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# AN INPUT-OUTPUT ANALYSIS OF NEW INDUSTRY IN IRELAND IN 1976

E. W. HENRY

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# AN INPUT-OUTPUT ANALYSIS OF NEW INDUSTRY IN IRELAND IN 1976

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E. W. HENRY



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## *General Summary*

### *Introduction*

The performance of new manufacturing industry in Ireland is of major importance to our economic development. The IDA is directly involved in establishing new enterprises and in providing capital grants for starting factories.

The writer was asked by the IDA to make an analysis of total 1976 New Industry (NI) results in the framework of a national input-output (I–O) model. These New Industry 1976 (NI 1976) estimates are grouped into the nine manufacturing sectors normally used by the IDA. As a national framework, an input-output table of 28 sectors has been prepared for 1976, nine sectors being those of NI 1976 and a further 19 sectors being other activities, including nine manufacturing activities which match those of NI 1976.

*New Industry* comprises those enterprises which have received new industry grants from the IDA and which were at least one full year in operation by the end of 1977. It includes expansions of existing Irish firms.

The main purpose of the I–O study is to analyse the economic effects of NI 1976 in a national setting. A particular objective of the study is to calculate multipliers for GNP and employment for each of the nine NI 1976 sectors, as is done in Chapter 5. A further objective is to update previously published I–O results for 1976.

The input-output method of analysis is explained in Appendix 1, and cannot be summarised here satisfactorily. If readers want to grasp the technique, they should study that Appendix.

There are two main sources of data for the I–O study being described. The first source is the sample survey made by Dr. P. N. O'Farrell in early 1978. The second source is various official and business publications, including unpublished data from the Central Statistics Office.

### *New Industry and Relationship with Whole Economy*

Chapter 2 contains much detailed information on the relationship of NI 1976 to the background economy. Only the salient features are summarised here. Sample results were grossed up, to give estimated NI 1976 totals.

The grossed up results for all 518 NI 1976 establishments, showed sales of £1636 million and 74400 persons employed. Total Irish costs amounted to £624 million, for materials, transport and other services. Total imports were £429 million, total wages and salaries £232 million.

In terms of total sales, the food sector was far larger than any other sector, taking £618 million; metal and engineering had £331 million, chemicals and plastics £248 million.

Some 70 per cent of total sales were exported, showing that NI 1976 is strongly oriented towards exports. By contrast, percentage exports for the Rest of manufacturing was 24. Six of the nine NI sectors exported between 69 and 80 per cent of their total output.

The NI sector tends to be more import-intensive than its counterpart: the aggregate import percentage of total cost is 26 for NI 1976, compared with 19 for Rest of manufacturing.

*NI Shares of National Totals*

Some 37 per cent of manufacturing total employment was taken by NI 1976. The Rest of manufacturing had more than half of total employment in eight of the nine sectors.

The export-intensive nature of NI 1976 is illustrated by its taking 70 per cent of total manufactured merchandise exports in 1976. In seven of the nine manufacturing sectors, at least 60 per cent of exports came from NI 1976, the two exceptions being clothing and footwear (34 per cent) and paper and printing (25 per cent).

*A National Input-Output Transactions Table which shows NI 1976 Components*

This chapter describes how the NI 1976 data for nine manufacturing sectors can be fitted into a national input-output transactions table, namely, Table 5 for the year 1976. The reader who wishes to fully understand the system must read through the text and Appendix 1. What follows is merely a selection of major points that emerge.

*General Description*

The NI 1976 sectors appear in Table 5 as nine rows and nine columns, designated food NI and so on. There are a further nine manufacturing sectors, denoted food Rest and so on. There are thus 18 manufacturing rows and columns in Table 5. A further 10 rows and columns describe 10 further economic activities and are numbered (19) to (28). The rows and columns numbered (1) to (28) are treated as Inter-Industry rows for development of the I–O models described in Chapter 4.

Rows (29) to (33) of Table 5 are *Primary Input* rows. Row (34) distributes employment among the various economic activities. Columns (29) to (34) are treated as *Final Demand* columns by the model of Chapter 4.

Generally, each row shows how a sector allocates or sells or distributes output to purchasers. Each column shows how a sector purchases inputs of goods and services. For each of Rows (1) to (28), the row sum, total output, has a value equal to its column sum, total input. Thus in general any transaction may be considered to be both a sale of output and simultaneously a purchase of input. By *transaction* we mean a numerical entry anywhere in Rows (1) to (33).

*System of Pricing*

The system of pricing used for Table 5 transactions (i.e., their method of valuation) is known as *Valuation at Producer Prices*. For goods generally, output is sold at "factory gate" cost of production. For electricity and townsgas, producer price means the full cost to the consumer. Services are priced like transport, at full cost of production. Wholesale and retail trade are valued only as Gross Margins. Imports are valued c.i.f. (cost, insurance, freight) and sold direct to the purchaser.

Indirect taxes (and subsidies with a negative sign) are distributed to the purchaser of the goods to which they relate, and entered in the indirect tax (or subsidy) row of the purchasing column.

Valuation at producer prices breaks down the full purchase cost into:

(i) the factory gate cost including delivery by producer

(ii) a retail and wholesale margin

(iii) a tax, customs or excise or VAT

(iv) a subsidy

(v) a transport cost, from factory to retailer, where transport as such is explicitly purchased.

Each of these appears in its own row, as relevant.

*Reconciliation with the National Accounts*

The 1976 National Accounts have been integrated with the Table 5 data. The GNP by sector of origin occupies Rows (30) to (33) of Table 5. The GNP expenditure occupies Columns (29) to (34) in conjunction with imports, Row (29).

*Final Demand related to Sector Outputs and Primary Inputs*

In this chapter we develop an input-output model, as described in the I–O methodology of Appendix 1. The sequence of analysis has the following stages:

(i) the I–O model, using Columns (1) to (28) of Table 5 having direct input coefficients, Table 6

(ii) The (I–A) inverse, Table 7

(iii) primary input direct plus indirect requirement coefficients per unit final demand, Table 8, which also has GNP coefficients

(iv) primary input required by Table 5 final demands, set out in Table 9

(v) employment direct plus indirect coefficients per unit final demand, Table 10

(vi) employment required by Table 5 final demands, set out in Table 11

The following major features of Chapter 4 summarise the results.

*Direct Input Coefficient*

Each direct input coefficient is calculated as the value of a Table 5 transaction or employment entry, divided by the total input value of its column in Table 5. For example, Table 5 Row (1) Column (1) entry is 38.38 units, Column (1) total input is 617.83; the derived direct input coefficient is 0.06212, given by 38.38/617.83.

*Primary Input Requirements per Unit Final Demand*

Each final demand requires primary inputs (e.g., imports) indirectly as well as directly. Let us take Column (3) of Table 8, denoted textiles NI. A £1 final demand for textiles NI requires £0.619 of imports direct and indirect. This 0.619 is the import requirement coefficient. The direct amount is £0.535, given by the import direct input coefficient shown in Column (3) of Table 6.

*GNP Requirements Coefficient per Unit Final Demand*

One unit of final demand for the output of a sector requires (direct and indirect) an amount of GNP shown by the coefficient under discussion, in the relevant column of Table 8. These coefficients will always be less than unity, the balance of unity consisting of required imports. These GNP coefficients can be considered to be of special significance for exports. They can be thought of as *Net Export* coefficients since a unit of exports must have its import content subtracted, in order to measure its positive effect on foreign trade balance of payments.

We now consider their numerical values, the bigger the better. The largest is 0.940 for trade and services. Other large net export coefficients are: agriculture 0.824; food NI 0.731; food Rest 0.713. We find that the Rest sectors are competitive with the NI sectors, in this matter of GNP coefficients.

*Employment Requirements Coefficients per Unit Final Demand*

One unit of final demand for the output of a sector requires (direct and indirect) an amount of employment shown by the coefficient under discussion,

in the row of Table 10. These coefficients are expressed in man-years per £ million final demand. The six largest are as follows: textiles Rest 279, clothing Rest 266, food NI 231, food Rest 228, wood Rest 220, clothing NI 203. We find that the Rest sectors are competitive with the NI sectors in the matter of employment required per unit final demand.

*Employment required by Exports*

Table 11 contains considerable detail of the way in which 1976 employment was required by various and total final demand. Here we consider only exports.

Total exports required some 369,000 man-years of employment (direct and indirect) during 1976, which is 36 per cent of total employment. NI exports required 183,000 man-years while the Rest of manufacturing exports required 100,000 man-years. The importance of NI 1976 exports, in requiring half of total employment related to exports, will be appreciated.

*Income and Employment Effects derived from the Results*

An important purpose of this paper is to determine the effect which each sector has on income (GNP) and employment in the state and to compare sectors in this regard. This is known as multiplier analysis. A number of different types of multiplier can be obtained from an I-O table. Here we refer to two such operators:

(1) direct coefficients or Type A multipliers

(2) direct plus indirect coefficients or Type B multipliers.

The Type A coefficient is the relationship between the output of the firm or industry and the income or employment created by it. The Type B coefficient is the relationship between the sales (final demand) of a sector and the income or employment generated by these sales, not alone in the sector itself, but in the economy as a whole.

The multipliers, as defined above, are average relationships which tell us what is happening in the different sectors of an economy at a particular period in time. They do not necessarily tell us what will happen to further industries introduced into some sectors but they usually give fairly good ideas. Multipliers will change slowly over time as a result of technological and other changes. Also multipliers must be interpreted with caution and those for each sector treated on their own merits. For example, the building of an extra food plant is not likely to increase agricultural output. It may do no more than put another factory out of business or shift resources from live exports.

*Application of Type A and Type B Multipliers to the Sectors defined in this Study*

The simple average of all the direct (Type A) GNP coefficients is 0.30 for NI and 0.255 for the Rest. The average for the direct plus indirect (Type B)

coefficient is 0.55 for the NI and 0.63 for the Rest. For both NI and Rest the food industry has the lowest direct coefficients, but has the highest direct plus indirect coefficient except for textiles (Rest). New wood has the highest direct coefficient of all. The meaning of the direct GNP coefficient of 0.30 is that on average every £ million of output generates £0.30 million of GNP direct within NI.

The simple average for all the direct (Type A) employment coefficients is 72 man-years per £1 million output for NI compared with 86 man-years per £1 million output for the Rest. The corresponding direct plus indirect coefficients are 134 and 184 respectively. These figures indicate that the older industries are more labour-intensive than the newer ones. The industry with the highest direct employment coefficient is clothing NI having 161 man-years per £1 million output. That with the highest direct plus indirect employment coefficient is textiles Rest, having 279 man-years per £1 million of output; it is closely followed by clothing, food and wood (all Rest). Of the NI food has the highest Type B coefficient, of value 231 man-years per £1 million of output.

Six conclusions drawn from this study are given on page 48.

Chapter 1

# *INTRODUCTION*

THE performance of new manufacturing industry in Ireland is of major importance to our economic development. The Industrial Development Authority (IDA) is directly involved in establishing new enterprises and in providing capital grants by way of enticement to industrialists to start factories in Ireland.

A sample survey of new enterprises which had a full business year in 1976 was performed by Dr. P. N. O'Farrell, on behalf of the IDA, during the first half of 1978. See reference to O'Farrell and O'Loughlin (1980). This writer was asked by the IDA to make an economic input-out analysis of full 1976 new industry results, in the framework of a national input-output model. The study which follows shows the outcome.

