# Image Cover Sheet

| CLASSIFICATION | SYSTEM NUMBER 503831 |
| --- | --- |
| UNCLASSIFIED | |

**TITLE**

ISSUES IN INPUT-OUTPUT MODELLING

**System Number:**

**Patron Number:**

**Requester:**

**Notes:**

**DSIS Use only:**

**Deliver to:** FF

DEPARTMENT OF NATIONAL DEFENCE

CANADA

OPERATIONAL RESEARCH AND ANALYSIS ESTABLISHMENT

DIRECTORATE OF SOCIAL AND ECONOMIC ANALYSIS

DSEA STAFF NOTE 10/91

# ISSUES IN INPUT-OUTPUT MODELLING

BY

G.A. PETERSON



OTTAWA, CANADA SEPTEMBER 1991

**Abstract**

This note is the third and final in a series of staff notes which discuss Input-Output modelling and various issues associated with building such a model in DSEA. The note outlines a suggested prototype of an I-O model for use within DSEA as well as discuss some conceptual issues regarding I-O models.

**Résumé**

Cette note est la troisième et dernière d'une série portant sur la modèle de Léontieff et diverses questions relatives à la construction de ce type de modèles à la DASE. La note donne un aperçu d'un prototype du modèle de Léontieff à être exploité par DASE. On y discute aussi les problèmes conceptuels associés à ces modèles.

**TABLE OF CONTENTS**

**INTRODUCTION**

1. A priority of the economics group within DSEA is to acquire the capacity, in house, to perform empirical analysis using an input-output (I-O) model. To achieve this, various issues have to be resolved. This paper is the third in a series that examines using I-O modelling in the study of the impact of defence expenditure.[1]

2. This note considers three different issues in the use of the I-O model. First, the note proposes a structure for an open I-O model at the national level, using impact matrices provided by Statistics Canada (STC). It then examines the validity of the data contained within STC's 1987 I-O tables. Finally, a summary is made of reasons for not using the closed version of the I-O model, along with implications and alternatives for DSEA.

**THE PLAN**

3. This section considers the type of inputs and outputs that DSEA would expect from its model. This includes data entry and a selection of tables to be produced. The terms of reference for this section are from the previous DSEA model (hereafter referred to as the old model). The output suggested below is based upon the output of the open version of the old model. Suggested flowcharts can be found in Annex A to this note.

Data Input

4. The proposed DSEA model will begin with a data entry subroutine. There are two major types of projects that DSEA may

---

[1] See G.A. Peterson, "A Review of the Use of Input-Output Modelling in Studies of Defence Expenditure," DSEA Staff Note 4/91, Ottawa: DND, May 1991, and "A Cost Effectiveness Study of Input-Output Modelling in DSEA," DSEA Staff Note 7/91, Ottawa: DND, July 1991.

encounter. The first is a single impact study, where results of a single expenditure vector may be required. The second may be comparisons between two different projects where the difference in output between the two different projects would be desired.

5. The proposed subroutine begins with an interactive data entry process. For analysis of the single expenditure vector, the computer would prompt for an I-O commodity code (IOCC) as well as the dollar value of inputs for the project. After all of the inputs are entered, the data must be sorted by IOCC. In addition, this subroutine would have to "fill out" the vector of final demand, creating a 602 length commodity vector so that the vector will be of commodity length, by giving a value of zero to those elements that have no specified entries. This is to ensure that the matrix multiplication can be performed.

6. For a comparative analysis between two different projects, the computer would prompt for an IOCC and dollar values of inputs for projects 1 and 2. As above, the data would have to be sorted by IOCC and then "filled out" to 602 commodities and made to be net of leakages. When this is done, the computer should calculate the difference of the inputs between the two projects and then calculate the impact of this difference.

7. Also, at this stage, leakages for imports, changes in inventories and government production would be entered and margins distributed. This requires the use of leakage and margin coefficients obtained from STC and retrieved from a file. Finally, the adjusted vector of final demand and the vector for imports, change in inventories and government production would be stored on a hard drive to be retrieved when tables are required.

Total Output by Industry

8. Determination of the total output by industry must be

executed, regardless of the choice of the user (from the menu of options). As such, this stage of the program is executed immediately after the final demand vector has been entered by the user. The data input from above must be post-multiplied by the impact matrix $(I-BD)^{-1}D$. This produces total output by industry. It should be saved on the hard drive.

Final Output by Commodity

9. The calculation of output by commodity must then be executed, although the printed output would be optional. Therefore this stage should be executed immediately after the data have been entered. The commodity dimension impact matrix must be read from a file. Then the data input, net of all leakages, must be post-multiplied by the impact matrix $(I-DB)^{-1}$. The result of this procedure will be a vector of final demand by commodity. This should be saved in a file.

Menu of Options

10. The running of the model requires some sort of control mechanism to determine the type of output that is required by the user. There are two different approaches that could be used. The first option would provide the user with a list of outputs from which to choose the output required. The second approach is to use the menu to act as an interactive pointer such that the menu would ask for one particular option, execute that option and then return to the menu for additional instructions.

