indirectly affects production in specific industries in the partner country and also its balance of payments. Moreover, various types of economic analysis can be performed by applying proper methods of analysis.

1.2 Format of the Table

The 1985 Singapore-Japan international input-output table is a commodity table in which all of the economic transactions undertaken, in 1985, in and between the territories of Singapore and Japan are expressed in a manner similar to a domestic input- output table. Table 1 illustrates the format of the table.

Table 1 Format of the 1985 Singapore-Japan International Input-Output Table (127 sectors)

To / From	AJ001-AJ127 AJ900	AS001-AS127 AS900	ET 900	FJ001-FJ004 FJ900	FS001-FS004 FS900	FX 900	GJ 900	GS 900	LC001-LW001 LX900	QX 001	XX 600
AJ001 | AJ127 AJ900	A^{JJ}	A^{JS}		F^{JJ}	F^{JS}				L^{J}	Q^{J}	X^{J}
AS001 | AS127 AS900	A^{SJ}	A^{SS}		F^{SJ}	F^{SS}				L^{S}	Q^{S}	X^{S}
BF001	B^{J}	B^{S}		B^{J}	B^{S}						
CW001 | CW127 CW900	A^{WJ}	A^{WS}		F^{WJ}	F^{WS}						
DT001	D^{J}	D^{S}		D^{J}	D^{S}						
ET900											
VV001 | VV004 VV900	V^{J}	V^{S}									
XX600	X^{J}	X^{S}									

Note: Blanks in the table are sub-totals (see Coding System).

The first column shows the input structure of industries in Japan. A^{JJ} (127 x 127) depicts the flow of goods and services produced and used by the Japanese industries (at producers' value). A^{SJ} (127 x 127) gives the flow of goods produced by the Singapore industries but used by the Japanese industries, i.e. the import matrix from Singapore (also at producers' value). The row below, B^J (1 x 127), is for the freight and insurance on imported goods from Singapore. A^{WJ} (127 x 127) is the import matrix from the rest of the world. Therefore, A^{WJ} is, in appearance, similar to A^{SJ}, but it is valued at c.i.f. and the imports of services from Singapore are also contained in A^{WJ}. In A^{SJ}, only the domestic trade margin and transportation costs on the imported goods from Singapore are presented, expressed as imports of services from Singapore. D^J (1 x 127) represents the custom duties and commodity taxes on all the imports to Japan. V^J (4 x 127) and X^J (1 x 127) are, respectively, value added and total inputs.

The second column shows the input structures of industries in Singapore. A^{JS} (127 x 127) is the import matrix from Japan. A^{SS} (127 x 127) is the intermediate transaction matrix of Singapore domestic goods and services. The explanations for the first column also apply to the other parts of the second column (B^S, A^{WS}, D^S, V^S, and X^S). The third and the fourth columns show the flow of goods and services produced for final demand in Japan and in Singapore. F^{JJ} (127 x 4) is the final demand for Japanese domestic goods and services. F^{SJ} (127 x 4) represents the final demand for imported goods from Singapore. In contrast, F^{JS} (127 x 4) is the final demand for imported goods from Japan and $F^{SS}(127\times4)$ that for Singapore domestic goods and services. The same explanation for the first and the second columns can be applied to the other parts of the third and the fourth columns (B^J, F^{WJ}, D^J, B^S, F^{WS}, and D^S).

L^J (127 x 10) and L^S (127 x 10) are the export matrices for Japan and Singapore to ten countries or regions - China, Hong Kong, Indonesia, Korea, Malaysia, Taiwan, the Philippines, Thailand, the U.S.A., and the rest of the world. Q^J (127 x 1) and Q^S (127 x 1) are the statistical discrepancies which will be discussed again on page 18. Finally, X^J (127 x 1) and X^S (127 x 1) are the total output figures for Japan and Singapore.

1.3 Compilation Steps

The project was initiated in 1988 and completed in 1992. During this period, the 1985 Singapore-Japan international input-output table was compiled and included the following steps.

Note: Each code inside the parenthesis after each title indicates the corresponding step in the Flow Chart.

(1) Compilation of the 1985 Singapore Input-Output Table by Updating (1-B)

The 1985 Singapore input-output table was not available at the beginning of the project. The 1985 Singapore input-output table was compiled by updating the 1983 Singapore input-output table[1]. The RAS method was employed for updating.

(2) Construction of the Uniform Input-Output Sector Classification (1-A, 2-A)

The Uniform Input-Output Sector Classification (UIO) was prepared for converting the domestic input-output tables into one bilateral input-output table. Also, several converters which link the input-output tables and the trade statistics were prepared.

(3) Conducting the Special Survey (1-C, 2-C)

A special survey[2] was conducted by NUS to investigate the shares of imported goods by country of origin which were used in producing goods in Singapore. Also, the Ministry of International Trade and Industry (MITI), Japan, conducted a survey to investigate the distribution ratios, by column sector, of the imported goods in Japan.

(4) Compilation of the Import Matrices (1-C, 2-C)

The import matrices by country of origin were compiled to link the domestic input-output tables. In this step, the results of the special survey mentioned above were used. The method of compilation here will be discussed again on page 17.

(5) Consistency Check of the Converter System (1-A, 2-A)

The trade statistics between the two countries - Japanese exports with Singapore imports and Singapore exports with Japanese imports - were compared, in US dollars, at the UIO level to check the consistency of the UIO-SIO(JIO)-SITCR2(CCCN) converters.

(6) An Estimation of Freight and Insurance (1-C, 2-C)

Freight and insurance ratios to the imports from the partner country were estimated. These ratios were used in converting the import matrix from the partner county (originally valued at c.i.f.) into f.o.b. values.

(7) Conceptual Adjustments of the Domestic Input-Output Tables (1-B, 2-B)

The concept and format of the domestic input-output tables were adjusted so that the Singapore and Japanese tables match each other. The details of the adjustment methods employed will be discussed on page 16.

(8) Linkage of Data (3)

The final compilation step was to link all the data compiled through steps (1)-(7) - transaction matrices of domestic goods, import matrices, etc. - into one bilateral input-output table. At the same time, all the values in the domestic input-output tables were converted from local currencies to US dollars. After the linkage, some adjustments were made to balance the bilateral table.