The survey results of O'Farrell have been grossed-up to estimate the full activity of all manufacturing "new industry" during 1976. These grossed-up estimates are denoted New Industry 1976 (NI 1976) and are grouped into the nine manufacturing sectors normally used by the IDA. As a national framework, a 28-sector national input-out transactions table has been constructed by the writer for the same year. This table has nine other manufacturing sectors which match those of the NI 1976 structure. The table therefore has 18 manufacturing sectors and 10 others.

## *Definition of New Industry*

*New Industry* comprises those enterprises which have received new industry grants from the IDA and which were at least one full year in operation by the end of 1977. It includes expansions of existing Irish firms. Small-industry grant-aided firms and re-equipment aided firms are excluded from the analysis, as are enterprises which were established without grant assistance. All new enterprises considered by the input-output (I-O) study described below belong to the manufacturing sector. Enterprises administered by the Shannon Free Airport Development Company are included, but firms sponsored by Gaeltarra Éireann (now Údarás na Gaeltachta) are excluded, unless they receive an IDA grant.

## *Purpose of the Input-Output Study*

The main purpose of the input-output study is to analyse the economic effects of New Industry in a national setting. What does NI 1976 do by way of

economic stimulus? How does it support employment? What is the export effect of NI 1976? What conclusions and policy implications may be drawn from the NI 1976 analysis?

A particular objective of the study is the calculation of so-called "Multipliers" (for GNP and employment) for each of the nine NI 1976 manufacturing sectors. All of Chapter 5 is devoted to these multipliers. Readers who are not familiar with input-output theory (and the related algebra) to the extent required by the present study should consult the summary in Appendix 1.

A further objective of the present paper is to update previously published I-O results for 1976 in the Henry 1980 ESRI paper. The I-O table in this present paper differs substantially from that previously published. In particular the industrial sectors show large revisions because of the inclusion of results of the 1976 Census of Production.

*Data Used in the Study*

There were two main sources of data for the I-O study being described. The first source was the sample survey made by P. N. O'Farrell in 1978. The second source was various official and business publications, including some unpublished data from Central Statistics Office (CSO). Each source will now be considered briefly.

(i) *The O'Farrell Sample Survey*

P. N. O'Farrell carried out and reported on a sample survey of 320 establishments in the category New Industry early in 1978 on behalf of the Industrial Development Authority. (See O'Farrell and O'Loughlin (1980)). The 320 establishments were the respondents from a sample selected randomly from the full population of 518 establishments, all in manufacturing. The sample of 320 establishments is considered by O'Farrell to be an unbiased estimator of at least three characteristics of the parent population, namely, location, sector and employment size. (ibid., p. 4).

What the O'Farrell survey measured was the business activity of these 320 establishments during their business year 1976. A summary picture of their 1976 business is as follows: total sales £1128 million; purchases of Irish goods and services £451 million; purchases of imported goods and services £282 million; wages and salaries £154 million; total employment 49,700 persons. Chapter 2 following discusses the grossed-up sample results, which estimate the 1976 business year activity of all 518 NI 1976 establishments.

(ii) *Official and Business Information*

In order to construct the national I-O transactions table which is the background to NI 1976 activity, a considerable amount of official and business information has been used. For a detailed account of data sources, see Appendix 1 of the Henry (1980) paper on a 19-sector 1976 transactions table.

The Central Statistics Office provided the main part of the official information. CSO data included export and import statistics, national income and expenditure, agricultural output detail, industrial census results (both annual and quarterly). Among the most recent CSO results are summary statistics of manufacturing industries, showing gross output, wages and salaries, employment, at detailed industry level (*Irish Statistical Bulletin,* December 1979-September 1980).

*General Reservation regarding the Data Used and the Results Derived in the Study*

Some reservation is necessary about the quality of the data presented in the study and the results derived from the subsequent analysis. Because a grossed-up sample has been used as the basis of the new industry results, the numerical data are less reliable than if full coverage has been achieved. A further handicap of the I-O structure discussed below is the lack of detailed input costs; such detail is available only to someone working in the CSO. Yet a third limitation was the necessity of pro rata breakdowns between new industry and the rest, within manufacturing sectors. But to some extent all I-O tables are subject to data limitations. It is not possible to quantify how far the detailed results given below depart from those obtainable if the mentioned data defects had been remedied. The principle of overall or "holistic" accuracy applies to what appears below, in spite of necessary reservations about fine detail.

## Chapter 2

### *NEW INDUSTRY AND RELATIONSHIP WITH WHOLE ECONOMY*

THE O'Farrell sample of 320 establishments was considered mainly satisfactory for providing unbiased estimates of the characteristics of the full population of NI 1976 establishments in each sector. The full population was 518 establishments in Manufacturing. Within each of the nine sectors of manufacturing, the number of establishments was used as the grossing factor, to scale up the sample results so as to estimate full population results. The names of these nine sectors generally explain their content, but drink and tobacco are included in "other manufacturing". For example, the grossing factor for the food sector was 75/56, because the sample had 56 establishments and the full NI 1976 number of food manufacturing establishments was 75. See Chapter 1 of O'Farrell and O'Loughlin (1980). The data presented in the two papers are not in complete agreement. This is probably caused by rounding errors introduced in the grossing of the sample results. The results of this grossing method did not work well for two sectors (1) wood and furniture and (2) other manufacturing. The grossed exports for these sectors were higher than the corresponding national export totals, those for other manufacturing being considerably higher. The grossed totals for these two sectors had, therefore, to be reduced arbitrarily, no further information being available. All figures for the two sectors were reduced initially to two-thirds of their grossed values but even this reduction gave too high a value for exports of other manufacturing. The latter was, therefore, reduced further to 60 per cent of its grossed value and left at that.

This chapter, with Tables 1 to 4, examines four aspects of the NI 1976 estimates for the full 518 establishments: (i) input costs and related employment; (ii) allocation of output to home markets and exports; (iii) direct import content of NI 1976 compared with import content of other establishments; (iv) the shares of national manufacturing totals taken by NI 1976 employment, exports, and total sales.

(i) *Input Costs and Related Employment*

Table 1 shows each of five kinds of input cost, for the nine sectors of NI manufacturing. Input cost means cost of production. Total input is also shown: this means total cost, by definition equal to receipts from total sales. Number of persons employed and number of establishments also appear for each manufacturing sector. We note that the input costs, total input, and numbers

Table 1: *Estimated 1976 input costs for 518 NI establishments*

| *Input* | *Food* (1) | *Textiles* (2) | *Clothing and footwear* (3) | *Wood and furniture** (4) | *Paper and printing* (5) | *Chemicals and plastics* (6) | *Structural clay, cement, glass* (7) | *Metals and engineering* (8) | *Other manufacturing** (9) | *Total of* (1) *to* (9) (10) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | £000 at current prices | | | | | |
| Aggregate Irish materials | 454,696 | 9,736 | 6,240 | 4,907 | 2,380 | 19,897 | 6,140 | 17,352 | 8,344 | 529,692 |
| Total Irish costs | 478,876 | 17,459 | 8,596 | 8,705 | 4,706 | 36,645 | 8,800 | 39,062 | 20,912 | 623,761 |
| Total direct imports | 37,639 | 63,494 | 16,158 | 9,895 | 10,062 | 86,012 | 7,109 | 140,510 | 58,086 | 428,965 |
| Wages and salaries | 40,039 | 23,382 | 12,586 | 10,089 | 5,186 | 33,285 | 6,949 | 69,030 | 31,884 | 232,430 |
| Remainder of total input | 61,272 | 14,232 | 4,539 | 7,662 | 4,574 | 92,276 | 7,237 | 82,117 | 76,809 | 350,718 |
| *Total input* | 617,826 | 118,567 | 41,879 | 36,351 | 24,528 | 248,218 | 30,095 | 330,719 | 187,691 | 1,635,874 |
| Number employed | 11,429 | 8,450 | 6,725 | 2,287 | 1,680 | 8,011 | 2,310 | 23,420 | 10,086 | 74,398 |
| Number of establishments | 75 | 50 | 52 | 19 | 14 | 64 | 19 | 153 | 72 | 518 |

*Scaled down to 2/3 of grossed samble value

employed are estimates obtained from the O'Farrell sample in the way explained in the first paragraph of this chapter.

The global estimate, for all 518 establishments, shows total input, same as total sales, of £1636 million and 74400 persons employed. Total Irish costs amounted to £624 million, for materials, transport and other services; of this total, the aggregate cost of Irish materials was £530 million. In the original O'Farrell survey and sample, there were nine subdivisions of Irish materials; Table 1 does not show this extent of detail. Total direct imports amounted to £429 million. The remaining two components of total input cost were £232 million for wages and salaries and £351 million remainder. The latter includes profits, allowances for depreciation, further returns on capital investment and further unspecified cost, which came to light at the stage of compiling the input-output table.

In terms of total sales, the food sector was far larger than any other sector, taking £618 million of the global £1636 million. Three other sectors had relatively large total sales: metals and engineering had £331 million; chemicals and plastics had £248 million; other manufacturing, after adjustment, had £188 million.

The aggregate Irish materials amounted to £530 million for all 9 sectors combined; of this aggregate, £455 million, roughly four-fifths, was purchased by the food sector and almost completely consisted of "live animals, food and food preparations". The other entries in the first row of Table 1 were mostly manufactured goods other than food. Total imports were £429 million. Wages and salaries amounted to £232 million.

(ii) *Allocation of Output to Home Markets and Exports*

By means of the same grossing factors as were used for Table 1, the O'Farrell sample results have been grossed up within each NI 1976 manufacturing sector so as to give the allocation results shown in Table 2. For each sector, the total output (total sales) has the same value as the total input of Table 1, which is as should be. Two kinds of allocation are shown: (i) exports, (ii) disposal in Ireland. Because of the uniform scaling of the export and domestic disposal parts of each sector, the export percentage of Table 2 is exactly the same as what would be derived from the O'Farrell sample, for each sector other than other manufacturing.

Table 2 results give an estimated 1976 aggregate £1145 million exported, of the total NI 1976 sales of £1636 million, that is exports were 70 per cent of output. Clearly, new industry is strongly oriented towards exports. Percentage exports for "Rest of Manufacturing" also given in Table 2 was 24. The Rest sectors generally are much less export-intensive than their NI equivalents. The Rest figures are, however, less reliable than the NI data because they are residuals obtained by deducting the NI figures from the national totals.

Table 2: *Estimated 1976 allocation of output for 518 NI establishments*
*£ thousand at current prices*

| *Sector of manufacturing* | | *NI Disposal in Ireland* | *NI Exports* | *NI Total output (Total sales)* | *Exports as a percentage of total sales* | |
|---|---|---|---|---|---|---|
| | | | | | *NI* | *Rest* |
| Food | (1) | 190,832 | 426,994 | 617,826 | 69.1 | 22.7 |
| Textiles | (2) | 35,058 | 83,509 | 118,567 | 70.4 | 45.8 |
| Clothing and footwear | (3) | 16,196 | 25,683 | 41,879 | 61.3 | 71.4 |
| Wood and furniture | (4) | 23,985 | *12,366 | 36,351 | 34.0 | 10.4 |
| Paper and printing | (5) | 14,974 | 9,554 | 24,528 | 39.0 | 19.6 |
| Chemicals and plastics | (6) | 71,896 | 176,322 | 248,218 | 71.0 | 26.0 |
| Structural clay etc. | (7) | 6,182 | 23,913 | 30,095 | 79.5 | 4.3 |
| Metals and engineering | (8) | 88,269 | 242,450 | 330,719 | 73.3 | 32.1 |
| Other manufacturing | (9) | 43,311 | †144,380 | 187,691 | 76.9 | 8.6 |
| *Total* | | 500,288 | 1,145,171 | 1,635,874 | 70.0 | 24.0 |

*Scaled-down to 2/3 of grossed sample value

†Scaled-down to 60 per cent of grossed sample value

Six of the nine NI sectors exported between 69 and 80 per cent of their total output. Structural clay had 80 per cent exports. Metals, chemicals, textiles, food, all exported between 69 and 73 per cent of their output.