11. This part of the program controls the execution of various subroutines. It displays the different options for the user and prompts the user to make a selection. Once the option has been selected, the subroutine is executed and the menu asks the user if he wants to make another selection. If "yes" then the program

should re-display the options. If "no" then the program should end.

12. The options open to users should include:

(1) edit final demand vector
(2) print total output vector by industry
(3) print total output vector by commodity
(4) list final demand vector and leakages
(5) income account summary
(6) total endogenous employment
(7) expenditure account

Edit Final Demand Vector

13. If this option is chosen, then the program would move back to the data input stage. The computer prompts for an IOCC as well as a value for the final expenditure. As before, the data would have to be sorted by IOCC and arranged as a 602 length commodity vector.

14. After the changes have been made to the final demand vector, the vector must again be made to be net of various leakages (imports, changes in inventories and government production). In a comparative analysis, both commodity vectors, net of leakages, should be calculated. The program would then have to re-generate the vector of total output, by commodity and by industry. All of the data should be stored on a hard drive. After the regeneration of the data, the program should loop back to the menu of options.

Print Total Output by Industry

15. This subroutine retrieves the total output by industry vector, generated above, and prints the vector, either to a printer, the screen, or the hard drive. There should be an option at this level to point out the total output at the L, M or a "modified M" level of aggregation. This "modified M" aggregation would print total output by industry for industries with an output greater than $1

million. All other industries should be aggregated into an "other" category.

Print Total Output by Commodity

16. This subroutine would read the total output by commodity from the hard drive and direct this output towards the printer or screen. This option could print out the leakages by commodity as DSEA will have leakage coefficients from STC.

17. As in the total output by industry, there would be an option to print out this table at the L, M or "modified M" level of aggregation.

List Final Demand Vector and Leakages

18. Under this option, the program would print out a listing of the final demand that had been entered. The print-out should show direct leakages due to imports, inventory and government production. It would also list the total to serve as a check, that the data had been correctly entered. All this subroutine would do is read the generated data from the hard drive, and send the output to the printer or screen.

19. As explained in the list of total output by industry, there should be an option to produce the output at an L, M or "modified M" level of aggregation.

Income Account Summary

20. This subroutine would calculate the income effects arising from the expenditure. The technology matrix should have, in the last seven rows, commodities representing the primary inputs which would be aggregated over all of the different industries. These primary inputs include:

(i) commodity indirect taxes
(ii) subsidies
(iii) other indirect taxes
(iv) wages and salaries
(v) supplementary labour income
(vi) net income from unincorporated businesses
(vii) other operating surplus

21. All of these can be calculated from "primary coefficients" provided by SC. The table produced by this subroutine should list the effect on primary inputs as well as the total (the sum of the primary inputs). In order to execute this subroutine, the vector of final demand by commodity should be read from the hard drive. The "commodities" corresponding to these primary inputs should be displayed in tabular form.[2]

Total Endogenous Employment

22. The additional wages and salaries accruing from the project have already been calculated. This subroutine would import data for job-output (or some other similar) ratios. If the additional wages and salaries to be induced by the expenditure are known, this could be divided by an annual average wage[3] in order to estimate the employment that is created by the project. These ratios would be multiplied by the vector of output by industry to determine the employment effects of the project.

23. This should be an optional entry in the menu. The output should list, by industry:

(i) wages and salaries

[2] At the L level of aggregation, primary inputs include commodities 596 to 602 inclusive.

[3] This can be found in STC, Survey of Employment and Payroll Hours.

(ii) supplementary labour income

(iii) total jobs[4]

The output should be directed to the printer.

Expenditure Account

24. The object of this subroutine would be to split the vector of final demand into domestic production and imports.

25. The vector of final demand (both by industry and by commodity) is net of the various leakages (import, government production and changes in inventory). The sum of these vectors (final demand and total imports) give domestic production. One should be able to determine the sum of domestic and foreign production by dividing total domestic production by one minus the leakage coefficients. The imports can then be determined by multiplying total output by the leakage coefficient.

26. The result would be a table showing domestic final demands, imports and the sum of the two. This should be an aggregate over all industries.

**THE METHODOLOGICAL RETHINK**

27. The I-O model is conceptually designed to determine the direct, indirect and induced economic effects of a particular expenditure, broken down by industry and commodity. This model often exists in an open and a closed version. The open version of the model determines the direct and the indirect effects of a particular expenditure. The closed version of the I-O model also calculates the spin-off or induced effects, taking into account the effects of additional income accruing to households.

[4] Previously, in the old model, estimates were made of unpaid jobs, and this would again be the case.

28. From the earned income, supplementary labour income and income from self-employed workers generated by the open model, the closed model subtracts income taxes and adds transfer payments to determine the income available for consumption purposes. Using an estimate of the marginal propensity to consume (MPC), the model calculates the consumption of goods and services and treats it as a new spending project. This is an iterative process and would last until the leakages exhaust the initial impact.

29. This "closed" model of STC is in fact only "partially closed to consumption," that is, it is closed only with respect to consumer goods and services. The model is not closed to capital flows as these are treated as leakages, and accordingly, the estimated multiplier will be understated. Nevertheless, the higher the salary share of the impact, or of the estimated MPC, the relatively higher will be the spin-off effects and hence the estimated multiplier.