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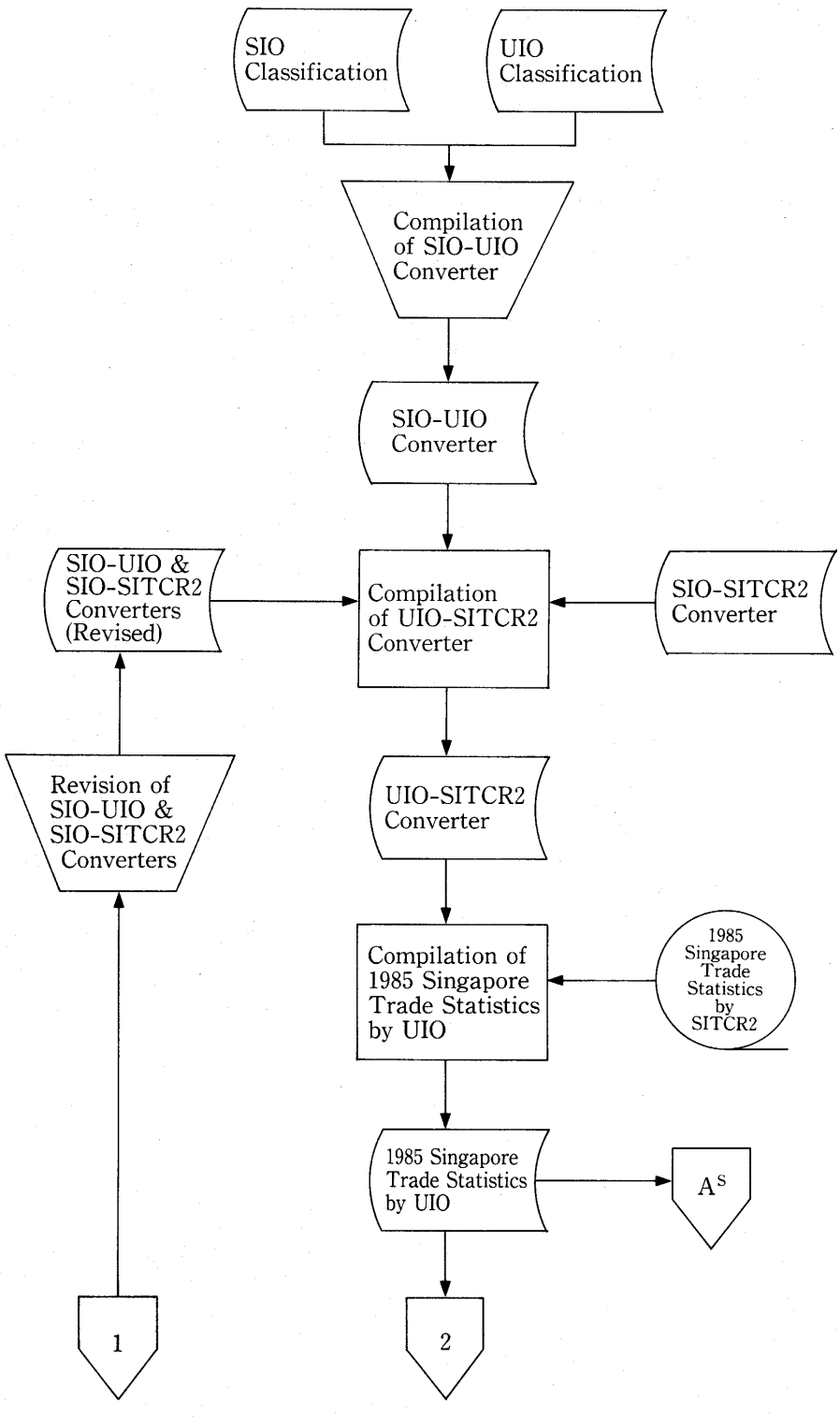
[1]Department of Statistics, *Singapore Input-Output Tables 1983* (Singapore: Department of Statistics, 1987)

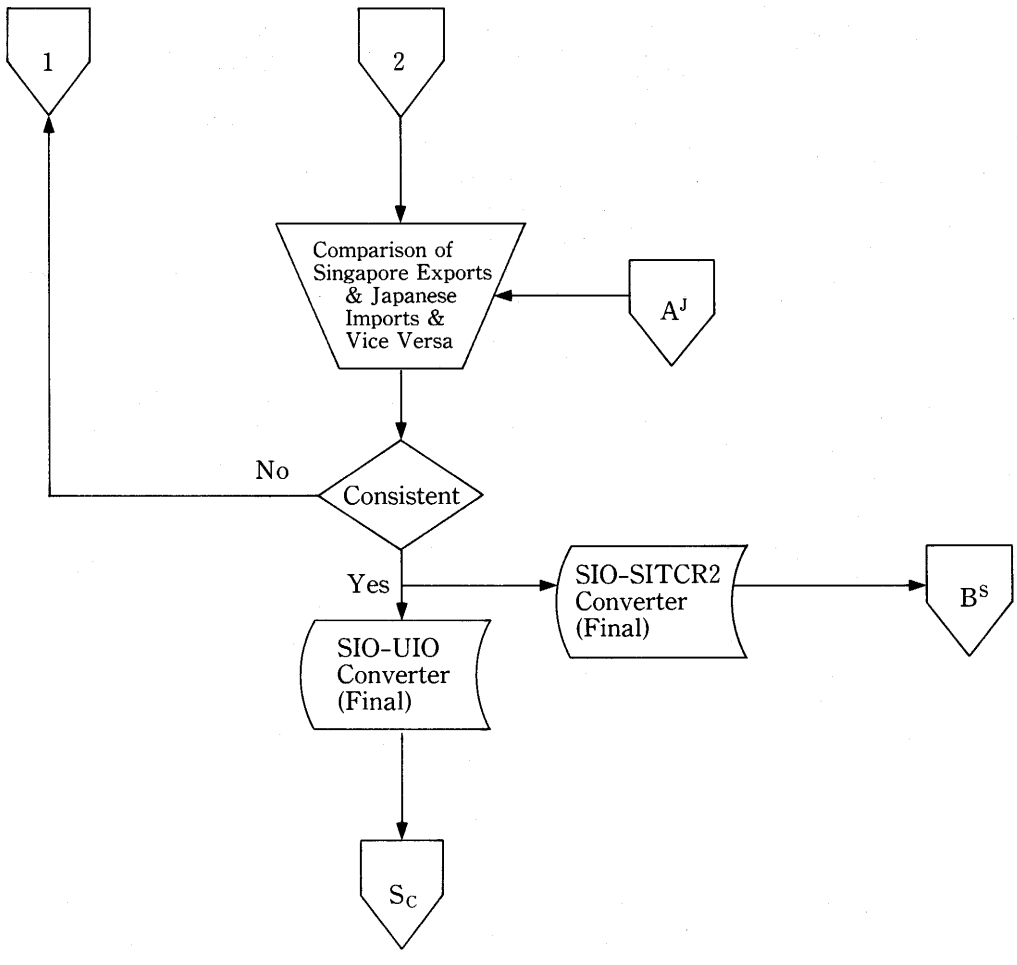
[2]NUS and IDE, *Report for Special Survey on Imported Component of Input in Singapore*, Asian International Input-Output Series No. 9 (Tokyo: IDE, 1989)