(iii) *Direct Import Content of NI 1976 Compared with that of Remainder*

Table 3 has two columns of percentages. The first column shows Table 1 total imports as a percentage of Table 1 total input, for each of the NI 1976 sectors and for all together. The percentage for the aggregate is about 26.

Six of the nine NI sectors show imports in the range 31 to 54 per cent of total input (here to be interpreted as total cost). These six are heavily dependent on imported raw materials; in descending order of the percentage they are: textiles, metals, paper, clothing, chemicals, other manufacturing.

The remaining three NI sectors have smaller import percentages of total cost: wood etc., has 27 per cent; structural clay etc., has 24 per cent; food has only 6 per cent. Thus we find food totally exceptional in its small dependence on imported raw materials.

The second column of Table 3 contains similar percentages for "Rest 1976". This remainder is the rest of manufacturing, that is, the establishments which were *not* NI 1976. As stated above, the Rest figures are less reliable than those

Table 3: *Direct import content of total cost: NI 1976, R 1976*

| *Sector of manufacturing* | | *New Industry 1976* | *Rest 1976* |
|---|---|---|---|
| | | *per cent* | *per cent* |
| Food | (1) | 6.1 | 10.9 |
| Textiles | (2) | 53.5 | 6.6 |
| Clothing etc. | (3) | 38.6 | 14.5 |
| Wood etc. | (4) | 27.2 | 16.8 |
| Paper etc. | (5) | 41.0 | 36.8 |
| Chemicals etc. | (6) | 34.7 | 31.7 |
| Structural clay etc. | (7) | 23.6 | 13.4 |
| Metals etc. | (8) | 42.5 | 25.9 |
| Other manufacturing | (9) | 30.9 | 32.7 |
| *Total* | | 26.2 | 19.3 |

for NI 1976. However, since they are the only ones available we have no option but to accept them. We find that the import content of Rest is generally smaller than that of NI 1976, the overall percentage being 19, compared with 27 for NI 1976.

(iv) *National Shares taken by NI 1976*

Of total manufacturing during 1976 within the state, the shares taken by NI 1976 are shown in Table 4 in a summary way. Much more detail appears in Table 5 below.

The first three columns of Table 4 show NI 1976 statistics. The employment figures are those shown in Table 1. The total sales figures are those of Table 2, but rounded to 0.1 of a million. The export figures are also those shown in Table 2.

The second three columns of Table 4 show estimated 1976 national aggregate levels of manufacturing employment, exports and gross output (total sales). The CSO 1976 Census of Industrial Production provided the figures for gross output and employment. The export figures were taken from the merchandise export statistics published by CSO for the calendar year 1976.

The first column of percentages shows the NI share of manufacturing employment during 1976. The NI share of the manufacturing total is 37 per cent. Eight of the nine NI sectors have less than half the corresponding national total, the exception being other manufacturing.

The export-intensive nature of NI 1976 industries is further illustrated by its contribution of an estimated 70 per cent to total manufacturing merchandise

Table 4: *NI 1976 employment, exports and total sales as percentages of 1976 estimated national totals*

| *Sector of manufacturing* | | *NI 1976 estimates* | | | *National Aggregate 1976* | | | *NI 1976 as percentage of 1976 national aggregate* | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | *Employment* | *Exports* | *Total sales (gross output)* | *Employment* | *Exports* | *Gross output* | *Employment* | *Exports* | *Gross output* |
| | | *Number* | *£ million* | *£ million* | *Number* | *£ million* | *£ million* | *Per Cent* | *Per Cent* | *Per Cent* |
| Food | (1) | 11,429 | 427.0 | 617.8 | 44,446 | 618.7 | 1464.1 | 25.7 | 69.0 | 42.2 |
| Textiles | (2) | 8,450 | 83.5 | 118.6 | 24,295 | 131.0 | 222.2 | 34.8 | 63.7 | 53.4 |
| Clothing and footwear | (3) | 6,725 | 25.7 | 41.9 | 17,204 | 76.3 | 112.8 | 39.1 | 33.7 | 37.1 |
| Wood and furniture | (4) | 2,287 | 12.4 | 36.4 | 8,158 | 16.6 | 76.6 | 28.0 | 74.7 | 47.5 |
| Paper and printing | (5) | 1,680 | 9.6 | 24.5 | 15,891 | 39.0 | 174.4 | 10.6 | 24.6 | 14.0 |
| Chemicals and plastics | (6) | 8,011 | 176.3 | 248.2 | 16,719 | 207.7 | 369.2 | 47.9 | 84.9 | 67.2 |
| Structural clay etc. | (7) | 2,310 | 23.9 | 30.1 | 13,154 | 32.2 | 224.3 | 17.6 | 74.2 | 13.4 |
| Metals and engineering | (8) | 23,420 | 242.5 | 330.7 | 49,800 | 361.8 | 702.6 | 47.0 | 67.0 | 47.1 |
| Other manufacturing | (9) | 10,086 | 144.4 | 187.7 | 14,039 | 159.5 | 364.2 | 71.8 | 90.5 | 51.5 |
| TOTAL | | 74,398 | 1145.2 | 1635.9 | 203,706 | 1642.8 | 3710.4 | 36.5 | 69.7 | 44.1 |

exports in that year per second column of Table 4 percentages. At least 60 per cent of exports came from NI 1976 in seven of the nine sectors. The seven NI sectors supplying at least 60 per cent of national exports of that kind for 1976 were: food, textiles, wood, chemicals, structural clay, metal, other manufacturing.

The last column of percentages of Table 4 shows NI total sales (or gross output) shares of the national totals. The aggregate figure indicates an order of 44 per cent of the national total being taken by NI 1976. A very high share is taken by the NI sector chemicals and plastics at 67 per cent.

The Table 4 columns of percentages indicate that NI 1976 gross output per person employed was generally higher than the national average. Some 37 per cent of 1976 manufacturing employees were NI-employed and produced 44 per cent of total sales. For six of the nine manufacturing sectors we find the NI employees producing a larger percentage of total sales than their numbers warranted, as a percentage of sectoral employment. The three exceptions are clothing, structural clay, other manufacturing. The explanation for the exceptions is that NI activity here was in labour-intensive projects, to a sufficient extent to give the results observed.

## Chapter 3

## *A NATIONAL INPUT-OUTPUT TRANSACTIONS TABLE WHICH SHOWS NI 1976 COMPONENTS*

THIS chapter describes how the NI 1976 data for nine manufacturing sectors, as shown in Tables 1 and 4, can be viewed and analysed when fitted into a national background consisting of an input-output transactions table, namely, Table 5, for the year 1976.

*General Description*

The NI 1976 sectors appear in Table 5 as nine rows and nine columns designated, food NI, textiles NI, and so on. There are a further nine manufacturing sectors denoted, food Rest, textiles Rest, and so on. Thus there are 18 manufacturing rows and columns in Table 5.

A further ten rows and columns describe ten further sectors or economic activities; these are numbered (19) to (28), where Row and Column (19) describes the economic activities of agriculture, forestry and fishing during 1976. Rows and Columns (26) to (28) are artificial sectors, meaning that they do not exist in real life as businesses which employ people and buy and sell goods and services. These three sectors are convenient accounting devices for certain expenses e.g., Row and Column (27) is denoted "packaging" and covers expenses of containers, paper, packaging etc., used to pack goods for merchandising. Employment is allocated to the sectors producing these materials.

The rows numbered (1) to (28) will be treated as *"Inter-Industry"* rows, for development of the I–O model described in Chapter 4 following. Rows (29) to (33) are *"Primary Input"* rows for the same purpose. Row (29) distributes all imports. Rows (30) to (33) show details of Gross National Product (GNP) by sector of origin, e.g., Row (32) shows how wages and salaries arise in the various productive sectors: food NI paying £40.04 million of wages etc., during 1976.

It is to be noted that the 1976 National Accounts, as published in *National Income and Expenditure, 1978,* have been integrated with the Table 5 data. The GNP by sector of origin occupies Rows (30) to (33) of Table 5. The GNP expenditure occupies Columns (29) to (34), in conjunction with import Row (29).

Row (34) allocates 1976 employment, in man-years, to the 25 real economic sectors, as distinct from the three artificial sectors, numbered (26) to (28). Food

NI employed 11,429 persons in 1976; a man-year means one person employed for one year.

There are three summary rows. The "Total Input" row contains the sum of the entries in Rows (1) to (33), and for Columns (1) to (28) each such sum is equal to the corresponding aggregate contained in the "Total Output" column (entries (1) to (28) ). The "Total Inter-Industry" row contains the sum of entries in Rows (1) to (28); thus the food NI value 525.46 is the sum of Column (1) entries 38.38, 130.27, . . ., 12.61. The "Total Primary" row contains the sum of entries in Rows (29) to (33); thus the food NI value 92.37 consists of the sum of Column (1) entries 37.64, 12.00, . . ., 16.19.

The columns numbered (1) to (28), like corresponding rows, are treated as "Inter-Industry" by the I–O model of Chapter 4. Thus there appear six "Final Demand" columns in Table 5, numbered (29) to (34). These columns show detail of the usual GNP Expenditure categories; (see Table A5 of *National Income and Expenditure, 1978*) e.g., Column (29), the household consumption entries, has a sum 2865.10 (£ million) shown as total input of Column (29), and recognisable as a National Accounting aggregate "personal expenditure on consumers' goods and services". The detailed entries in Column (29) show what goods and services were purchased by household consumption expenditure, e.g., £82.05 million of food NI output was bought, at factory producer prices.

The other final demand columns have a similar meaning. Government current expenditure, Column (30), has an aggregate value of £844.7 million, of which £790.0 million was paid for government services of various kinds as a purchase of the output of Row (25). Gross Fixed Capital Formation totalled £1101.1 million, of which £579.50 million was spent on new construction, Row (22). The details of exports of goods and services appear in Column (33). The estimated pattern of tourist expenditure (Henry (1980) page 24) appears as Column (34) and is an invisible export.

There are three summary columns. Each row entry of the "Total Output" column contains the sum of entries in Columns (1) to (34) of that row. The "Total Inter-Industry" column is the sum of entries in Columns (1) to (28). The "Total Final Demand" column is the sum of entries in Columns (29) to (34).

Generally, each row shows how a sector allocates or sells or distributes output to purchasers. Each column shows how a sector purchases inputs of goods and services on current account. For each of Rows (1) to (28), the total output has a value equal to total input for the corresponding column. Thus, in general, any transaction may be considered as a sale of output and also as a purchase of input. By transaction we mean a numerical entry anywhere in Rows (1) to (33). We now consider the system of pricing used.

*System of Pricing*

The system of pricing used for Table 5 transactions (or the method of valuing them) is known as "Valuation at Producer Prices". The following description is to be regarded as a working definition rather than a detailed account of the system.