30. In assessing the reliability of this closed model, STC identified five problems. These problems led to a methodological rethink that resulted in STC removing the closed model from their product line. Listed below are these identified problems and their implications for DSEA.

Static Model

31. The I-O model is static. One of the main raisons d'etre for the closed version of the I-O model was to estimate the Keynsian multiplier for the project. As the model is static, it is not possible to determine the time horizon for the project. With partial closure of the model, it is not known how the impacts are spread over time. The lack of an intertemporal dimension may have serious repercussions in studying an impact of a base where it is likely important to know whether a change of one thousand person-years means 1,000 jobs over one year or 50 jobs over 20 years.

While this is a problem for both the open and the closed model, it is compounded in the closed model due to the increased impact that is calculated.

Partially Closed

32. The partially closed model assumes that spin-off effects are due only to additional income accruing to the household. As such, it ignores three important points. First, income on capital (returns) may increase. Second, if the spending project is large, there will be additional pressure on all factor inputs, leading to capital spending on non-residential construction, machinery and equipment. Finally, the partially closed model fails to consider residential construction that may arise due to increased household income.

33. The partially closed model considers the spin-off effects of only one agent (households) and ignores the effects of the rest. This could be particularly misleading in the case of modelling the defence industrial base (DIB). If the effects of a capital procurement that requires a major re-fitting of factories and equipment are being studied, one would expect the impact of capital expenditures to be high, so that the estimated multiplier arising from the closed I-O model would be too low.

34. Also, with no induced capital spending mechanism, the estimated multiplier will be biased upwards for labour intensive (as opposed to capital intensive) production techniques (as the spin-off effects for capital are not considered). This may likely result in an upwards bias in the multiplier calculated for the impact of a military base or station.

Labour Coefficients

35. It may be misleading using fixed coefficients to evaluate

labour inputs. These coefficients may be overestimated when the economy is not operating at full capacity. Firms may "hoard" labour and other factors to avoid the cost of laying them off and then re-hiring them[5]. Therefore, the increase in demand will lead to an increase in production which in turn will lead to an increase in the working hours of employees, but there would be only limited increases in employment because of existing underemployment of labour.

36. The structure of the I-O model cannot take these adjustments into account. Therefore the estimated value of the employment multiplier will be biased upwards. This problem is acute in using the model during or immediately after a recession. The I-O model assumes full employment of resources. In a time of economic slowdown, this is clearly not the case.

Fixed Propensity to Consume

37. Returning to the assumptions of the I-O model, STC questions the assumption of fixed propensity to consume, that is, households will consume goods in equal proportions. In real life, this varies as a function of the nature of employment, average salary level and economic situation (i.e. paradox of thrift). Therefore, a fixed propensity to consume may produce a bias in the estimated multiplier. As well, capital spending by households (i.e. residential construction) cannot be factored in as it is largely a function of interest rates which are not even considered in this model.

---

[5] The Conference Board has estimated that 80% of firms were operating either slightly or substantially below current capacity for the period of June 1991. This is a cyclical phenomenon that cannot be picked up in the I-O model. The Conference Board of Canada, Index of Business Confidence, July 1991.

## Equilibrium

38. STC finally raises a more fundamental criticism of the I-O model. By virtue of its construction, the I-O model fails to consider other macroeconomic variables and equilibrium relationships. This makes the Keynsian multiplier obtained in the closed form of the model somewhat suspect and more difficult to interpret.

39. For example, consider the study of the economic impact arising from a base. The I-O model will, through some set of job-output ratios, determine the jobs created due to the existence of the base. It is not difficult to imagine the scenario where the expansion of a base results in the increase of capital and labour employed in the community. This should result in a rise in factor prices, in a purely competitive market, as a response to the additional demand for labour. If the factor prices rise, then so should producers prices to reflect the increase in factor prices. The increase in prices will lead to a decline in the demand for final goods which should lead to the reduction of employment of some of the capital and labour employed by the expansion of the base.

40. The I-O model, by nature of its construction, cannot model any kind of crowding out effect described above. The I-O model cannot show that in the real world, factor prices adjust in order to reach a new equilibrium.

## Alternatives to the STC Closed Model

41. With all of these problems facing the closed version of their I-O model, STC decided to drop the closed model from their product line. Rather than to leave the user out on a limb, STC has offered two alternatives to the closed I-O model.

42. The first alternative is to ignore the concerns regarding the use of the closed model and treat the income accruing to the household in the form of wages and salaries, supplementary labour income and income from unincorporated businesses as a separate project. The user would then take these household income results from the open model and run a second simulation. This second run of the model would show the effects of this increased household income.

43. Using this alternative does not address the concerns raised earlier. Therefore, STC suggests that the economic conditions underlying the project be assessed. For example, main industries should be examined to determine whether the increased demand will be met by additional workers or increased productivity. If the increased demand is met by increased productivity the spin-offs would be smaller.

44. It is also suggested that if additional labour is required, the effect on average wage levels must be taken into consideration in the calculation of the MPC. Savings rates will tend to increase during an economic slowdown (paradox of thrift) so it becomes an endogenous variable. Finally, if the project involves transient labour, then employment in the region will not rise and the spin-offs due to additional income would be small.