Flow Chart

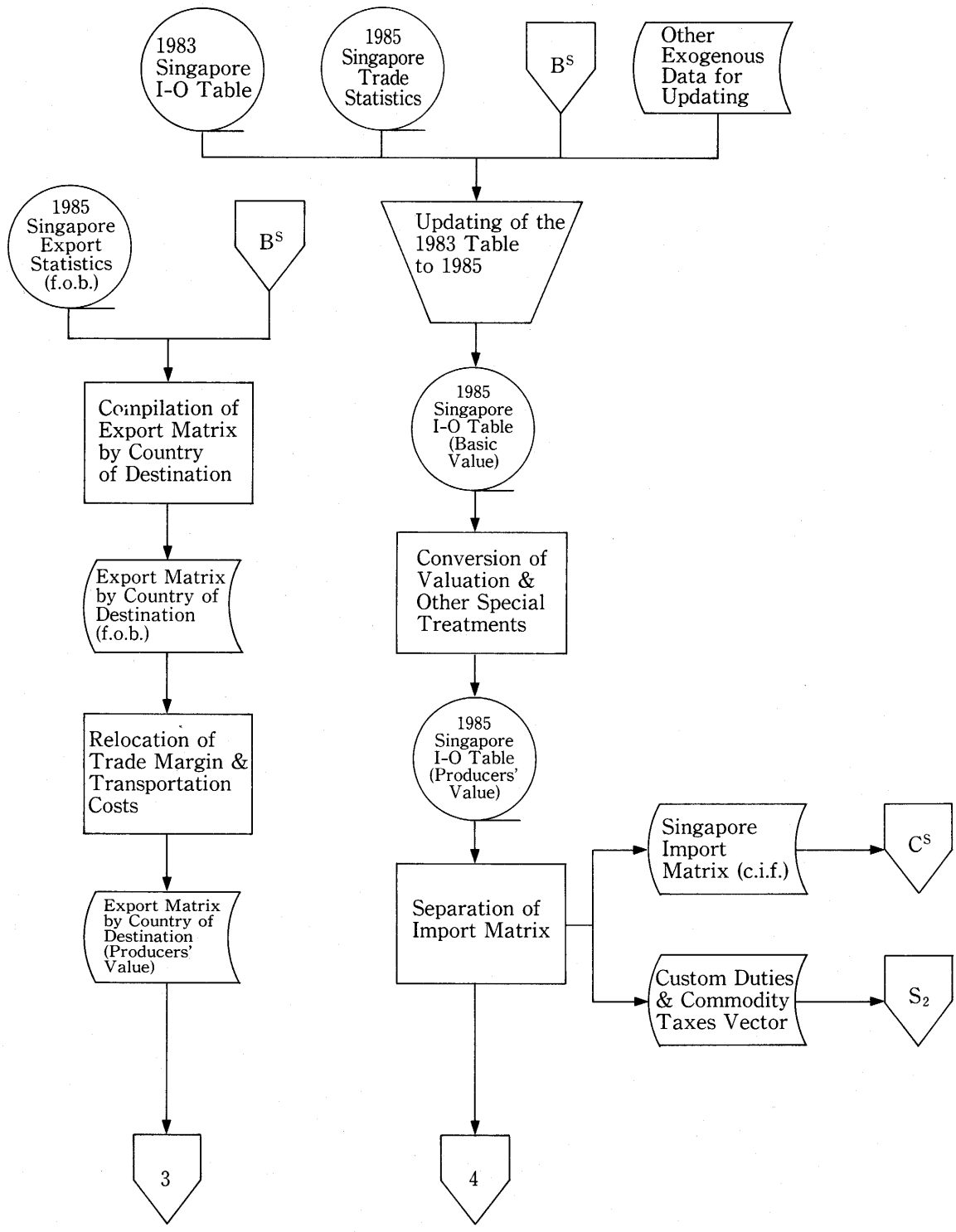
1. Work on Singapore Data

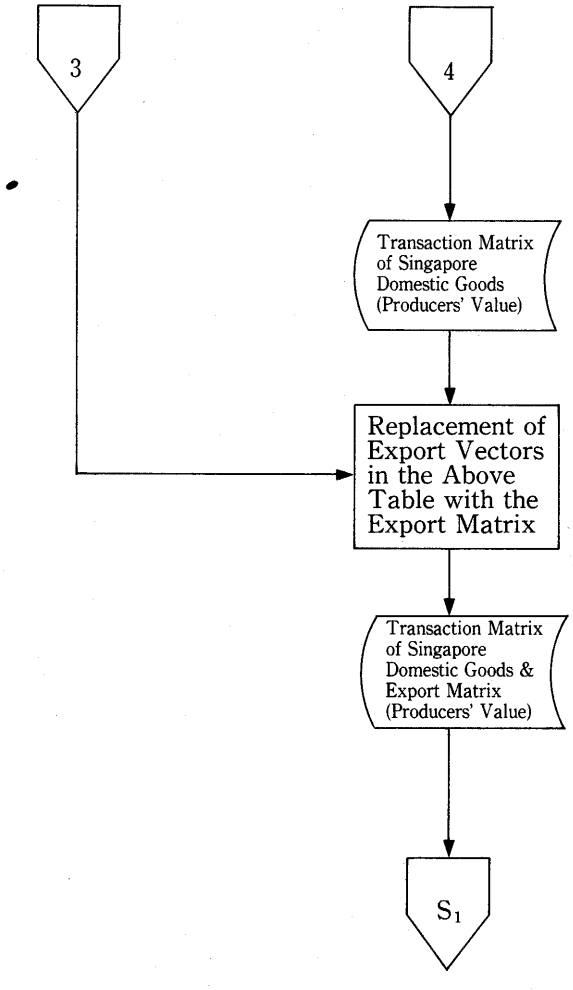
1-A Construction of Singapore Converter System



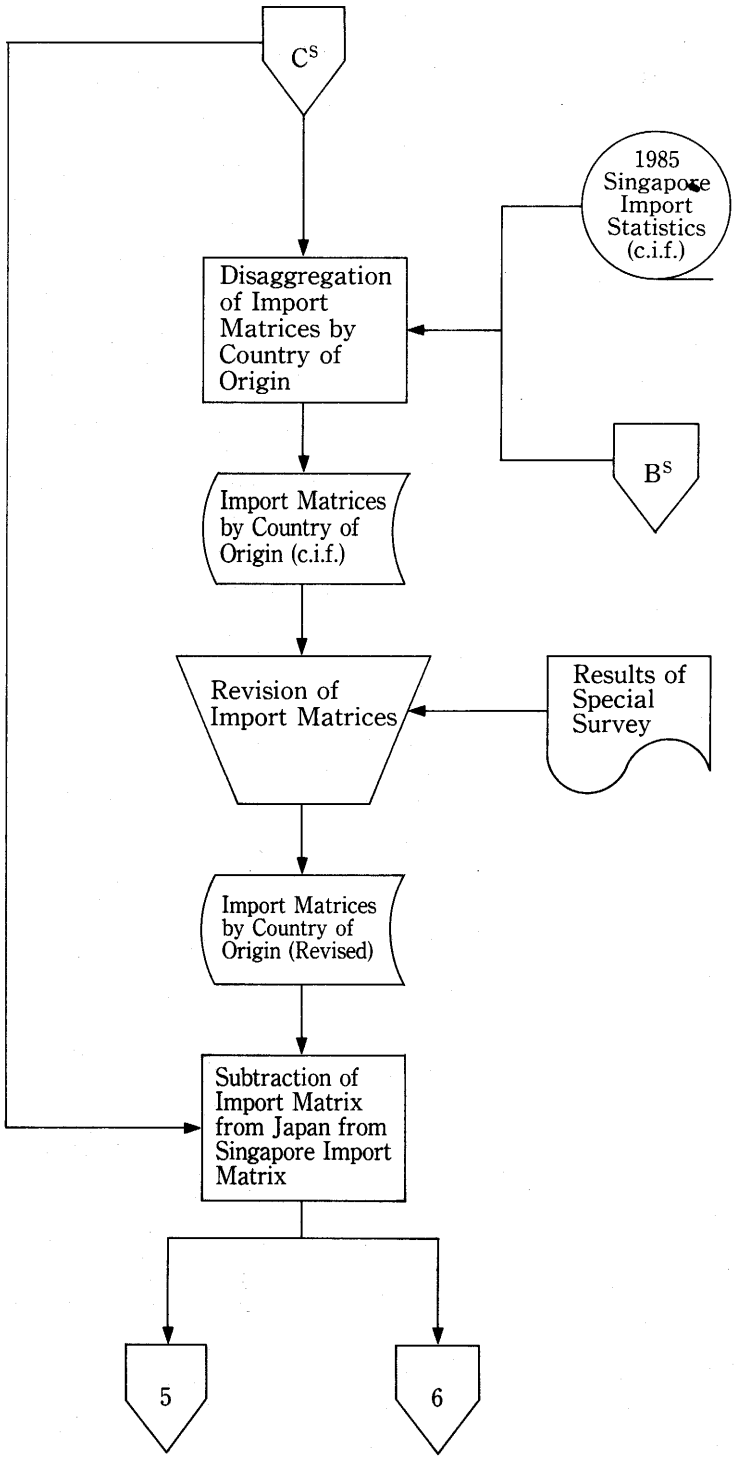

1
2
Comparison of Singapore Exports & Japanese Imports & Vice Versa
A^J
No
Consistent
Yes
SIO-SITCR2 Converter (Final)
B^S
SIO-UIO Converter (Final)
S_C