For goods generally, excluding electricity and gas (that is, for Rows (1) to (22), valuation at producer prices means that the output is sold at "factory gate" cost of production, which includes cost of delivery by the producers' own transport. Subsidies on output are ignored, in valuing the output row and the input column. Subsidies on input costs are aggregated in the subsidy row of the input column. Thus the −13.50 appearing in the subsidy row of food NI, Column (1), is the subsidy on agricultural produce bought by food NI. The subsidised cost to food NI is 291.60 less 13.50, but this cost is shown as two separate entries, the unsubsidised "full economic" producer cost of the agricultural output, Row (19), at 291.60 million, less the subsidy entry–13.50, already commented on. Value added tax (VAT) on inputs is included in the indirect tax Row (30) of each sector.

For electricity and townsgas, Row (23), producer price means the full cost of delivery to the consumer. Any subsidies on townsgas appear in Row (31) of personal consumption Column (30) as negative amounts; thus these subsidies are separated from the true delivered cost of electricity and gas to personal consumption. For transport, Row (24), producer price effectively means the same as for townsgas, that is, the row shows sales of the service at full production cost; any subsidies to purchasers are entered as negative amounts in the subsidy row of the purchaser column.

For trade margin and services, Row (25), producer price has two meanings. The service parts are priced like transport, at full cost of production. The trading parts (wholesale and retail trade, hotels, guesthouses, catering) are valued only as gross margins; this means that the output of retail food shops is valued as the difference between the retail cost and the "factory gate" cost of the produce. The manufactured food is distributed already along Rows (1) and (2) to personal consumption Column (29).

Column (25) includes full detail of government gross current expenditure on goods and services. Government employees are included in Column (25) employment. Accordingly, government services are purchased as Row (25) by government current expenditure. Since the detailed costing has appeared in Column (25) it will not appear again in the government current expenditure Column (30).

For Sectors (26) to (28), valuation at producer prices means the amount they cost to the producer during 1976.

Imports are valued at c.i.f. prices and sold direct to the purchaser. If sold to a consumer, the trade and transport margins on them are included in the trade and transport rows. Any import duties are entered in the indirect tax row of the purchaser of the imports, e.g., we find £16.00 m. in the indirect tax row of the metal and engineering, NI , Column (15). This amount is mainly import duty on vehicle and machinery components; we see imports of £140.51 m. in column (15).

Indirect taxes (and subsidies with negative sign) have been mentioned many times already. These generally are distributed to the purchaser of the goods to which they relate, and entered in the indirect tax (or subsidy) row of the purchaser's column. The household consumption column, number (29), shows £365.63 million of indirect taxes; this large amount includes most of taxes on drink and tobacco, as well as large shares of tax on petrol and of VAT on retail sales. Tourist expenditure, Column (34) shows only £23.50 million of indirect taxes.

The wages and salaries hardly require detailed comment. They are the full cost of hired labour within each real sector. Row (33) includes profits and depreciation, as defined in the National Accounts.

From the viewpoint of the purchaser, valuation at producer prices breaks down the full purchase cost into several components: (i) the "factory gate" cost; (ii) a retail and wholesale margin; (iii) a tax on the good, which may be customs duty or excise duty or VAT or several of these types; (iv) a subsidy on the good or service, which reduces its price; (v) a cost of transport, from the factory gate to the consumer, if the transport is done by the I–O transport sector, Row (24). But when all these components are aggregated, the full cost to the purchaser is the outcome.

*The Nine NI 1976 Sectors fitted into Table 5*

The nine NI manufacturing sectors, which were considered in Tables 1 to 4 and related text, are entered in Table 5 as Rows and Columns (1), (3), (5), . . . (17). Sectors (2), (4), . . . (18) relate to the Rest of manufacturing. All that is intended here is to identify the sectors and show that many of the numerical entries of Tables 1 and 4 are directly recognisable in Table 5. It will be realised that some of the Table 1 entries have had to be disaggregated in order to make sense in Table 5, likewise for some of the Table 4 entries.

The Table 1 entries "total imports", "wages and salaries", "total input", "number employed" are entered, without change, other than numerical rounding in Table 5. For example, wood and furniture NI has £10.089 million of wages and salaries shown in Table 1; wage Row (32) of Table 5 shows £10.09 million in Column (7), which is the wood and furniture NI column. Food total imports are valued at £37.64 million in both tables.

But three further entries of Table 1 have had to be broken down for inclusion in Table 5; these are "aggregate Irish materials", "total Irish costs", "remainder of total input". To fully explain how these three amounts were allocated to Table 5 is beyond the scope of this chapter and of no particular interest to the ordinary reader. Various constraints and balances have to be taken into account. For six of the nine NI sectors, "remainder of total input" is closely approximated by the sum of entries in Rows (26), (27) (28) and (33); these six sectors are textiles, clothing, wood, paper, chemicals, structural clay. Thus, for these six sectors, "total Irish costs" approximates the aggregate of entries in Rows (1) to (25) and (30). For the other three sectors, part of "remainder of total input" has had to be distributed among Rows (1) to (25), because infeasibly large entries in Rows (26), (27), (28) and (33) would have resulted from confinement of this aggregate to those four rows.

In a similar manner the nine NI sectors have their outputs distributed along Rows (1), (3), (5) . . . (17). The export entries are those shown in Table 4, e.g., food NI exported £427.0 million, and this appears in Column (33) of Row (1) of Table 5. The rest of "Total Sales" obviously had to be sold in Ireland, and this NI output was distributed according to background information from various sources. One source was the 1976 transactions Table 1 for NI and Rest combined, published in the Henry (1980) paper. Proportionate allocation, between available supply of NI versus Rest, was used where more specific information was unavailable.

At this stage the reader should be able to understand the entries in the table, and be able to find or aggregate other entries, as required. Further elaboration is not deemed necessary here.

## Chapter 4

## *FINAL DEMAND RELATED TO SECTOR OUTPUTS AND PRIMARY INPUTS*

IN this chapter we develop an input-output model, as described in the I–O methodology of Appendix 1. We use Columns (1) to (28) of Table 5 to give us numerical data for the $a_{ij}$ direct input coefficients. From these coefficients, and primary input and employment Rows (29) to (34) of Table 5, the (I–A) inverse and the "direct plus indirect" coefficients of primary input and employment (per unit final demand) have been computed. We then analyse Table 5 final demand (Columns (29) to (34)), to show how these final demands absorb primary inputs and employment.

The sequence of analysis has the following stages:

(i) the I–O model, and direct input ($a_{ij}$) coefficients, Table 6;

(ii) the (I–A) inverse, Table 7;

(iii) primary input direct plus indirect requirement coefficients per unit final demand, with GNP coefficients, Table 8;

(iv) primary input required by final demands of Table 5, set out in Table 9;

(v) employment direct plus indirect coefficients per unit final demand, Table 10;

(vi) employment required by final demands of Table 5, set out in Table 11.

### *The Input-output Model and Direct Input Coefficients*

As a numerical application of the I–O model theory of Appendix 1, we assume that the input cost proportions of Table 5 may be generalised for analysis other than that directly observable in Table 5. Direct input coefficients have been calculated for Columns (1) to (28) of Table 5; these coefficients are given in Table 6. Similarly defined employment coefficients are shown in the bottom row of Table 6.

Each direct input coefficient is calculated as the value of a Table 5 transaction, divided by the total input value of its column in Table 5. For example, Table 5 Row (1) and Column (1) entry is 38.38 units, Column (1) total input is 617.83; the derived direct input coefficient is 38.38/617.83, which is 0.062121; this appears as .062 in Row (1) Column (1) of Table 6. In the computer processing of Table 5, the computer calculated these coefficients from Table 5 transactions, to six significant figures. The Table 6 entries are rounded from the computer print-out. Because of the method of calculation, the direct input coefficients in Rows (1) to (33) of each column add to unity.

Because the inter-industry matrix used below has 28 rows and 28 columns, Table 6 coefficients in Rows (1) to (28) are called *inter-industry* ($a_{ij}$) direct input coefficients. Table 6 coefficients in Rows (29) to (33) are called *Primary input* direct input coefficients; any row of these can be regarded as the ($z_1, z_2 \ldots . z_n$) row used in the model description of Appendix 1.

The employment direct input coefficients are similar to primary input coefficients. For example, Table 5 Column (3), Textiles NI, has 8450 man-years of employment for a total input £118.57 million. The direct input coefficient is given by 8450/118.57, which is 71.2659 man-years per £ million total input. This coefficient is shown as 71.3 in Row (34) Column (3) of Table 6.

*The (I–A) Inverse*

Table 7 shows numerical values of the (I–A) inverse derived from the matrix of $a_{ij}$ coefficients having 28 rows and columns. The Table 7 entries are rounded from the computer print-out results, which showed 6 decimal places; the table has 28 rows and columns.

The meaning of the entries in Table 7 should now be considered. Table 7 is to be read by columns, not by rows. Each column of Table 7 gives a list of sector output amounts *required directly plus indirectly* by one unit of final demand for the kind of output specified by the column. For example, Column (1) of Table 7 relates to food NI. A final demand (e.g., exports) of £1 million of food NI requires £1.093 million of food NI, Row (1) of Column (1); it requires £0.659 million of agricultural output, Row (19) of Column (1); it requires £0.316 million of output of food Rest, Row (2) of Column (1).

It will be noticed that coefficients generally are quite small, except for the row corresponding to the column being considered. This row has a coefficient generally exceeding unity, which says that to get, for instance, £1 million of food NI exports requires, throughout the 28 economic sectors, more than just the direct contribution from the food NI sector. Table 5 shows that food NI sells output to trade and services sector (25), which in turn sells output (Row (25)) to food NI, thus some elaborate indirect effects occur.

The Table 7 coefficients are particularly appropriate for analysis of Table 5 final demands. But these Table 7 coefficients are also valid as estimators of amounts required by other final demands. Their validity has to be decided upon by the user. Chapter 5 below considers important conditions for their meaningful use.

*Primary Input Requirements per Unit Final Demand*

Corresponding to Column (1) of Table 7, having Rows (1) to (28), we can visualise Column (1) of that table extended to include primary input rows (29)

to (33). This perhaps is the easiest way to approach the primary input "direct plus indirect" coefficients shown in Table 8. Within the rest of the present chapter we shall use *requirement* as an abbreviated title for these coefficients, which are the coefficients of direct plus indirect primary input requirements per unit final demand.

Their meaning is analogous to that of the inter-dependence coefficients described in the previous section. Each row of primary input of Tables 5 and 6 has a row of requirement coefficients in Table 8. For the moment we ignore the row of GNP coefficients, to be discussed in the next section of the chapter. The sum of the requirement coefficients derived from Rows (29) to (33) of Table 6, and shown as correspondingly-numbered rows of Table 8 should add to unity; the practical result can be observed in Table 8. For instance, the five entries in Column (25), 0.060, .. . . . 0.221, add up to give 1.000. Due to losses through rounding errors many such sums amount to 0.999 or 0.998. This summing to unity means that the I–O system has primary input equal to final demand, when analysed in the way being considered, by the requirement coefficients.

A numerical example may clarify the meaning. Let us take Column (3) of Table 8, denoted textiles NI. Per £1 million of final demand for output of textiles NI, our model says that £0.619 million of imports is required, that other direct and indirect costs are £0.062 million of indirect taxes, £0.278 million of wages etc., £0.059 million of profits, and that government will have to find £0.019 million of subsidy payout.