45. The second alternative suggested by STC is to forego the I-O model as a means of finding the Keynsian multiplier. The user should determine the macroeconomic impact of a project using a more detailed macroeconomic model that could capture different equilibrium relationships in the economy. With the calculation of these relationships, the user could then use the I-O tables to disaggregate the impact into its industry and commodity components.

46. This second alternative, however, has limitations in that it would require a separate model to be either purchased or developed

within DSEA. Therefore this alternative may prove to be rather costly and not readily acceptable.

## CHARACTERISTICS OF DEFENCE INDUSTRIAL BASE - 1987 I-O TABLES

47. The reliability of the I-O model in estimating the economic effects of a particular expenditure is dependant upon the data provided by STC. Of particular importance are the stability of the market shares and technology coefficients over time. In studies of the economic impacts of various procurement projects, the stability of these coefficients in the defence industrial base (DIB) is of particular importance.

48. The reliability of the data is difficult to determine. Examination is relatively easy of some of the industries in the DIB, such as in the shipbuilding and repair industry, where a significant portion of the output goes to the military (ships and boats, military), but becomes more difficult in the electronic equipment industries as well as the aircraft and aircraft parts industries. Data for ammunition and ordinance as well as explosives are suppressed in the L level I-O tables, therefore these commodities and their associated industries cannot be examined.

49. Annex B lists the inputs, outputs and final demands by DND of industries in the DIB, from the 1987 I-O tables.

### Examination of the 1987 I-O Tables

50. Examining the 1987 data on the DIB is an inconclusive exercise. It is difficult to assess the validity of these tables as recent detailed manufacturing statistics are not available. It would be useful to consider the characteristics of the entire set of tables. Even if the impression from the initial examination of

the DIB is good, there may still be flaws in other industries. This would be damaging to the outcome of the entire model.

51. In this section, the interest is in the broader question of the reliability of the data within the tables to determine if the model can be expected to remain stable from year to year.

52. Using the most recent available data from STC, the ratio of wages and salaries to industry output is calculated for the years 1987 and 1988. Thus the labour technology coefficients for these two years can be compared.

53. Out of the 216 different industries at the W level of aggregation, twelve industries had changes in the wage-output ratio greater than +/- 0.030. Increases in the wage-output ratio were greatest in the folowing indistries:

- gold mines
- miscellaneous non-metal mines
- contract textile dyeing and finishing
- power boilers and heat exchangers
- agriculture implement
- inter-urban and rural transit systems.

Decreases in the wage-output ratio were largest in the following industries:

- other metal mines
- shipbuilding and repair
- postal services
- banks
- trust/deposit accepting morgage institutions.

54. These represent small changes, therefore it is suggested that the 1987 I-O tables form an adequate representation of the present day economy for the types of projects that DSEA wishes to analyze. Any modification made to the impact matrices should not have any great effect on the outcome of the model. It is unlikely that the

benefit of obtaining more accurate estimates from information will outweigh the additional cost associated with modifying and re-balancing the I-O tables.

**CONCLUSION**

55. This note undertook to examine three issues in I-O modelling including: a proposed structure of how the model should be run, an examination of the methodological rethink that resulted in the discontinuation of STC's closed version I-O model, and an examination of the I-O data.

56. It is recommended that the I-O model be structured as a menu driven program that would call for a final demand vector, by commodity, calculate the direct and indirect impacts by industry and commodity and produce output according to the choice of the user. Suggested output includes: total output by industry and commodity, list of final demand and leakages, income account summary, total endogenous employment, open model multiplier and expenditure account.

57. Examination of the I-O tables reveal that there are no readily identified modifications required to the tables to solve the types of problems facing DSEA. While there are industries with seemingly different labour markets in 1987 than in 1988, only in shipbuilding and repair are these in the defence industrial base.

**BIBLIOGRAPHY**

Conference Board of Canada. Index of Business Confidence. July, 1991.

LeBreton, M. "An Input-Output Model of the Canadian Economy for DND: An Automated Package." ORAE Project Report 321. Ottawa: DND, 1985.

Peterson, G.A. "A Review of the Use of Input-Output Modelling in Studies of Defence Expenditure." DSEA Staff Note 4/91. Ottawa: DND, May 1991.

_____________. "A Cost Effectiveness Study of Input-Output Modelling in DSEA." DSEA Staff Note 7/91. Ottawa: DND, July 1991.