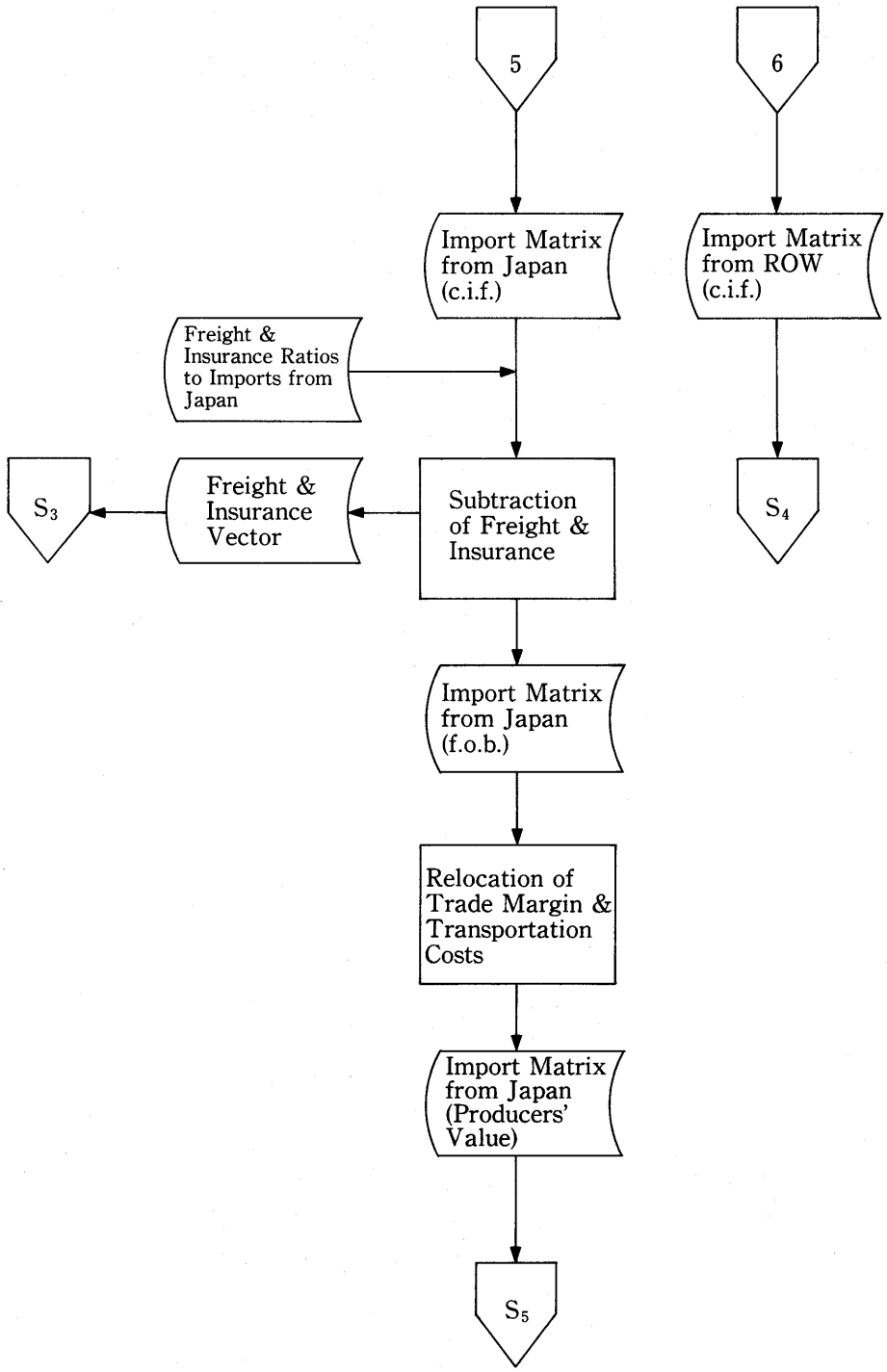
1-B Work on Singapore Input-Output Table




3
4
Transaction Matrix of Singapore Domestic Goods (Producers' Value)
Replacement of Export Vectors in the Above Table with the Export Matrix
Transaction Matrix of Singapore Domestic Goods & Export Matrix (Producers' Value)
S1

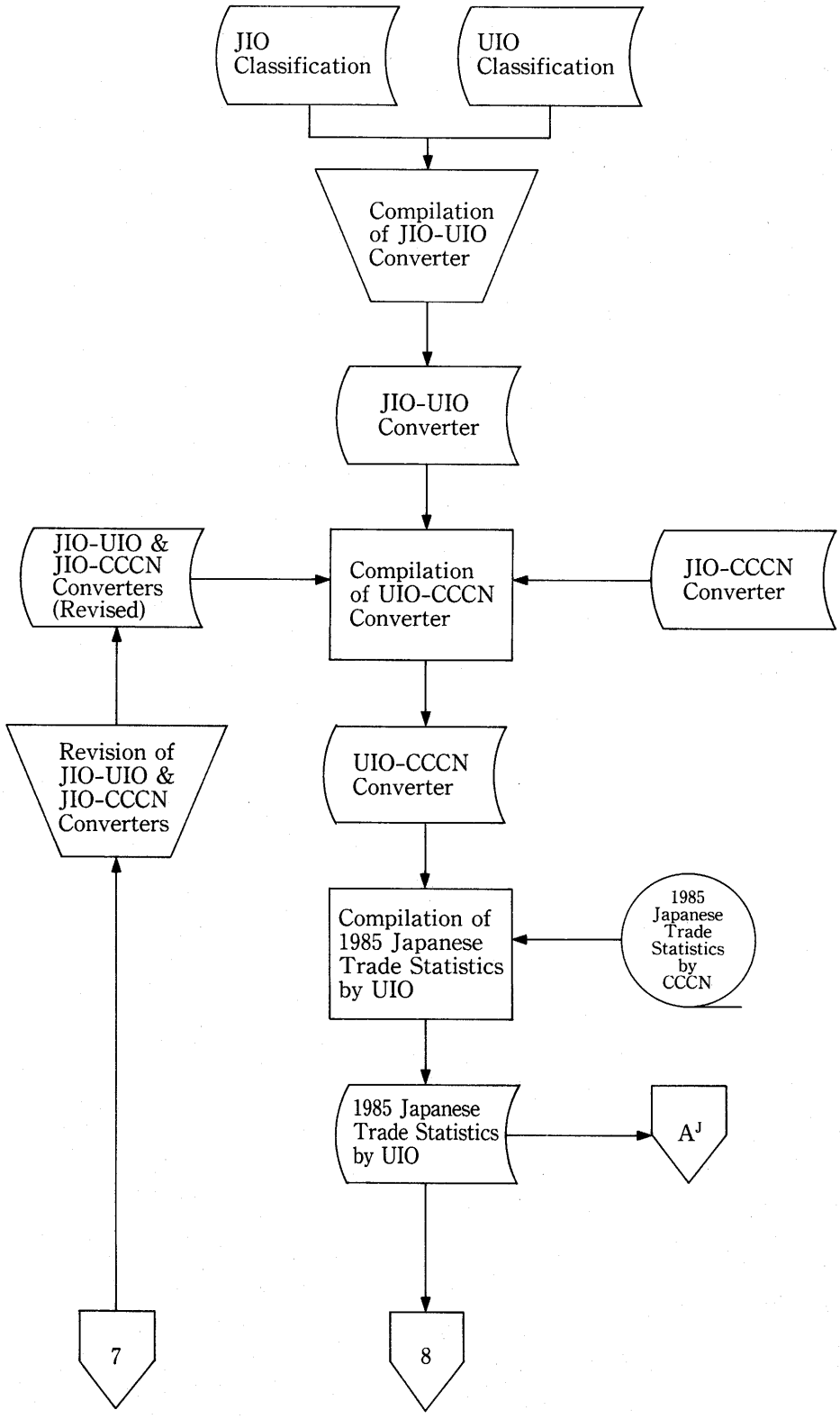
1-C Compilation of Singapore Import Matrix