*GNP Coefficients*

The last row of Table 8 shows the sum of coefficients numbered (30) to (33); for each column of Table 8 this sum should be 1.0 less the value of the import coefficient, Row (29), but rounding error causes discrepancies. The sum of the four coefficients is Gross National Product at market prices. These GNP coefficients will be discussed as multipliers in Chapter 5 below and their economic significance and conditions of valid use considered carefully. Here we consider only statistical aspects.

The meaning of the GNP row of coefficients of Table 8 should be fairly obvious. One unit of final demand for the output of a sector is related to an amount of GNP shown by the coefficient under discussion, in the relevant column of Table 8. These GNP coefficients will always be less than unity, because a unit of final demand always requires some imports, which have to be subtracted from final demand to leave domestic shares, which are GNP components.

The same row of coefficients can be considered as being of special significance for exports. They can be thought of as *Net Export* coefficients, since

a unit of exports could have its import content subtracted, in order to measure its positive effect on foreign trade balance of payments; these net export coefficients are exactly equivalent to GNP coefficients.

We now consider the numerical values for the 18 manufacturing sectors. Their range is considerable, going from 0.380 to 0.731. The largest is 0.731 for food NI; it says that £1 million of exports from that sector is worth £0.731 million of foreign exchange net of imports, and an equal amount of GNP. Other large GNP coefficients occur for textiles Rest and food Rest. There is no clear superiority of either NI or Rest over the other corresponding sectors; some pairs of sectors have NI greater than Rest and vice versa.

Before leaving Table 8 we may notice that the five largest GNP coefficients occur in non-manufacturing sectors (19), (20), (21) (25) and (28), the largest of all occurring in (25) trade, and having a value 0.940.

*Primary Input Required by Aggregate Final Demand*

The six columns of final demand, numbered (29) to (34) in Table 5, have been broken down further to show the eight separate columns of Table 9, as well as the total column. The export column of Table 5 has been subdivided into (i) NI, (ii) Rest, (iii) Exports from sectors (19) to (25). The Rest abbreviation means rest of manufacturing, which is sectors (2), (4), (6), . . . . . (18).

What Table 9 shows is how the final demands of Table 5 *are fully accounted for* by primary input Rows (29) to (33). These primary inputs are required or absorbed by the final demand both directly and indirectly. The direct entries are those which explicitly appear in the final demand columns of Table 5, for example, imports of £654.20 million appear in the household column. These direct entries or flows to final demand are shown explicitly in Table 9. The remaining flows are estimated through the (I–A) inverse and are denoted "via inter-industry". The direct and indirect amounts are then added together to give the "Total" row for each of the five primary inputs.

The primary input content of each major kind of final demand can be affected by the degree of detail contained in the inter-industry matrix. See Appendix 2 for a discussion of disaggregation effects on the Irish 1976 final demands, by comparing two available sets of results.

*All Imports*

Most of the total amount of £2467 million is absorbed by three kinds of final demand, as shown. Household expenditure takes £1049 million, capital formation takes £609 million and NI exports takes £481 million.

*Indirect Taxes less Subsidies*

Household expenditure takes £552 million of the total £889 million indirect taxes. NI exports take £107 million, with £86 million absorbed by government current expenditure.

Subsidies benefit household expenditure most, to the extent of £162 million. Exports of NI absorbed £60 million of subsidies.

*Wages and Salaries*

The total of £2507 million of wages and salaries has four major allocations, each more than 10 per cent of the total. Household expenditure absorbs £887 million; government current expenditure takes £525 million; capital formation takes £375 million, while NI exports take £307 million.

*Profits and Depreciation*

This has a total value of £1418 million. Three major allocations take at least 10 per cent each. The largest allocation is the £539 million going to household expenditure. A further £311 million is absorbed by NI Exports. The third largest share, £184 million, goes to government current expenditure.

*NI Exports compared with Rest Exports*

The comparision of NI exports with those of Rest shows three large differences in primary input content. The NI exports are more import-intensive, having 42 per cent import content as against 34 per cent for Rest. They are much less wage-intensive, having 27 per cent as against 39 per cent. They are profit-intensive, having 27 per cent content, as against 23 per cent for Rest.

*Employment Requirements per Unit Final Demand*

Table 10 shows the employment requirement coefficients for the 28 sectors. Because of inter-industry inputs a unit of final demand requires indirect employment from all sectors as well as the direct employment which corresponds to the direct input coefficient. These employment coefficients will be discussed as multipliers in Chapter 5 below and their conditions of valid use considered carefully. Here we consider only statistical aspects.

There is considerable variation among the employment requirement coefficients of the 18 manufacturing sectors. The largest value is 278.6, in textiles Rest; and the smallest is 75.3, in NI chemicals. Except for food and other manufacturing the Rest coefficient is in each pair larger than its counterpart.

Table 5: *Irish input-output transactions for 1976 with new industry separate in £ million at producer prices*