Annex A
to DSEA Staff Note 10/91
Sept 1991

**ANNEX A: SUGGESTED FLOWCHARTS FOR I-O MODEL**

Figure 1: Main Flowchart

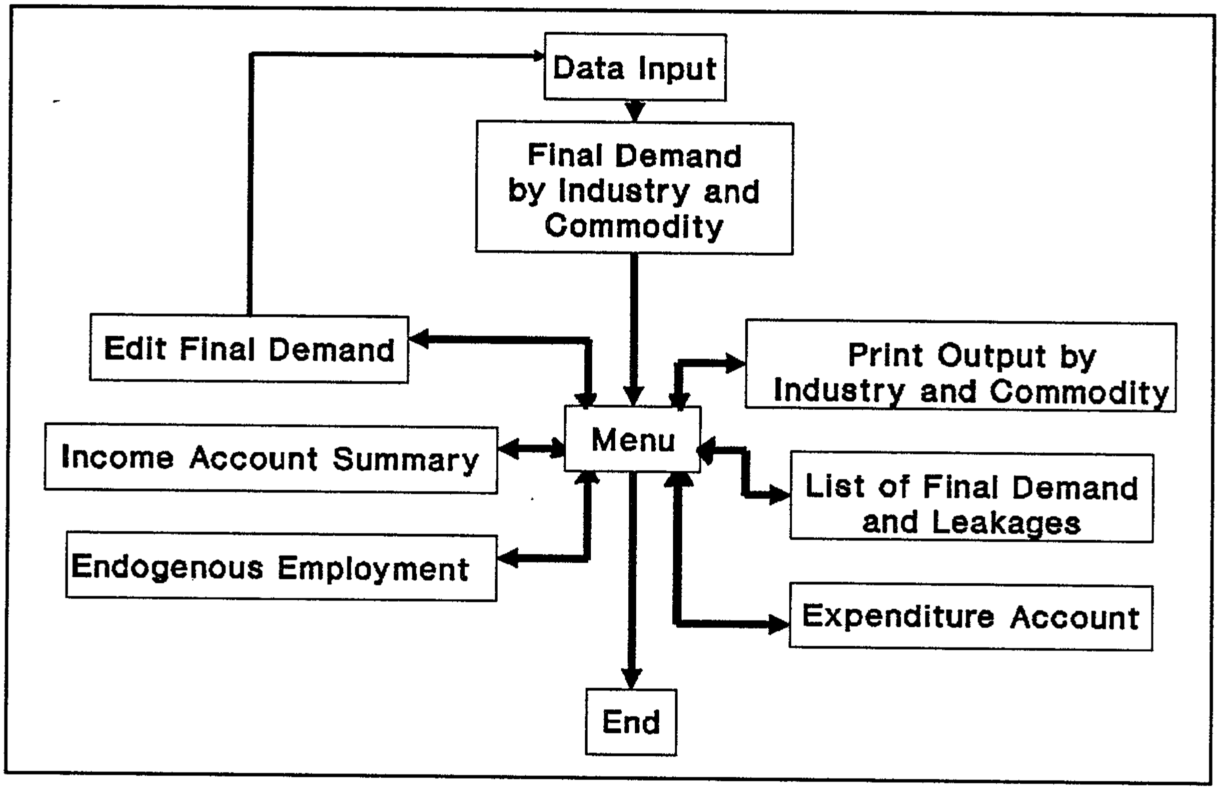


Figure 2: Data Input

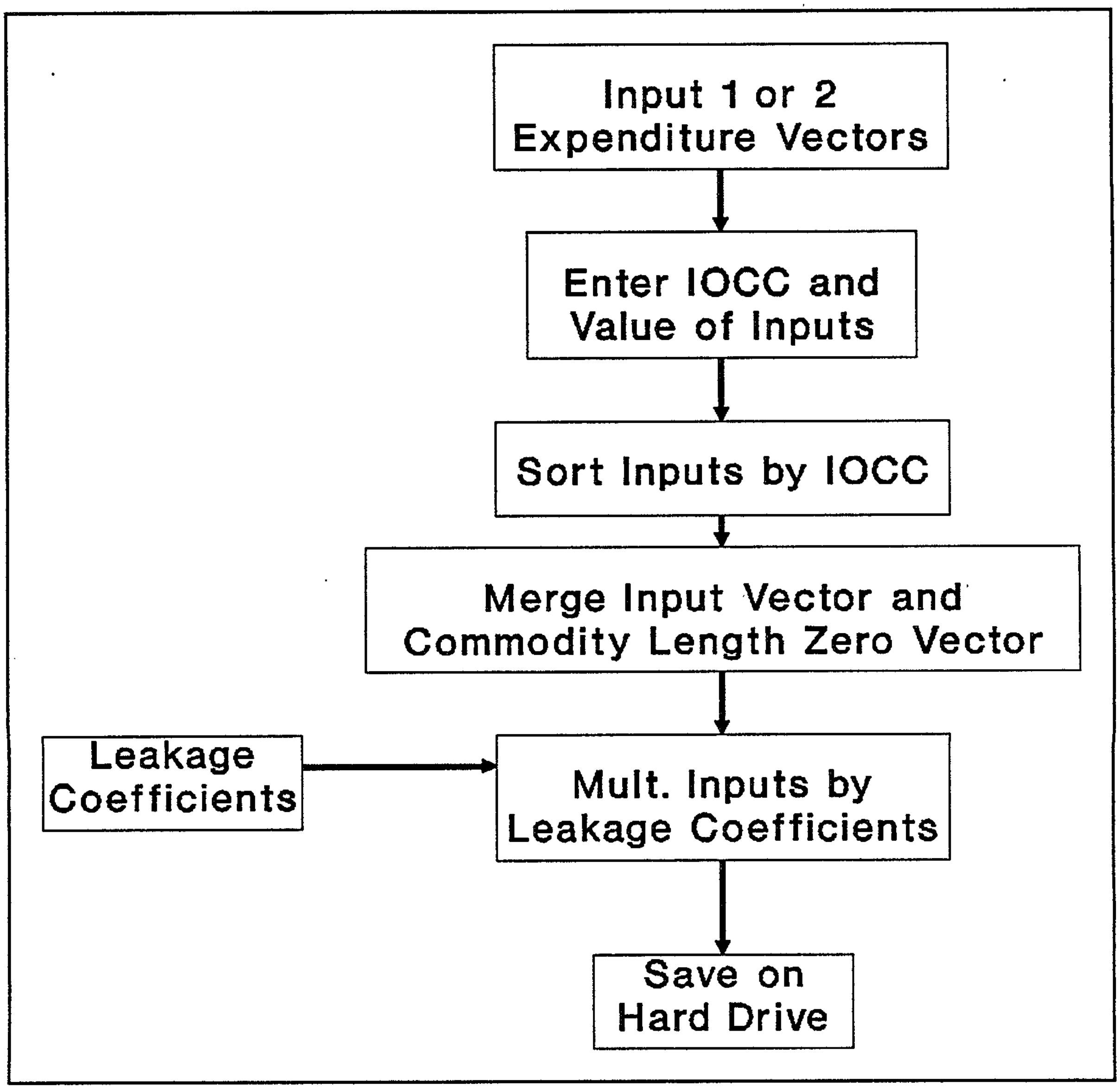
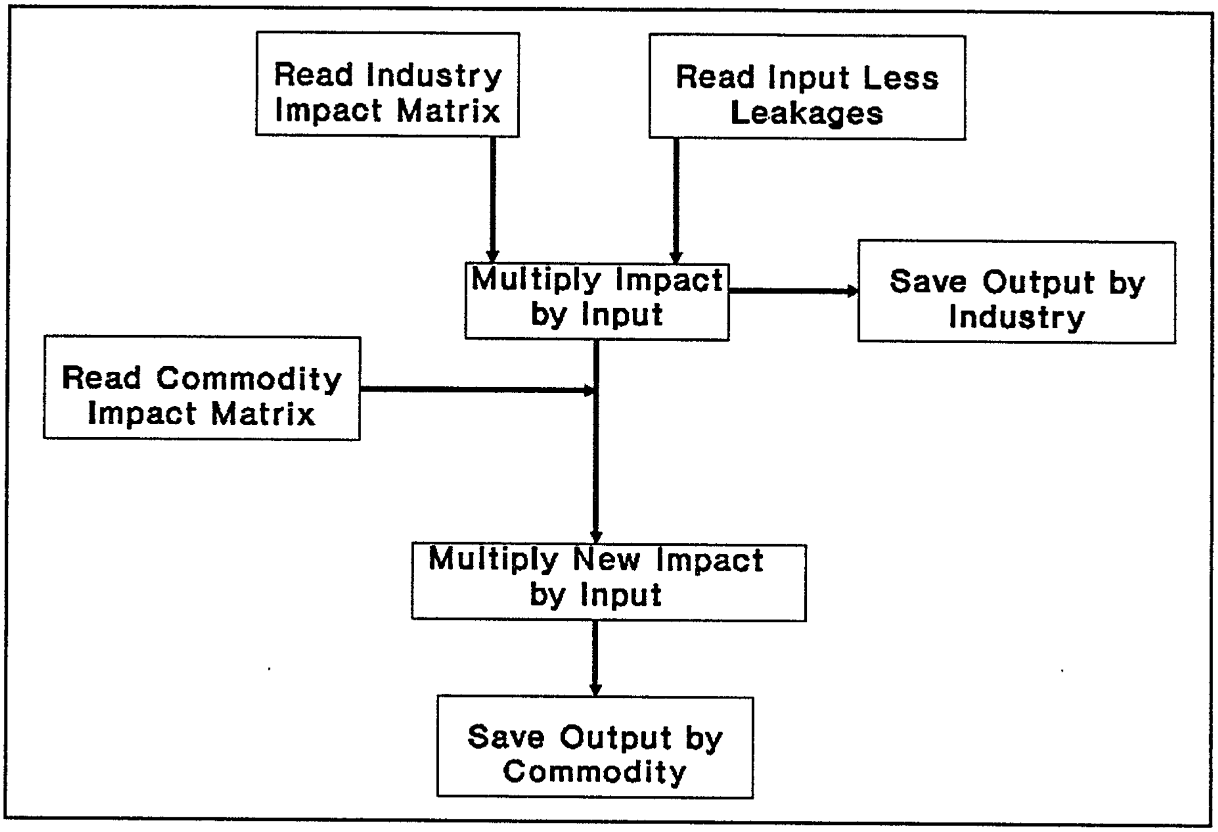