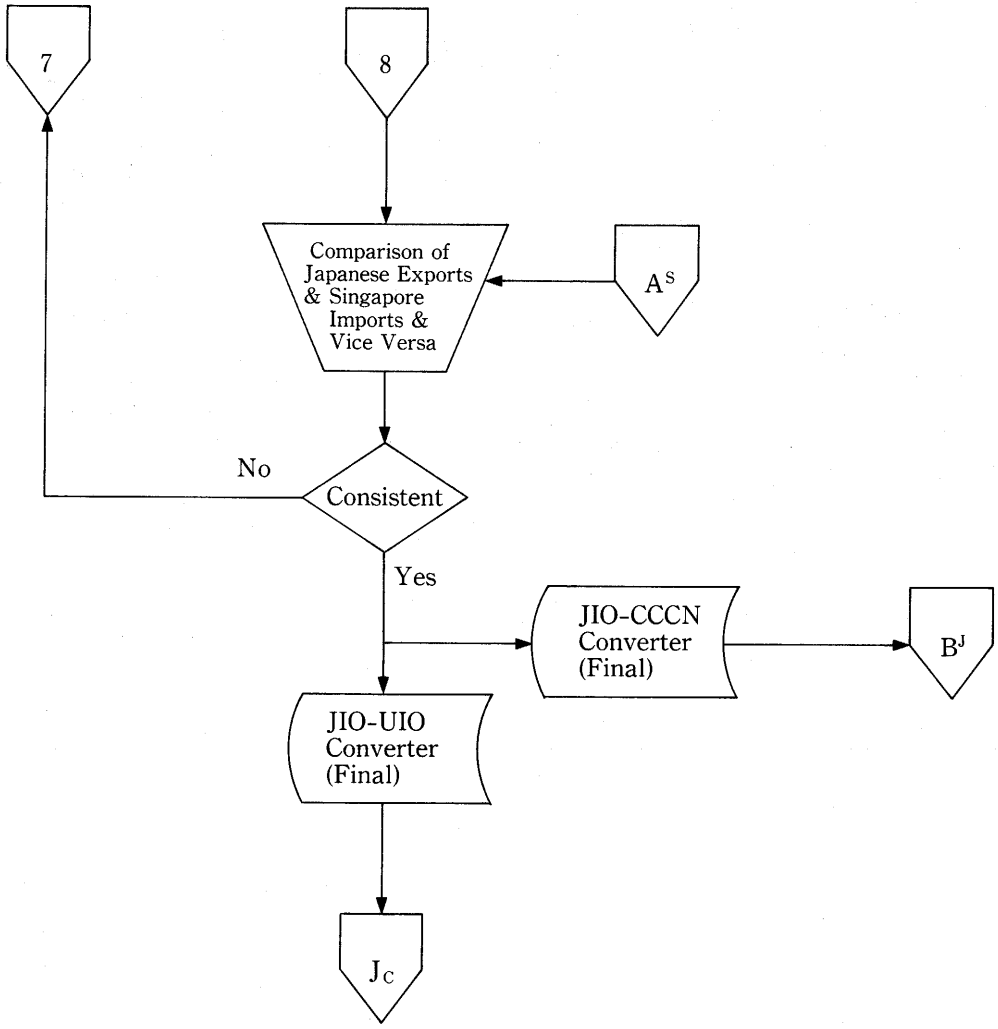



5
6
Import Matrix from Japan (c.i.f.)
Import Matrix from ROW (c.i.f.)
Freight & Insurance Ratios to Imports from Japan
S3
Freight & Insurance Vector
Subtraction of Freight & Insurance
S4
Import Matrix from Japan (f.o.b.)
Relocation of Trade Margin & Transportation Costs
Import Matrix from Japan (Producers' Value)
S5