| Sources of Inputs / Allocation of output | | Food NI | Food rest | Textiles NI | Textiles rest | Clothing and footwear NI | Clothing and footwear rest | Wood and furniture NI | Wood and furniture rest | Paper and printing NI | Sectors | Paper and printing rest | Chemicals and plastics NI | Chemicals and plastics rest | Struct. clay NI | Struct. clay rest | Metal and engineer. NI | Metal and engineer. rest | Other manufact. NI | Other manufact. rest | Sectors | Agric., forestry, fishing | Solid fuel | Stone, ores, gravel | New and repair construct. | Electric. and townsgas | Transport | Trade and services | Mats. for repairs | Packaging | Residual business current expend. | Sectors | Total inter-industry | Household consumpt. expend. | Govt. current expend. | Increases in stocks | Gross fixed capital formation | Exports except tourist | Tourist expend. | Total final demand | Total output | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) | | (19) | (20) | (21) | (22) | (23) | (24) | (25) | (26) | (27) | (28) | | | (29) | (30) | (31) | (32) | (33) | (34) | | | |
| Food NI | (1) | 38.38 | 26.48 | | | | | | | | (1) | | | | | | | | 2.47 | 4.78 | (1) | 22.48 | | | | | 0.85 | 4.22 | | | 3.02 | (1) | 102.68 | 82.05 | | | | 427.00 | 6.10 | 515.15 | 617.83 | (1) |
| Food rest | (2) | 130.27 | 89.85 | | | | | | | | (2) | | | | | | | | 8.44 | 16.26 | (2) | 76.35 | | | | | 2.90 | 14.29 | | | 10.20 | (2) | 348.56 | 288.32 | | | | 191.70 | 17.70 | 497.72 | 846.28 | (2) |
| Textiles NI | (3) | | | 3.51 | 11.24 | 0.59 | 3.50 | 0.04 | 0.15 | | (3) | 0.03 | | | | | | | 0.64 | 1.17 | (3) | 0.35 | | | 0.28 | | | 0.09 | | 0.51 | 3.94 | (3) | 26.04 | 7.63 | | | | 83.50 | 1.40 | 92.53 | 118.57 | (3) |
| Textiles rest | (4) | | | 4.07 | 13.05 | 0.68 | 4.06 | 0.05 | 0.18 | | (4) | 0.03 | | | | | | | 0.74 | 1.35 | (4) | 0.40 | | | 0.32 | | | 0.10 | | 0.59 | 4.56 | (4) | 30.18 | 25.27 | | | | 47.50 | 0.70 | 73.47 | 103.65 | (4) |
| Clothing NI | (5) | | | | | 0.68 | 4.69 | | | | (5) | | | | | | | | | | (5) | | | | | | | | | | (5) | 5.37 | 10.81 | | | | 25.70 | | 36.51 | 41.88 | (5) |
| Clothing rest | (6) | | | | | 2.35 | 16.43 | | | | (6) | | | | | | | | | | (6) | | | | | | | | | | (6) | 18.78 | 1.52 | | | | 50.60 | | 52.12 | 70.90 | (6) |
| Wood NI | (7) | | | | | | | 0.66 | 4.03 | | (7) | | | | | | 0.16 | 0.34 | | | (7) | | | | 3.09 | | | | | 2.03 | (7) | 10.31 | 10.49 | | | 3.15 | 12.40 | | 26.04 | 36.35 | (7) |
| Wood rest | (8) | | | | | | | 1.53 | 9.28 | | (8) | | | | | | 0.37 | 0.75 | | | (8) | | | | 7.09 | | | | | 4.66 | (8) | 23.68 | 9.51 | | | 2.85 | 4.20 | | 16.56 | 40.24 | (8) |
| Paper NI | (9) | | | | | | | | | 0.33 | (9) | 1.91 | | | | | | | | 0.09 | (9) | | 0.01 | | | 0.05 | 4.50 | | 3.29 | 2.28 | (9) | 12.46 | 2.47 | | | | 9.60 | | 12.07 | 24.53 | (9) |
| Paper rest | (10) | | | | | | | | | 2.74 | (10) | 15.37 | | | | | | | | 0.66 | (10) | | 0.12 | | | 0.42 | 36.36 | | 26.61 | 18.18 | (10) | 100.46 | 18.63 | | | | 29.40 | 1.40 | 49.43 | 149.89 | (10) |
| Chemicals NI | (11) | 8.15 | 12.98 | | | | 0.29 | 0.38 | 0.74 | | (11) | | 3.38 | 0.70 | | | 2.92 | 5.81 | | 0.09 | (11) | 16.51 | | | 0.96 | | | 4.14 | 0.18 | 1.18 | | (11) | 58.41 | 13.51 | | | | 176.30 | | 189.81 | 248.22 | (11) |
| Chemicals rest | (12) | 10.46 | 16.65 | | | | 0.34 | 0.50 | 0.96 | | (12) | | 4.35 | 0.86 | | | 3.77 | 7.39 | | 0.13 | (12) | 21.19 | | | 1.23 | | | 5.31 | 0.23 | 1.51 | | (12) | 74.88 | 14.72 | | | | 31.40 | | 46.12 | 121.00 | (12) |
| Struct. clay NI | (13) | | | | | | | | | | (13) | | | | 0.09 | 1.68 | 0.07 | 0.10 | | | (13) | 0.01 | | 0.05 | 2.19 | | | 0.18 | 0.13 | 0.20 | 1.08 | (13) | 5.78 | 0.42 | | | | 23.90 | | 24.32 | 30.10 | (13) |
| Struct. clay rest | (14) | | | | | | | | | | (14) | | | | 2.87 | 50.17 | 1.86 | 4.22 | | | (14) | 0.38 | | 1.34 | 65.60 | | | 5.47 | 3.84 | 6.18 | 32.38 | (14) | 174.31 | 11.58 | | | | 8.30 | | 19.88 | 194.19 | (14) |
| Metal NI | (15) | | | | | | | 0.28 | 0.53 | | (15) | | | | | | 4.73 | 7.04 | | | (15) | 5.13 | 0.02 | | 5.65 | 0.82 | 4.21 | 3.87 | 2.80 | 2.34 | | (15) | 37.42 | 31.22 | | | 19.58 | 242.50 | | 293.30 | 330.72 | (15) |
| Metal rest | (16) | | | | | | | 1.31 | 2.47 | | (16) | | | | | | 23.15 | 34.78 | | | (16) | 25.09 | 0.16 | | 27.68 | 4.08 | 20.52 | 18.86 | 13.72 | 11.50 | | (16) | 183.32 | 42.55 | | | 26.68 | 119.30 | | 188.53 | 371.85 | (16) |
| Other man. NI | (17) | 0.25 | 0.56 | 0.01 | 0.12 | 0.49 | 0.30 | 0.02 | 0.02 | 0.01 | (17) | 0.07 | 0.33 | 0.04 | 0.07 | 0.57 | 0.22 | 0.36 | 0.51 | 0.96 | (17) | 0.23 | | 0.04 | 0.15 | 0.01 | 0.12 | 0.24 | 0.01 | | 7.24 | (17) | 12.95 | 26.84 | | | | 144.40 | 3.50 | 174.74 | 187.69 | (17) |
| Other man. rest | (18) | 0.33 | 0.74 | 0.02 | 0.15 | 0.63 | 0.39 | 0.03 | 0.03 | 0.01 | (18) | 0.09 | 0.44 | 0.05 | 0.09 | 0.75 | 0.28 | 0.47 | 0.66 | 1.25 | (18) | 0.30 | 0.01 | 0.05 | 0.20 | 0.02 | 0.16 | 0.32 | 0.02 | | 9.45 | (18) | 16.94 | 137.35 | | | | 15.10 | 7.10 | 159.55 | 176.49 | (18) |
| *Sectors* | | (1 | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | *Sectors* | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) | *Sectors* | (19) | (20) | (21) | (22) | (23) | (24) | (25) | (26) | (27) | (28) | *Sectors* | *Inter* | *House* | *Govt.* | *Stocks* | *GFCF* | *Exports* | *Tourism* | *Final* | *Total output* | *Sectors* |
| Ag., for., fish. | (19) | 291.60 | 376.43 | 0.80 | 10.28 | | | | 0.50 | | (19) | | | | | | | | 6.25 | 9.80 | (19) | 2.99 | | | | | | 1.53 | | | | (19) | 700.18 | 141.30 | 2.80 | 13.00 | 5.50 | 169.67 | 9.10 | 341.37 | 1,041.55 | (19) |
| Solid fuel | (20) | | | | | | | | | | (20) | | | | | | | | | | (20) | | | | | 16.26 | | 5.11 | | | | (20) | 21.37 | 12.19 | | | | 5.69 | | 17.88 | 39.25 | (20) |
| Stone etc. | (21) | | 0.36 | | | | | | | | (21) | | | | 3.10 | 18.31 | | | | | (21) | 3.96 | | 0.60 | 17.82 | | | | | | | (21) | 44.15 | | | | | 29.54 | | 29.54 | 73.69 | (21) |
| New and R. constr. | (22) | | | | | | | | | | (22) | | | | | | | | | | (22) | | | 2.26 | 48.12 | | 4.88 | 36.52 | | | 7.82 | (22) | 99.60 | | 51.90 | | 579.50 | | | 631.40 | 731.00 | (22) |
| Electr. and Gas | (23) | 4.57 | 7.49 | 2.31 | 2.44 | 0.94 | 0.43 | 0.43 | 0.69 | 0.34 | (23) | 1.60 | 4.29 | 3.85 | 0.41 | 6.74 | 4.96 | 9.62 | 3.97 | 1.92 | (23) | 3.45 | 0.41 | 1.92 | 15.98 | 2.36 | 0.37 | 19.14 | | | 1.66 | (23) | 102.29 | 89.29 | | | | | | 89.29 | 191.58 | (23) |
| Transport | (24) | 6.47 | 0.54 | 2.03 | | 0.98 | | 1.17 | | 0.80 | (24) | | 10.97 | | 0.90 | | 6.91 | 1.48 | 11.21 | | (24) | 4.48 | | | | | 1.18 | 16.68 | | | 5.57 | (24 | 71.37 | 56.40 | | | 15.00 | 124.80 | 3.60 | 199.80 | 271.17 | (24) |
| Trade and services | (25) | 3.31 | 32.62 | 0.93 | 0.60 | 0.10 | 0.27 | 0.10 | 0.20 | 0.08 | (25) | 0.43 | 1.22 | 0.88 | 0.55 | 6.69 | 6.02 | 18.54 | 3.23 | 5.22 | (25) | 34.28 | 0.32 | 0.79 | 15.39 | 0.32 | 1.70 | 138.88 | 1.40 | | 482.78 | (25) | 756.85 | 903.80 | 790.00 | | 30.00 | 41.15 | 58.20 | 1,823.15 | 2,850.00 | (25) |
| Mats. for repair | (26) | 4.14 | 6.74 | 2.24 | 2.57 | 0.11 | 0.29 | 0.15 | 0.24 | 0.22 | (26) | 1.82 | 5.20 | 1.52 | 0.77 | 7.90 | 2.41 | 5.21 | 2.06 | 3.00 | (26) | | 2.15 | 1.03 | 2.00 | 7.34 | 0.95 | 27.85 | | | 12.03 | (26) | 99.94 | | | | | | | nil | 99.94 | (26) |
| Packaging | (27) | 14.92 | 22.44 | 2.75 | 2.95 | 1.17 | 1.05 | 0.11 | 0.21 | 0.20 | (27) | 1.66 | 27.34 | 1.71 | 0.55 | 4.08 | 2.38 | 6.20 | 8.49 | 11.18 | (27) | | 0.28 | 0.92 | | | | 3.89 | | | | (27) | 114.48 | | | | | | | nil | 114.48 | (27) |
| Resid. bus. c.e. | (28) | 12.61 | 58.47 | 6.72 | 25.30 | 2.07 | 6.84 | 4.19 | 3.17 | 2.55 | (28) | 17.09 | 35.17 | 42.25 | 3.46 | 23.22 | 23.25 | 78.29 | 16.72 | 20.36 | (28) | 116.90 | 2.75 | 7.64 | 20.84 | 3.07 | 11.77 | 109.42 | | | 44.37 | (28) | 698.49 | | | | | | | nil | 698.49 | (28) |
| *Total inter-industry* | | 525.46 | 652.35 | 25.39 | 68.70 | 10.79 | 38.88 | 10.95 | 23.40 | 7.28 | *Inter* | 40.10 | 92.69 | 51.86 | 12.86 | 120.11 | 83.46 | 180.60 | 65.39 | 78.22 | *Inter* | 334.48 | 6.23 | 16.64 | 234.59 | 34.28 | 50.08 | 456.97 | 22.33 | 53.91 | 653.25 | *Inter* | 3,951.25 | 1,937.87 | 844.70 | 13.00 | 682.26 | 2,013.65 | 108.80 | 5,600.28 | 9,551.53 | *Inter* |
| All Imports | (29) | 37.64 | 91.84 | 63.49 | 6.88 | 16.16 | 10.31 | 9.89 | 6.77 | 10.06 | (29) | 55.11 | 86.01 | 38.39 | 7.11 | 25.98 | 140.51 | 96.47 | 58.09 | 57.79 | (29) | 100.02 | 2.10 | 1.91 | 135.13 | 60.51 | 63.30 | 39.64 | 75.61 | 60.57 | 25.01 | (29) | 1,382.30 | 654.20 | | | 415.95 | 3.85 | 10.90 | 1,084.90 | 2,467.20 | (29) |
| Indir Taxes | (30) | 12.00 | 8.18 | 3.50 | 3.66 | 1.30 | 1.61 | 1.90 | 1.40 | 0.70 | (30) | 4.83 | 8.80 | 2.85 | 1.20 | 4.71 | 16.00 | 7.28 | 9.00 | 8.71 | (30) | 7.05 | 0.02 | 0.69 | 2.93 | 8.65 | 2.71 | 203.77 | 2.00 | | 171.63 | (30) | 497.08 | 365.63 | | | 2.89 | | 23.50 | 392.02 | 889.10 | (30) |
| Less subsidies | (31) | −13.50 | −13.80 | | | | | | | | (31) | | | | | | | | | | (31) | −25.80 | | | | | | | | | −151.40 | (31) | −204.50 | −92.60 | | | | −1.70 | −6.00 | −100.30 | −304.80 | (31) |
| Wages and salaries | (32) | 40.04 | 89.84 | 23.38 | 21.48 | 12.59 | 19.22 | 10.09 | 8.34 | 5.19 | (32) | 46.28 | 33.29 | 21.14 | 6.95 | 36.67 | 69.03 | 72.89 | 31.89 | 17.25 | (32) | 49.40 | 15.67 | 22.56 | 300.89 | 37.52 | 121.60 | 1,394.20 | | | | (32) | 2,507.40 | | | | | | | nil | 2,507.40 | (32) |
| Profits and deprec. | (33) | 16.19 | 17.87 | 2.81 | 2.93 | 1.04 | 0.88 | 3.52 | 0.33 | 1.30 | (33) | 3.57 | 27.43 | 6.76 | 1.98 | 6.72 | 21.72 | 14.61 | 23.32 | 14.52 | (33) | 576.40 | 15.28 | 31.89 | 57.46 | 50.62 | 33.48 | 485.42 | | | | (33) | 1,418.00 | | | | | | | nil | 1,418.00 | (33) |
| *Total primary* | | 92.37 | 193.93 | 93.18 | 34.95 | 31.09 | 32.02 | 25.40 | 16.84 | 17.25 | *Prim* | 109.79 | 155.53 | 69.14 | 17.24 | 74.08 | 274.26 | 191.25 | 122.30 | 98.27 | *Prim* | 707.07 | 33.02 | 57.05 | 496.41 | 157.30 | 221.09 | 2,123.03 | 77.61 | 60.57 | 45.24 | *Prim* | 5,600.28 | 927.23 | nil | nil | 418.84 | 2.15 | 28.40 | 1,376.62 | 6,976.90 | *Prim* |
| *Total input* | | 617.83 | 846.28 | 118.57 | 103.65 | 41.88 | 70.90 | 36.35 | 40.24 | 24.53 | *Total* | 149.89 | 248.22 | 121.00 | 30.10 | 194.19 | 330.72 | 371.85 | 187.69 | 176.49 | *Total* | 1,041.55 | 39.25 | 73.69 | 731.00 | 191.58 | 271.17 | 2,580.00 | 99.94 | 114.48 | 698.49 | *total* | | 2,865.10 | 844.70 | 13.00 | 1,101.10 | 2,015.80 | 137.20 | | | *total* |
| Sectors | | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | *Sectors* | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) | *Sectors* | (19) | (20) | (21) | (22) | (23) | (24) | (25) | (26) | (27) | (28) | *Sectors* | *Inter* | *House* | *Govt.* | *Stocks* | *GFCF* | *Exports* | *Tourism* | *Final* | *Total Output* | *Sectors* |
| Employment | (34) | 11,429 | 33,017 | 8,450 | 15,845 | 6,725 | 10,479 | 2,287 | 5,871 | 1,680 | *Employ* | 14,211 | 8,011 | 8,708 | 2,310 | 10,844 | 23,420 | 26,380 | 10,086 | 3,953 | *Employ* | 243,000 | 9,150 | 5,225 | 76,000 | 10,790 | 41,000 | 446,129 | | | | *Employ* | 1,035,000 | | | | | | | | 1,035,000 | *Employ* |