Figure 3: Final Demand by Industry and Commodity



Annex B
to DSEA Staff Note 10/91
Sept 1991

**ANNEX B: THE I-O REPRESENTATION OF THE DIB**

Table 1a: Electronic Equipment Industries - Output & Final Demand by Defence

| Commodity Code | Commodity | Output ($m) | Final Demand ($m) |
|---|---|---|---|
| 305 | Custom Metal Working | 28 | 0 |
| 329 | Office Machines | 14 | 85 |
| 357 | T.V., Radio, Record Players | 32 | 0 |
| 358 | Telephone & Telegraph Line | 2295 | 0 |
| 359 | Broadcasting & Trans. Equip. | 781 | 392 |
| 360 | Radar Equip. | 796 | 331 |
| 362 | Electronic Equipment | 1063 | 13 |
| 363 | Interior Alarm & Clock Sys. | 64 | 0 |
| 550 | Wholesaling Margin | 135 | 159 |
| 551 | Repair Service | 114 | 85 |
| 555 | Other Real Estate | 14 | 1 |
| 556 | Services to Business | 37 | 0 |
| 570 | Meals | 8 | 0 |
| 579 | Rental AO Machinery | 16 | 4 |
| | Total | 5852 | |

Table 1b: Electronic Equipment Industries - Inputs

| Commodity Code | Commodity | Input ($m) |
|---|---|---|
| 39 | Natural Gas | 3 |
| 135 | Plastic Pipe Fittings | 39 |
| 199 | Containers & Wood Pallets | 1 |
| 214 | Wrapping Paper | 2 |
| 221 | Paper Cartons & Boxes | 9 |
| 259 | Precious Metals and Alloys | 15 |
| 264 | Aluminum & Aluminum Alloys | 20 |
| 265 | Copper Prod. Cast | 7 |
| 271 | Solders | 7 |
| 282 | Metal Basic Prod. | 44 |
| 292 | Bolts, Nuts Screws | 21 |
| 305 | Custom Metal Works | 34 |
| 329 | Office Machines | 65 |
| 358 | Telephone & Telegraph Line | 149 |
| 361 | Elec. Tubes & Semiconductors | 185 |

Table 1b: Electronic Equipment Industries - Inputs (cont'd)

| Commodity Code | Commodity | Input ($m) |
|---|---|---|
| 362 | Electronic Equipment | 985 |
| 366 | Engines, Marine | 2 |
| 367 | Transformers | 55 |
| 372 | Enclosed Safety Switches | 41 |
| 396 | Fuel Oil | 2 |
| 433 | Photographic Chem. | 1 |
| 522 | Repair Construction | 7 |
| 536 | Truck Transportation | 7 |
| 540 | Pipeline Transportation | 2 |
| 544 | Telephone & Telegraph | 50 |
| 545 | Postal Services | 5 |
| 546 | Electric Power | 29 |
| 547 | Gas Distribution | 1 |
| 550 | Wholesaling Margin | 90 |
| 551 | Repair Service | 25 |
| 552 | Rental of Office | 4 |
| 554 | Imputed Service | 11 |
| 555 | Other Real Estate | 87 |
| 556 | Insurance | 7 |
| 559 | Other Rent | 38 |
| 556 | Services to Bus | 28 |
| 575 | Rental Data Process. Equip. | 13 |
| 576 | Other Services to Business | 24 |
| 577 | Rental of Autos | 3 |
| 578 | Trade Association Dues | 2 |
| 579 | Rental AO Machinery | 14 |
| 580 | Spare Parts & Maintenance | 55 |
| 581 | Office Supplies | 16 |

Table 1b: Electronic Equipment Industries - Inputs (cont'd)

| | | |
|---|---|---|
| 582 | Cafeteria Supplies | 4 |
| 583 | Transportation Margins | 34 |
| 584 | Laboratory Equipment | 24 |
| 585 | Travelling & Entertainment | 54 |
| 586 | Advertising and Promotion | 26 |
| 596 | Commodity Indirect Taxes | 22 |
| 597 | Subsidies | -151 |
| 598 | Other Indirect Taxes | 46 |
| 599 | Wages and Salaries | 1814 |
| 600 | Suppl. Labour Income | 224 |
| 602 | Other Operating Surplus | 1076 |
| | Total | 5852 |

Table 2a: Aircraft and Aircraft Parts Industries - Output and Final Demand by DND

| Commodity Code | Commodity | Output ($m) | Final Demand ($m) |
|---|---|---|---|
| 305 | Custom Metal Work | 95 | 0 |
| 330 | Aircraft, All Types | 734 | 178 |
| 331 | Aircraft Engine | 1091 | 46 |
| 332 | Specialized Air Equipment | 1238 | 77 |
| 333 | Modifications, Conversions | 496 | 222 |
| 366 | Engines, Marine | 80 | 0 |
| 518 | Misc. Fab. Mat incl. Bristles | 3 | 0 |
| 550 | Wholesale Margin | 15 | 159 |
| 551 | Repair Service | 3 | 85 |
| 559 | Other Rent | 1 | 28 |
| 556 | Services to Business | 15 | 0 |
| 570 | Meals | 3 | 0 |
| 579 | Rental AO Machinery | 12 | 14 |
| | Total | 3858 | 3786 |