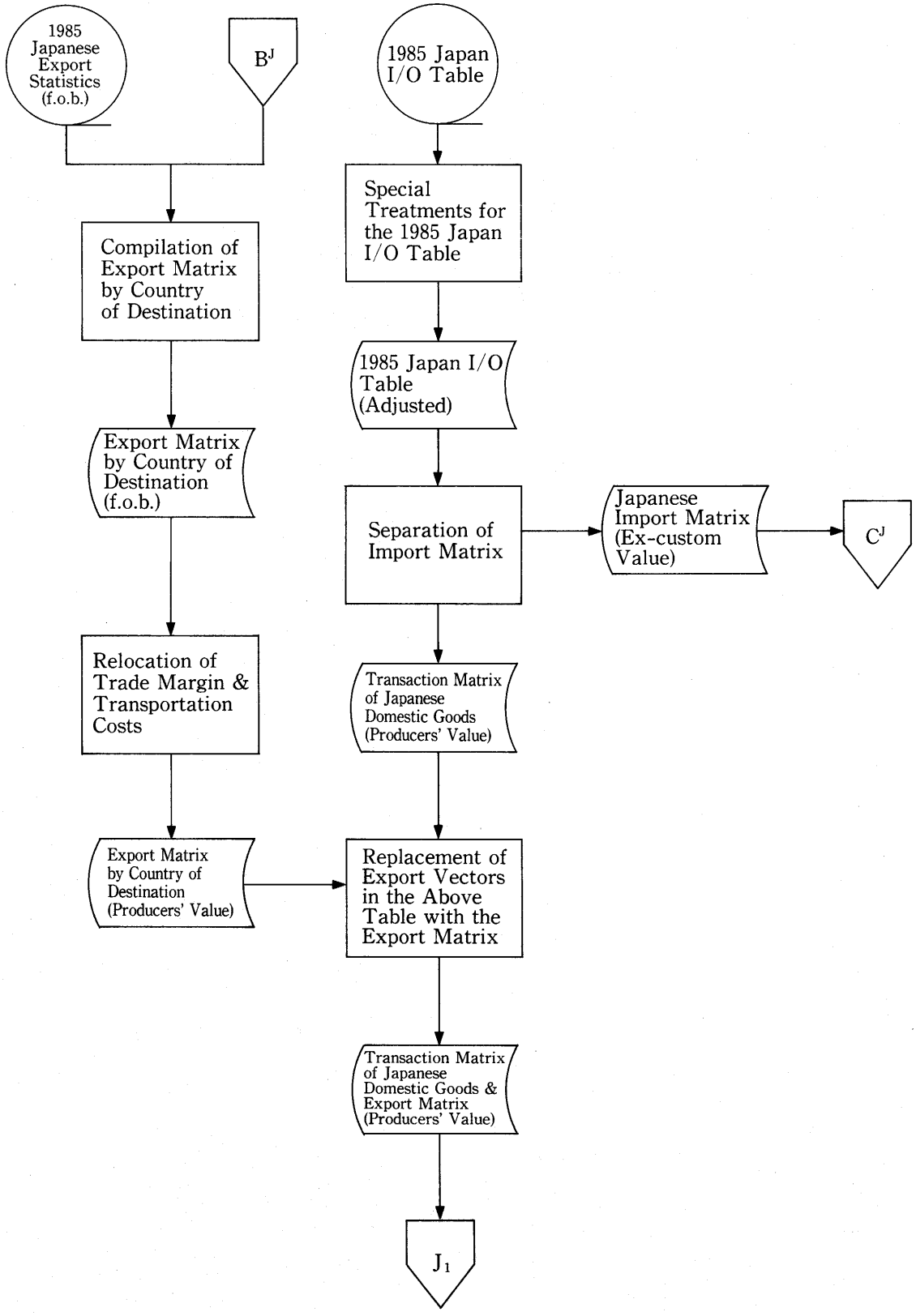
2. Work on Japanese Data

2-A Construction of Japanese Converter System

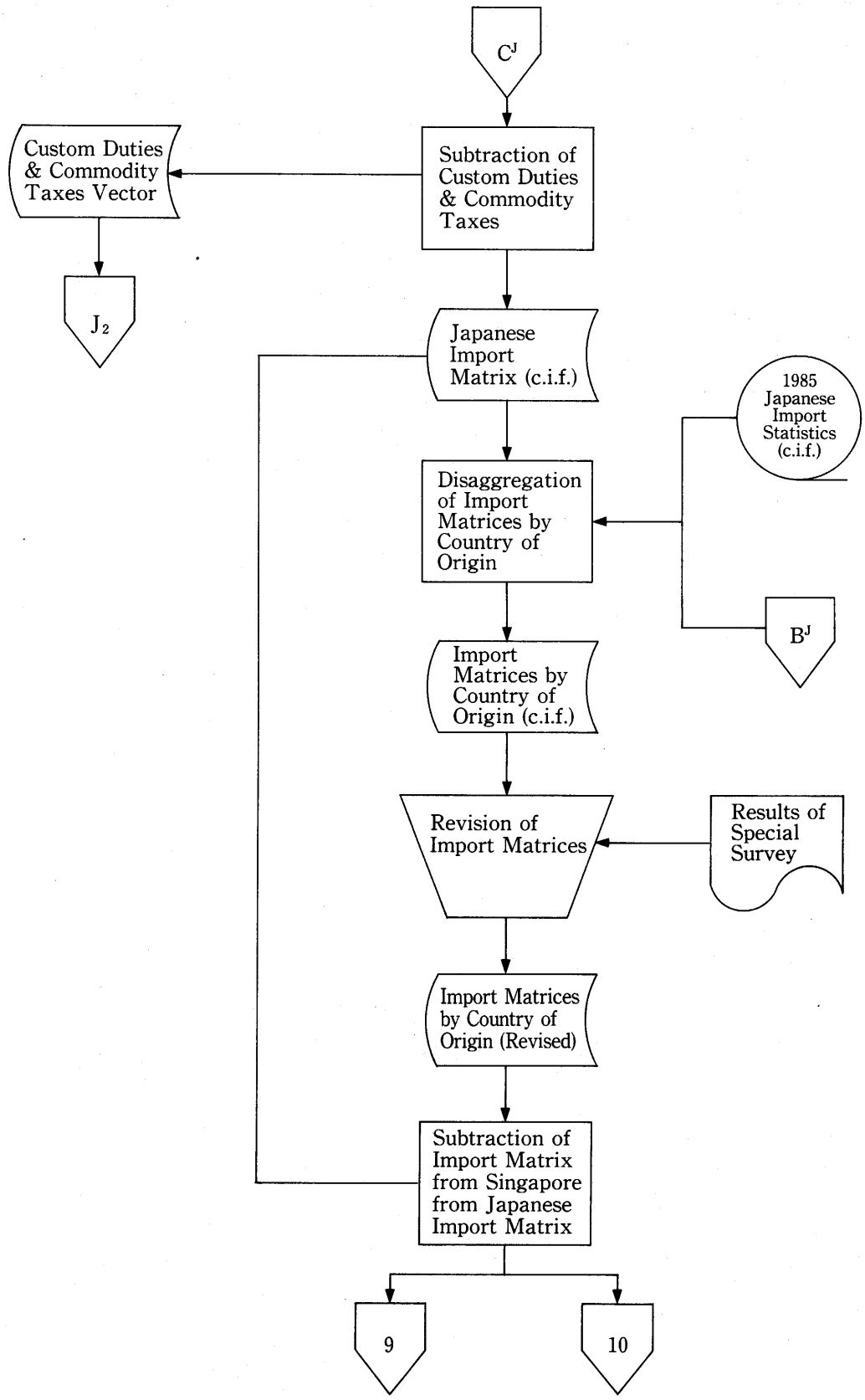


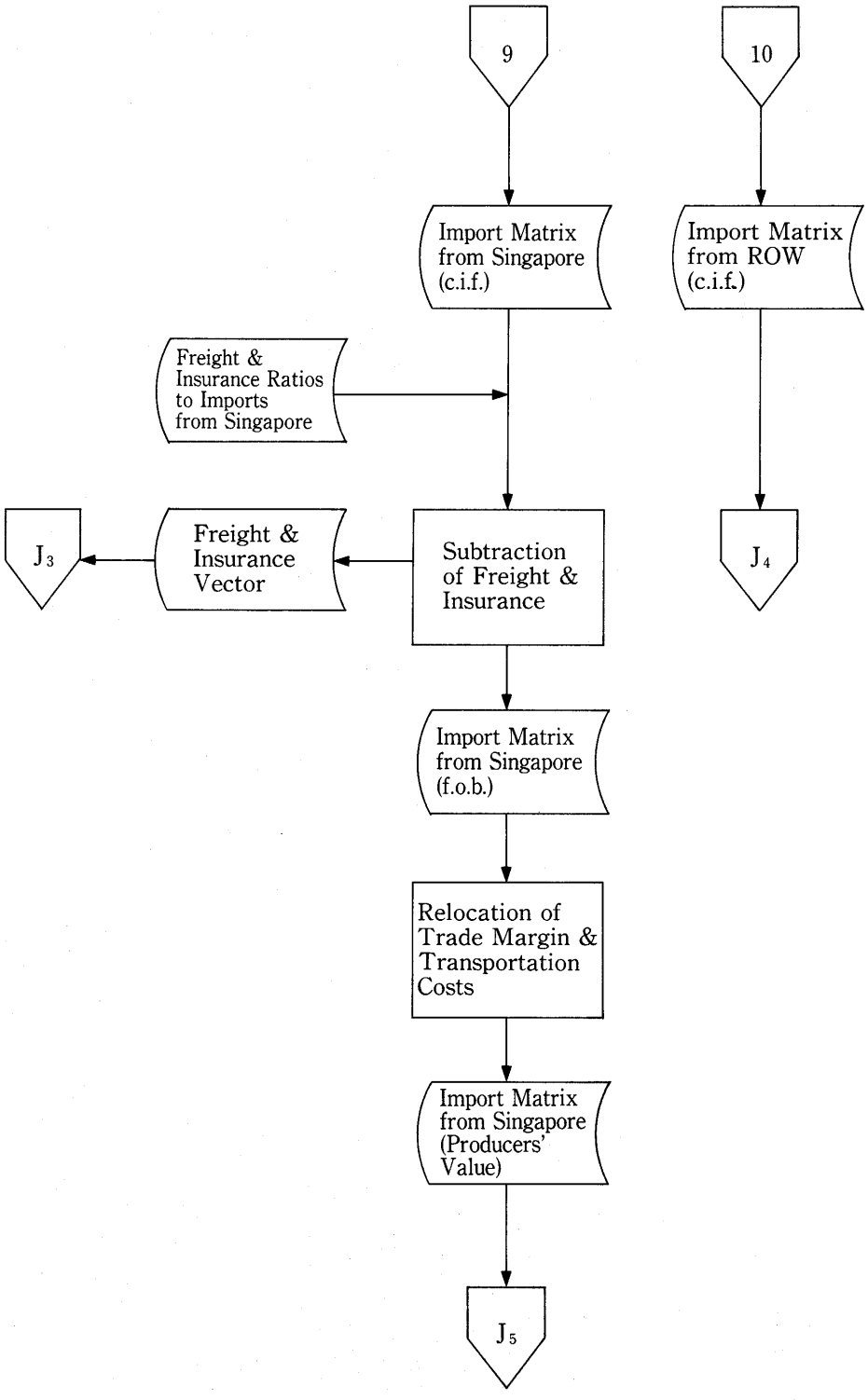

7
8
Comparison of Japanese Exports & Singapore Imports & Vice Versa
A^S
No
Consistent
Yes
JIO-CCCN Converter (Final)
B^J
JIO-UIO Converter (Final)
J_C

2-B Work on Japanese Input-Output Table

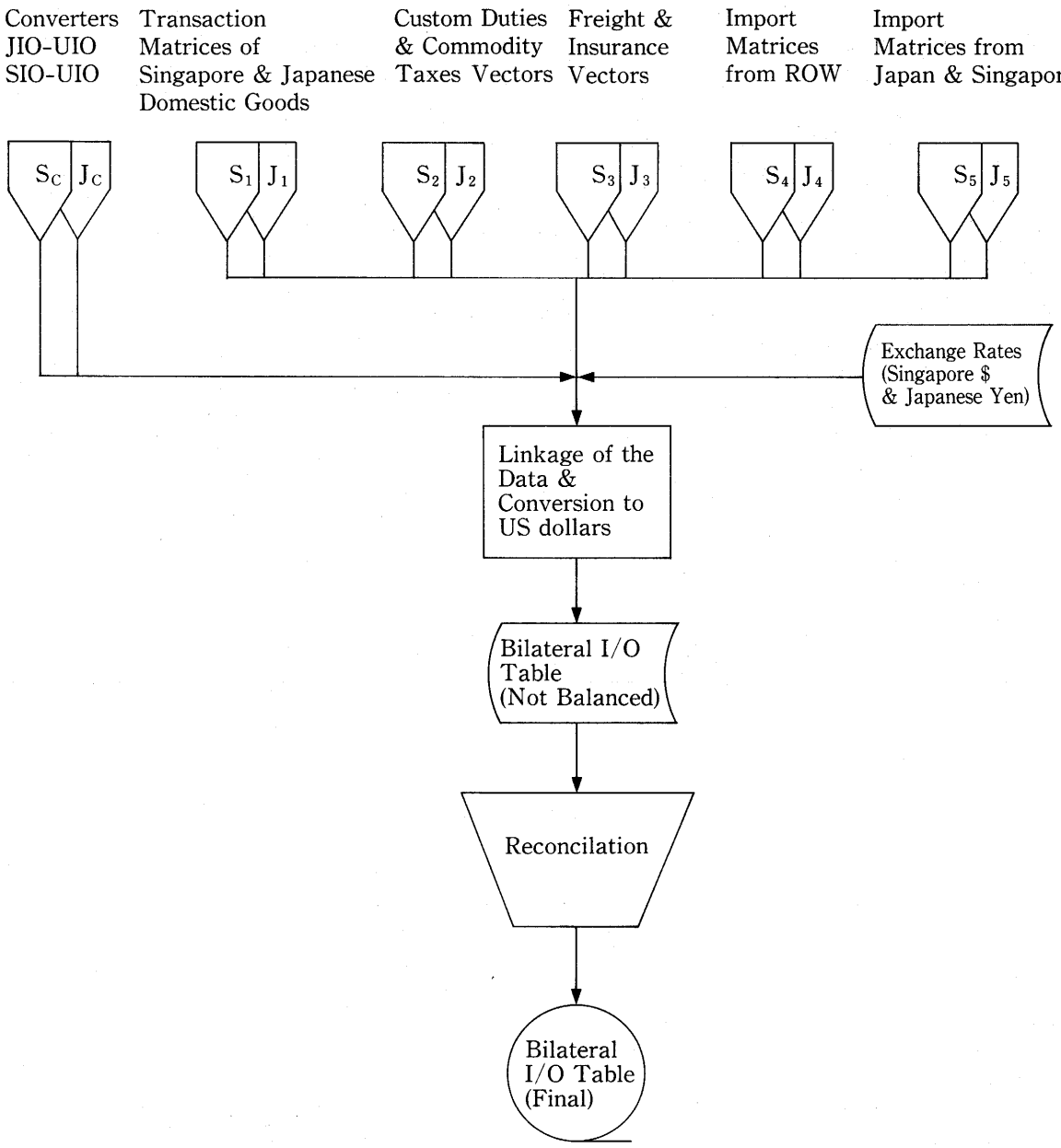


2-C Compilation of Japanese Import Matrix




9
10
Import Matrix from Singapore (c.i.f.)
Import Matrix from ROW (c.i.f.)
Freight & Insurance Ratios to Imports from Singapore
J3
Freight & Insurance Vector
Subtraction of Freight & Insurance
J4
Import Matrix from Singapore (f.o.b.)
Relocation of Trade Margin & Transportation Costs
Import Matrix from Singapore (Producers' Value)
J5

3. Linkage of the Data



Note: The data linked in the process shown above compose the bilateral I/O table in Table 1 as follows.

$S_1 = A^{SS} + F^{SS} + L^S + V^S + X^S$
$J_1 = A^{JJ} + F^{JJ} + L^J + V^J + X^J$
$S_2 = D^S$
$J_2 = D^J$
$S_3 = B^S$
$J_3 = B^J$
$S_4 = A^{WS} + F^{WS}$
$J_4 = A^{WJ} + F^{WJ}$
$S_5 = A^{JS} + F^{JS}$
$J_5 = A^{SJ} + F^{SJ}$

CHAPTER 2. METHODOLOGY

2.1 Sector Classification and Converter System

The 1985 Singapore-Japan international input-output table was compiled by linking the 1985 input-output tables of Singapore and Japan through the Uniform Input-Output Sector Classification (UIO). The UIO is composed of 127 sectors. Each corresponds to both the Singapore and the Japanese input-output sectors: the Singapore and the Japanese domestic input-output tables have 175 row and 176 column sectors and 529 row and 408 column sectors, respectively.

In addition to the basic table, two aggregated tables, consisting of 7 and 66 sectors respectively, are also provided.