## Table 6: *Direct input coefficients for columns (1) to (34) of Table 5*

| | | *Food NI* (1) | *Food rest* (2) | *Textiles NI* (3) | *Textiles rest* (4) | *Clothing and footwear NI* (5) | *Clothing and footwear Rest* (6) | *Wood and furniture NI* (7) | *Wood and furniture rest* (8) | *Paper and printing NI* (9) | *Sectors* | *Paper and printing rest* (10) | *Chemicals and plastics NI* (11) | *Chemicals and plastics rest* (12) | *Struct. clay NI* (13) | *Struct. clay rest* (14) | *Metal and engineer. NI* (15) | *Metal and engineer. rest* (16) | *Other manufact. NI* (17) | *Other manufact. rest* (18) | *Sectors* | *Agricult., for. fishing* (19) | *Solid fuel* (20) | *Stone, ores, gravel* (21) | *New and repair construct* (22) | *Electric. and townsgas* (23) | *Transport* (24) | *Trade and services* (25) | *Mats for repairs* (26) | *Packaging* (27) | *Residual business current Expend.* (28) | *Sectors* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Food NI | (1) | .062 | .031 | | | | | | | | (1) | | | | | | | | .013 | .027 | (1) | .022 | | | | | .003 | .002 | | | .004 | (1) |
| Food rest | (2) | .211 | .106 | | | | | | | | (2) | | | | | | | | .045 | .092 | (2) | .073 | | | | | .011 | .006 | | | .015 | (2) |
| Textiles NI | (3) | | | .030 | .108 | .014 | .049 | .001 | .004 | | (3) | | | | | | | | .003 | .007 | (3) | | | | | | | | | .004 | .006 | (3) |
| Textiles rest | (4) | | | .034 | .126 | .016 | .057 | .001 | .005 | | (4) | | | | | | | | .004 | .008 | (4) | | | | | | | | | .005 | .007 | (4) |
| Clothing NI | (5) | | | | | .016 | .066 | | | | (5) | | | | | | | | | | (5) | | | | | | | | | | | (5) |
| Clothing rest | (6) | | | | | .056 | .232 | | | | (6) | | | | | | | | | | (6) | | | | | | | | | | | (6) |
| Wood NI | (7) | | | | | | | .018 | .100 | | (7) | | | | | | | .001 | | | (7) | | | .004 | | | | | | .003 | (7) |
| Wood rest | (8) | | | | | | | .042 | .230 | | (8) | | | | | | .001 | .002 | | | (8) | | | .010 | | | | | | .007 | (8) |
| Paper NI | (9) | | | | | | | | | .014 | (9) | .013 | | | | | | | | .001 | (9) | | | | | | .002 | | .029 | .003 | (9) |
| Paper rest | (10) | | | | | | | | | .112 | (10) | .103 | | | | | | | | .004 | (10) | | .003 | | | .002 | .014 | | .232 | .026 | (10) |
| Chemicals NI | (11) | .013 | .015 | | | | .004 | .011 | .018 | | (11) | | .014 | .006 | | | .009 | .016 | | .001 | (11) | .016 | | | .001 | | .002 | .002 | .010 | | (11) |
| Chemicals rest | (12) | .017 | .020 | | | | .005 | .014 | .024 | | (12) | | .018 | .007 | | | .011 | .020 | | .001 | (12) | .020 | | | .002 | | .002 | .002 | .013 | | (12) |
| Struct. clay NI | (13) | | | | | | | | | | (13) | | | | .003 | .009 | | | | | (13) | | | .001 | .003 | | | .001 | .002 | .002 | (13) |
| Struct. clay rest | (14) | | | | | | | | | | (14) | | | | .095 | .258 | .006 | .011 | | | (14) | | | .018 | .090 | | .002 | .038 | .054 | .046 | (14) |
| Metal NI | (15) | | | | | | | .008 | .013 | | (15) | | | | | | .014 | .019 | | | (15) | .005 | .001 | | .008 | .004 | .016 | .002 | .028 | .020 | | (15) |
| Metal rest | (16) | | | | | | | .036 | .061 | | (16) | | | | | | .070 | .094 | | | (16) | .024 | .004 | | .038 | .021 | .076 | .007 | .137 | .100 | | (16) |
| Other manu. NI | (17) | | .001 | | .001 | .012 | .004 | .001 | .001 | | (17) | | .001 | | .002 | .003 | .001 | .001 | .003 | .005 | (17) | | | .001 | | | | | | .010 | (17) |
| Other manu. rest | (18) | .001 | .001 | | .001 | .015 | .006 | .001 | .001 | | (18) | .001 | .002 | | .003 | .004 | .001 | .001 | .004 | .007 | (18) | | | .001 | | | .001 | | | .014 | (18) |
| *Sectors* | | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) | | (19) | (20) | (21) | (22) | (23) | (24) | (25) | (26) | (27) | (28) | |
| Ag., for., fish. | (19) | .472 | .445 | .007 | .099 | | | | .012 | | (19) | | | | | | | | .033 | .056 | (19) | .003 | | | | | | .001 | | | | (19) |
| Solid fuel | (20) | | | | | | | | | | (20) | | | | | | | | | | (20) | | | | | .085 | | .002 | | | | (20) |
| Stone etc. | (21) | | | | | | | | | | (21) | | | | .103 | .094 | | | | | (21) | .004 | | .008 | .024 | | | | | | | (21) |
| New and R. constr. | (22) | | | | | | | | | | (22) | | | | | | | | | | (22) | | | .031 | .066 | | .018 | .014 | | .011 | | (22) |
| Electr. and gas | (23) | .007 | .009 | .019 | .024 | .022 | .006 | .012 | .017 | .014 | (23) | .011 | .017 | .032 | .014 | .035 | .015 | .026 | .021 | .011 | (23) | .003 | .011 | .026 | .022 | .012 | .001 | .007 | | | .002 | (23) |
| Transport | (24) | .019 | .001 | .017 | | .023 | | .032 | | .033 | (24) | | .044 | | .030 | | .021 | .004 | .060 | | (24) | .004 | | | | | .004 | .006 | | | .008 | (24) |
| Trade and services | (25) | .005 | .039 | .008 | .006 | .002 | .004 | .003 | .005 | .003 | (25) | .003 | .005 | .007 | .018 | .034 | .018 | .050 | .017 | .030 | (25) | .033 | .008 | .011 | .021 | .002 | .006 | .054 | .014 | | .691 | (25) |
| Mats. for repair | (26) | .007 | .008 | .019 | .025 | .003 | .004 | .004 | .006 | .009 | (26) | .012 | .021 | .013 | .026 | .041 | .007 | .014 | .011 | .017 | (26) | | .055 | .014 | .003 | .038 | .004 | .011 | | | .017 | (26) |
| Packaging | (27) | .024 | .027 | .023 | .028 | .028 | .015 | .003 | .005 | .008 | (27) | .011 | .110 | .014 | .018 | .021 | .007 | .017 | .045 | .063 | (27) | | .007 | .013 | | | | .002 | | | | (27) |
| Resid. bus. c.e. | (28) | .020 | .069 | .057 | .244 | .050 | .096 | .115 | .079 | .104 | (28) | .114 | .142 | .349 | .115 | .120 | .070 | .211 | .089 | .115 | (28) | .112 | .070 | .103 | .029 | .016 | .043 | .042 | | | .064 | (28) |
| imports | (29) | .061 | .109 | .535 | .066 | .386 | .145 | .272 | .168 | .410 | (29) | .368 | .347 | .317 | .236 | .134 | .425 | .259 | .310 | .327 | (29) | .096 | .054 | .026 | .185 | .316 | .233 | .015 | .757 | .529 | .036 | (29) |
| indir. taxes | (30) | .019 | .010 | .030 | .035 | .031 | .023 | .052 | .035 | .029 | (30) | .032 | .035 | .024 | .040 | .024 | .048 | .020 | .048 | .049 | (30) | .007 | .001 | .009 | .004 | .045 | .010 | .079 | .020 | | .246 | (30) |
| Less subsid. | (31) | −.022 | −.016 | | | | | | | | (31) | | | | | | | | | | (31) | −.025 | | | | | | | | | −.022 | (31) |
| Wages and sal. | (32) | .065 | .106 | .197 | .207 | .301 | .271 | .278 | .207 | .212 | (32) | .309 | .134 | .175 | .231 | .189 | .209 | .196 | .170 | .098 | (32) | .047 | .399 | .306 | .412 | .196 | .448 | .540 | | | | (32) |
| Profits and d. | (33) | .026 | .021 | .024 | .028 | .025 | .012 | .097 | .088 | .053 | (33) | .024 | .111 | .056 | .066 | .035 | .066 | .039 | .124 | .082 | (33) | .553 | .388 | .433 | .079 | .264 | .123 | .788 | | | | (33) |
| *Sectors* | | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) | | (19) | (20) | (21) | (22) | (23) | (24) | (25) | (26) | (27) | (28) | |
| Employment | (34) | 18.5 | 39.0 | 71.3 | 152.9 | 160.6 | 147.8 | 62.9 | 145.9 | 68.5 | Empl. | 94.8 | 32.3 | 72.0 | 76.7 | 55.8 | 70.8 | 70.9 | 53.8 | 22.4 | *Empl.* | 233.3 | 233.1 | 70.9 | 104.0 | 56.3 | 151.2 | 172.9 | | | | |

(1) Except for rounding errors, entries in rows (1) to (33) of each column add to unity.

(2) The employment coefficients are given in manyears per £ million total input.