Table 2b: Aircraft and Aircraft Parts Industries - Inputs

| Commodity Code | Commodity | Input ($m) |
|---|---|---|
| 39 | Natural Gas | 5 |
| 191 | Lumber & Timber | 1 |
| 221 | Paper Cartons, Boxes | 1 |
| 239 | Steel Bars and Rods | 21 |
| 260 | Other Non Ferrous Metals | 46 |
| 264 | Aluminum | 176 |
| 286 | Containers and Bottles | 2 |
| 292 | Nuts, Bolts and Screws | 6 |
| 305 | Custom Metal Working | 94 |
| 331 | Aircraft Engine | 407 |
| 332 | Specialized Aircraft Eqpt. | 357 |
| 333 | Modifications, conversions | 133 |
| 396 | Fuel Oil | 3 |
| 522 | Repair Construction | 29 |
| 536 | Truck Transportation | 7 |
| 544 | Telephone & Telegraph | 28 |
| 545 | Postal Services | 3 |
| 546 | Electric Power | 20 |
| 547 | Gas Distribution | 1 |
| 549 | Water and Other Utilities | 1 |
| 550 | Wholesaling Margin | 44 |
| 551 | Repair Service | 39 |
| 552 | Rental of Office Equipment | 1 |
| 554 | Imputed Service, Banks | 9 |
| 555 | Other Real Estate | 25 |
| 556 | Insurance | 6 |
| 559 | Other Rent | 19 |
| 566 | Services to Businesses | 13 |

Table 2b: Aircraft and Aircraft Parts Industries - Inputs (cont'd)

| Commodity Code | Commodity | Input ($m) |
|---|---|---|
| 568 | Laundry, Cleaning Services | 3 |
| 575 | Rental Data Processing | 13 |
| 576 | Other Services to Business | 25 |
| 577 | Rental of Autos, Trucks | 2 |
| 578 | Trade Association | 3 |
| 579 | Rental AO Machinery | 2 |
| 580 | Spare Parts and Maintenance | 66 |
| 581 | Office Supplies | 11 |
| 582 | Cafeteria Supplies | 1 |
| 583 | Transportation Margins | 30 |
| 584 | Laboratory Equip. | 9 |
| 585 | Travelling & Entertainment | 61 |
| 586 | Advertising and Promotion | 10 |
| 596 | Commodity Indirect Taxes | 19 |
| 597 | Subsidies | -19 |
| 598 | Other Indirect Taxes | 25 |
| 599 | Wages & Salaries | 1382 |
| 600 | Suppl. Labour Income | 237 |
| 602 | Other Operating Surplus | 331 |
| | Total | 3858 |

Table 3a: Shipbuilding and Repair Industries - Output and Final Demand by DND

| Commodity Code | Commodity | Output ($m) | Final Demand ($m) |
|---|---|---|---|
| 305 | Custom Metal Workings | 3 | 0 |
| 348 | Ships & Boats, Military | 397 | 400 |
| 350 | Ship Repairs | 281 | 43 |
| 518 | Misc. Fab. Mat. Inc. Bristles | 2 | 0 |
| 550 | Wholesaling Margin | 1 | 159 |
| 551 | Repair Service | 32 | 85 |
| 570 | Meals | 1 | 0 |
| | Total | 903 | 9647 |

Table 3b: Shipbuilding and Repair Industries - Inputs

| Commodity Code | Commodity | Input ($m) |
|---|---|---|
| 252 | Cast and Wrought Iron | 1 |
| 275 | Boilers, Marine | 2 |
| 295 | Basic Hardware | 14 |
| 305 | Custom Made Workings | 30 |
| 359 | Radio & T.V. Broadcasting | 122 |
| 360 | Radar Equip. & Related Dev. | 59 |
| 409 | Paints and Related Products | 6 |
| 497 | Aircraft and Maintenance | 3 |
| 522 | Repair Construction | 4 |
| 536 | Truck Transportation | 1 |
| 540 | Pipeline Transportation | 1 |
| 544 | Telephone & Telegraph | 8 |
| 546 | Electric Power | 6 |
| 550 | Wholesaling Margin | 32 |
| 551 | Repair Service | 7 |
| 554 | Imputed Service, Banks | 3 |
| 555 | Other Real Estate | 8 |
| 556 | Insurance | 8 |
| 559 | Other Rent | 4 |
| 566 | Services to Business | 3 |
| 575 | Rental Data Processing | 1 |
| 576 | Other Services to Business | 2 |
| 577 | Rental of Autos, Trucks | 2 |
| 578 | Trade Associations | 1 |
| 579 | Rental AO Machinery | 2 |
| 580 | Spare Parts and Maintenance | 6 |
| 581 | Office Supplies | 3 |
| 582 | Cafeteria Supplies | 1 |

Table 3b: Shipbuilding and Repair Industries - Inputs (cont'd)

| Commodity Code | Commodity | Input ($m) |
|---|---|---|
| 583 | Transportation | 8 |
| 584 | Laboratory Equipment | 3 |
| 585 | Travelling & Entertainment | 17 |
| 586 | Advertising and Promotion | 3 |
| 596 | Commodity Indirect Tax | 6 |
| 597 | Subsidies | -9 |
| 598 | Other Indirect Taxes | 18 |
| 599 | Wages and Salaries | 307 |
| 600 | Supplementary Labour Income | 51 |
| 602 | Other Operating Surplus | -115 |
| | Total | 903 |

#S03831