The converters developed for the project are as follows;
(1) UIO - Input-Output Sector Classification of Singapore
(2) UIO - Input-Output Sector Classification of Japan
(3) UIO - Trade Classification of Singapore(SITCR2)
(4) UIO - Export Classification of Japan (CCCN)
(5) UIO - Import Classification of Japan (CCCN)
(6) UIO - Aggregated UIO (7 and 66 sectors)

2.2 Valuation in Common Currency

The 1985 Singapore-Japan international input-output table is valued at a common currency of US dollars. The exchange rates applied were 2.2002 Singapore dollar/US dollar and 238.54 yen/US dollar, which were calculated by averaging the monthly 1985 exchange rates (derived from *International Financial Statistics, January, 1989*, International Monetary Fund).

2.3 Special Treatments for the Japanese Input-Output Table

Since the Singapore and the Japanese input-output tables do not necessarily match each other in regard to format and concept, it was necessary to make adjustments. For this purpose, both the concept and format of the Japanese table were adjusted in the following ways:

(1) Business Consumption

Business consumption has its own sector in the Japanese input-output table, though it is not separated from the others in the Singapore table. Therefore, the column and row for business consumption in the Japanese table were removed by distributing them proportionally (based on the compositions of the row and the column) to each element of the matrix.

(2) Bank Service Charges

In the Japanese table, bank service charges are distributed to the intermediate transactions only, but they are not in the Singapore table. Therefore, portions of these were distributed to the final demand sectors based on the financial data.

(3) Dummy Sectors

In the Japanese table, the self-consumption activities, such as self-education, are separated from their main activities and have their own dummy sectors. Therefore, these dummy sectors were removed by distributing them proportionally (based on the compositions of the rows and the columns for the dummy sectors) to each element of the matrix. Another sector which is provided with a dummy sector in the Japanese table is office supplies, and it was removed in the same way.

(4) Scraps and By-products

The Japanese table deals with scraps and by-products by the Stone method, which caused negative input figures in the Japanese table, whereas the Singapore table does so based on "A System of National Accounts" so that it has no negative input figures. Therefore, the scraps and by-products of the Japanese table were dealt with in a way similar to the treatment that the Singapore table received.

2.4 Special Treatments for the Singapore Input-Output Table

The Singapore table was compiled closely following the concepts and principles advocated by the United Nations in their "A System of National Accounts" (SNA) and "Input-Output Tables and Analysis". Therefore, the following treatments were done in a special way on the Singapore table in order to convert its format and concept to those of the bilateral table:

(1) Imputed Bank Service Charge

In the Singapore table, the imputed bank service charge is separated from other bank service charges and has its own sector (column only). Therefore, it was necessary to distribute it in the row (intermediate transaction only) of the Banking Sector and, at the same time, deduct the same amounts from the operating surplus of the corresponding sectors. The distribution of the imputed bank service charge was done based on the share of each sector's value added.

(2) Conversion of Valuation

In the Singapore table, all inputs and outputs are valued at basic value. Therefore, in order to convert its valuation from basic value to producers' value, commodity taxes on output were distributed to each element of the matrix (based on the input structure of each sector).

2.5 Compilation of the Export Matrices

In order to change the format of the export section, the columns of ordinary exports were replaced by the export matrices (SIO or JIO x country of destination) which were compiled based on the 1985 Singapore and Japanese export statistics. At the same time, the valuation of the export matrices was converted into producers' value (from f.o.b.) by relocating the trade margin and the transportation costs. In the export matrices, the columns for special exports and direct purchases (export) were merged into the exports to the rest of the world column.

2.6 Compilation of the Import Matrices

Four kinds of import matrices, which cover both intermediate transactions and final demand, were compiled in order to link the domestic input-output tables, namely: (i) Singapore x Japan, (ii) ROW x Japan, (iii) Japan x Singapore, and (iv) ROW x Singapore. The compilation methods are discussed below, with an example of the import matrices for Singapore.

(1) Compilation of the Import Matrices Based on the Import Statistics

First, import matrices by country of origin were compiled by disaggregating the original import matrix into ten countries or regions - Japan, China, Indonesia, Korea, Malaysia, Taiwan, the Philippines, Thailand, the U.S.A., and ROW - on the basis of the 1985 Singapore import statistics.

The formula applied here was:

$$M_{ij}^{\alpha} = M_{ij} \times (M_i^{\alpha} / M_i)$$

where: M_{ij}^{α} = Singapore import matrix from country α

M_{ij} = Singapore import matrix (original)
M_i^{α} = imports of commodity i from country α
M_i = Total imports of commodity i ($= \sum_{\alpha} M_i^{\alpha}$)
(both M_i^{α} and M_i were obtained from the import statistics)

In other words, it was assumed that all of the goods imported to Singapore were distributed to each sector in the same proportion ($=M_i^{\alpha}/M_i$), regardless of the column sector in Singapore. As for the valuation, these matrices are valued at c.i.f. because they were obtained from the import statistics (also valued at c.i.f.).

(2) Revision of the Import Matrices Based on the Results of the Special Survey

Since the import matrices obtained above do not contain any surveyed data, the results of the special survey were used to increase the reliability of the table. The special survey conducted by NUS provided information on the ratios for the use of the imported goods from a specific country ($= M_{ij}^{\alpha} / M_{ij}$) for each column sector; on the other hand, the survey conducted by MITI gives information on the proportion by which imported goods from each country were distributed to a specific column sector ($= M_{ij}^{\alpha} / M_i^{\alpha}$). Therefore, the import matrices were revised based on this surveyed data, and then were balanced manually again.

(3) Compilation of the Japan x Singapore and ROW x Singapore Import Matrices

The import matrix from Japan obtained in (2) was first subtracted from the original import matrix of the Singapore domestic input-output table, and then the remainder became the import matrix from the rest of the world. Second, the valuation of the import matrix from Japan was converted into f.o.b. value (from c.i.f.) by subtracting the freight and insurance ($=$ the freight and insurance ratio on imports from Japan times the import value from Japan). Finally, the valuation of the import matrix from Japan was further changed into producers' value by relocating the trade margin and the transportation costs (see Flow Chart 1-C).

The import matrix from Japan and the import matrix from ROW were obtained from the above process, with a final valuation of producers' value and c.i.f., respectively. Moreover, imports of services from Japan are contained in the import matrix from ROW, because the import matrix from Japan was originally compiled from the Singapore import statistics which covered the imports of goods only, so the imports of services from Japan were still left in the import matrix from ROW.

2.7 Data on Freight and Insurance

In order to compile the import matrix from the partner country, it was necessary to estimate the freight and insurance ratios to the imports from the partner country (see 2.6 (3)). For this purpose, NUS estimated these ratios from the relevant publications and IDE estimated them based on interviews and the publications of the Japan Maritime Research Institute[1].

2.8 Statistical Discrepancies

Statistical discrepancies were generated in the compilation process. Column-wise discrepancies were thought to be due to rounding errors and were merged into the operating surplus (VV002). Row-wise discrepancies were more complicated. The possible reasons for this were the gap in value between the trade statistics of the two countries, the mismatch of classifications between the two countries, the gap in value between the trade statistics and the domestic input-output tables, rounding errors, etc. All of the row-wise discrepancies were put into the QX001 column.

[1] Japan Maritime Research Institute, *Compilation of an Input - Output Table Focused on International Freight Transport* (in Japanese) (Tokyo, Japan Maritime Research Institute, 1988)