Table 7: *The 28-Sector (I-A) inverse derived from Table 5*

| | | *Food NI* | *Food rest* | *Textiles NI* | *Textiles rest* | *Clothing and footwear NI* | *Clothing and footwear rest* | *Wood and furniture NI* | *Wood and furniture rest* | *Paper and printing NI* | *Sectors* | *Paper and printing rest* | *Chemicals and plastics NI* | *Chemicals and plastics rest* | *Struct. clay NI* | *Struct. clay rest* | *Metal and engineer NI* | *Metal and engineer. rest* | *Other manufact. NI* | *Other manufact. rest* | *Sectors* | *Agricult., forestry, fishing* | *Solid fuel* | *Stone, ores gravel* | *New and repair constr.* | *Electric. and townsgas* | *Transport* | *Trade and services* | *Mats. for repairs* | *Packaging* | *Residual business current expend.* | *Sectors* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) | | (19) | (20) | (21) | (22) | (23) | (24) | (25) | (26) | (27) | (28) | |
| Food NI | (1) | 1.093 | .054 | .001 | .006 | .002 | .002 | .002 | .002 | .001 | (1) | .091 | .002 | .003 | .002 | .002 | .001 | .002 | .019 | .038 | (1) | .029 | .001 | .001 | .001 | | .005 | .003 | .001 | .001 | .009 | (1) |
| Food rest | (2) | .316 | 1.182 | .004 | .021 | .006 | .008 | .005 | .007 | .004 | (2) | .004 | .006 | .011 | .006 | .007 | .004 | .008 | .065 | .128 | (2) | .098 | .002 | .004 | .002 | .001 | .016 | .009 | .002 | .003 | .030 | (2) |
| Textiles NI | (3) | .002 | .002 | 1.036 | .131 | .022 | .079 | .003 | .007 | .001 | (3) | .001 | .002 | .003 | .001 | .002 | .001 | .002 | .005 | .009 | (3) | .002 | .001 | .001 | .001 | | .001 | | | .005 | .007 | (3) |
| Textiles rest | (4) | .001 | .001 | .041 | 1.150 | .025 | .091 | .002 | .007 | | (4) | .001 | | .001 | | | | | .005 | .010 | (4) | .001 | | | .001 | | | | | | .002 | (4) |
| Clothing NI | (5) | | | | | 1.022 | .088 | | | | (5) | | | | | | | | | | (5) | | | | | | | | | | (5) |
| Clothing rest | (6) | | | | | .075 | 1.308 | | | | (6) | | | | | | | | | | (6) | | | | | | | | | | (6) |
| Wood NI | (7) | .001 | .001 | | .001 | | .001 | 1.025 | .134 | .001 | (7) | .001 | .001 | .002 | .001 | .001 | .001 | .003 | .001 | .001 | (7) | .001 | | .001 | .006 | | .001 | | | .001 | .005 | (7) |
| Wood rest | (8) | .002 | .002 | .001 | .003 | .001 | .002 | .058 | 1.309 | .001 | (8) | .001 | .002 | .004 | .002 | .002 | .003 | .006 | .001 | .002 | (8) | .002 | .001 | .002 | .015 | | .001 | .001 | .001 | .001 | .011 | (8) |
| Paper NI | (9) | .002 | .002 | .001 | .003 | .002 | .002 | .001 | .001 | 1.016 | (9) | .016 | .005 | .003 | .002 | .002 | .001 | .002 | .002 | .004 | (9) | .001 | .001 | .001 | .001 | | .001 | .003 | | .033 | .006 | (9) |
| Paper rest | (10) | .018 | .019 | .011 | .025 | .013 | .016 | .009 | .012 | .135 | (10) | 1.126 | .038 | .022 | .014 | .018 | .008 | .019 | .019 | .031 | (10) | .010 | .009 | .009 | .005 | .002 | .006 | .020 | .004 | .269 | .049 | (10) |
| Chemicals NI | (11) | .032 | .030 | .001 | .004 | .001 | .007 | .013 | .029 | .001 | (11) | .001 | 1.016 | .007 | .001 | .001 | .011 | .019 | .004 | .007 | (11) | .020 | .001 | .001 | .003 | .001 | .002 | .002 | .005 | .013 | .003 | (11) |
| Chemicals rest | (12) | .041 | .038 | .001 | .005 | .002 | .008 | .018 | .037 | .001 | (12) | .001 | .021 | 1.009 | .001 | .002 | .014 | .024 | .005 | .009 | (12) | .026 | .001 | .001 | .004 | .001 | .003 | .003 | .006 | .017 | .004 | (12) |
| Struct. clay NI | (13) | .001 | .001 | | .001 | | .001 | | .001 | | (13) | | .001 | .001 | 1.005 | .013 | .001 | .001 | | .001 | (13) | | | .001 | .005 | | | | .002 | .003 | .003 | (13) |
| Struct. clay rest | (14) | .017 | .018 | .009 | .030 | .009 | .016 | .013 | .017 | .012 | (14) | .012 | .028 | .031 | .149 | 1.375 | .019 | .041 | .014 | .019 | (14) | .014 | .010 | .040 | .139 | .005 | .010 | .011 | .059 | .083 | .080 | (14) |
| Metal NI | (15) | .006 | .005 | .002 | .004 | .002 | .002 | .011 | .022 | .002 | (15) | .001 | .005 | .002 | .003 | .004 | 1.018 | .024 | .004 | .004 | (15) | .007 | .003 | .002 | .011 | .006 | .018 | .003 | .032 | .024 | .004 | (15) |
| Metal rest | (16) | .029 | .026 | .010 | .019 | .009 | .009 | .053 | .104 | .008 | (16) | .006 | .024 | .011 | .014 | .018 | .086 | 1.117 | .018 | .018 | (16) | .033 | .016 | .008 | .051 | .032 | .089 | .014 | .157 | .117 | .018 | (16) |
| Other manuf. NI | (17) | .003 | .003 | .001 | .005 | .013 | .009 | .003 | .003 | .002 | (17) | .002 | .004 | .005 | .005 | .006 | .002 | .004 | 1.004 | .008 | (17) | .002 | .001 | .002 | .002 | | .001 | .001 | .001 | .002 | .012 | (17) |
| Other manuf. rest | (18) | .004 | .004 | .002 | .007 | .017 | .012 | .003 | .004 | .003 | (18) | .003 | .005 | .006 | .006 | .009 | .003 | .006 | .006 | 1.010 | (18) | .003 | .002 | .003 | .002 | .001 | .002 | .001 | .001 | .002 | .016 | (18) |
| *Sectors* | | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) | | (19) | (20) | (21) | (22) | (23) | (24) | (25) | (26) | (27) | (28) | |
| Ag., for., fish. | (19) | .659 | .553 | .013 | .128 | .007 | .015 | .004 | .022 | .003 | (19) | .003 | .004 | .007 | .004 | .005 | .003 | .006 | .073 | .133 | (19) | 1.061 | .002 | .002 | .002 | .001 | .010 | .006 | .001 | .002 | .020 | (19) |
| Solid fuel | (20) | .002 | .002 | .002 | .004 | .002 | .002 | .002 | .003 | .002 | (20) | .001 | .002 | .004 | .002 | .005 | .002 | .004 | .002 | .002 | (20) | .001 | 1.001 | .003 | .003 | .086 | .001 | .003 | .001 | .001 | .003 | (20) |
| Stone etc. | (21) | .004 | .005 | .001 | .004 | .001 | .002 | .001 | .002 | .001 | (21) | .001 | .002 | .003 | .119 | .132 | .002 | .004 | .002 | .003 | (21) | .006 | .001 | 1.013 | .040 | .001 | .002 | .001 | .006 | .008 | .009 | (21) |
| New and R. construct. | (22) | .005 | .006 | .003 | .009 | .003 | .005 | .005 | .005 | .004 | (22) | .004 | .005 | .010 | .009 | .010 | .004 | .008 | .005 | .005 | (22) | .005 | .002 | .037 | 1.074 | .001 | .021 | .018 | .002 | .003 | .027 | (22) |
| Electr. and Gas | (23) | .019 | .019 | .023 | .036 | .027 | .017 | .018 | .032 | .018 | (23) | .015 | .023 | .038 | .025 | .056 | .021 | .036 | .026 | .018 | (23) | .010 | .012 | .031 | .033 | 1.015 | .006 | .010 | .008 | .012 | .015 | (23) |
| Transport | (24) | .019 | .009 | .019 | .008 | .027 | .007 | .037 | .009 | .035 | (24) | .003 | .048 | .006 | .033 | .004 | .024 | .010 | .068 | .005 | (24) | .009 | .001 | .002 | .002 | .001 | 1.007 | .008 | .003 | .004 | .016 | (24) |
| Trade and services | (25) | .169 | .215 | .074 | .277 | .068 | .149 | .129 | .154 | .110 | (25) | .115 | .146 | .308 | .156 | .212 | .110 | .275 | .123 | .175 | (25) | .168 | .074 | .110 | .091 | .031 | .071 | 1.105 | .066 | .077 | .843 | (25) |
| Mats. for repair | (26) | .018 | .019 | .025 | .044 | .009 | .017 | .012 | .019 | .016 | (26) | .019 | .030 | .027 | .040 | .067 | .014 | .028 | .018 | .027 | (26) | .008 | .059 | .021 | .014 | .045 | .008 | .015 | 1.007 | .013 | .035 | (26) |
| Packaging | (27) | .041 | .038 | .026 | .039 | .034 | .029 | .007 | .015 | .011 | (27) | .014 | .115 | .018 | .025 | .033 | .011 | .024 | .050 | .071 | (27) | .008 | .008 | .014 | .005 | .002 | .003 | .003 | .005 | 1.009 | .007 | (27) |
| Resid. bus. c.e. | (28) | .169 | .197 | .086 | .355 | .085 | .191 | .166 | .189 | .142 | (28) | .150 | .188 | .407 | .173 | .214 | .115 | .291 | .132 | .179 | (28) | .169 | .088 | .130 | .079 | .035 | .079 | .062 | .054 | .090 | 1.143 | (28) |
| *Sectors* | | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) | | (19) | (20) | (21) | (22) | (23) | (24) | (25) | (26) | (27) | (28) | |

Table 8: *Direct plus indirect primary input requirements per unit final demand, and GNP coefficients via (I–A) inverse of Table 5*

| *Source* | | *Food NI* (1) | *Food rest* (2) | *Text. NI* (3) | *Text. rest* (4) | *Cloth. NI* (5) | *Cloth. rest* (6) | *Wood NI* (7) | *Wood rest* (8) | *Paper NI* (9) | *Paper rest* (10) | *Chem. NI* (11) | *Chem. rest* (12) | *Struct. clay NI* (13) | *Struct. clay rest* (14) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Imports | (29) | .267 | .285 | .619 | .277 | .484 | .344 | .364 | .376 | .514 | .463 | .503 | .413 | .347 | .313 |
| Indirect taxes | (30) | .089 | .087 | .062 | .161 | .066 | .101 | .112 | .120 | .079 | .085 | .100 | .154 | .104 | .111 |
| Less subsidies | (31) | −.082 | −.077 | −.019 | −.081 | −.019 | −.042 | −.036 | −.042 | −.031 | −.033 | −.041 | −.089 | −.038 | −.047 |
| Wages and salaries | (32) | .273 | .312 | .278 | .462 | .407 | .524 | .415 | .454 | .345 | .426 | .275 | .382 | .417 | .452 |
| Profits and deprec. | (33) | .451 | .391 | .059 | .178 | .061 | .072 | .144 | .090 | .092 | .058 | .162 | .138 | .169 | .170 |
| GNP (30) to (33) | | .731 | .713 | .380 | .720 | .515 | .655 | .635 | .622 | .485 | .536 | .496 | .585 | .652 | .686 |

| *Source* | | *Metal NI* (15) | *Metal rest* (16) | *Other man. NI* (17) | *Other man. rest* (18) | *Agri-cult.* (19) | *Solid fuel* (20) | *Stone* (21) | *Constr.* (22) | *Electr.* (23) | *Trans-port* (24) | *Trade* (25) | *Mats. for rep.* (26) | *Packag.* (27) | *Resid. bus. c.e.* (28) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Imports | (29) | .508 | .400 | .421 | .470 | .175 | .124 | .090 | .277 | .377 | .294 | .060 | .841 | .738 | .166 |
| Indirect taxes | (30) | .091 | .123 | .097 | .116 | .068 | .031 | .054 | .039 | .059 | .039 | .105 | .046 | .046 | .357 |
| Less subsidies | (31) | −.025 | −.063 | −.032 | −.045 | −.065 | −.019 | −.028 | −.017 | −.008 | −.018 | −.013 | −.012 | −.020 | −.249 |
| Wages and salaries | (32) | .319 | .417 | .303 | .252 | .186 | .454 | .408 | .560 | .261 | .530 | .627 | .094 | .191 | .532 |
| Profits and deprec. | (33) | .106 | .122 | .210 | .206 | .635 | .409 | .476 | .140 | .311 | .154 | .221 | .030 | .044 | .193 |
| GNP (30) to (33) | | .491 | .599 | .578 | .529 | .824 | .875 | .910 | .722 | .623 | .705 | .940 | .158 | .261 | .833 |

Table 9: *Primary input required by 1976 final demand*

£ million

| Kind of Primary Input | *Household expenditure col.* (29) | *Govt. current expend. Col.* (30) | *Capital form cols.* (31) *&* (32) | *NI exports col.* (33) *part* | *Rest exports col.* (33) *part* | *Exports from sectors* (19) *to* (25) *Col.* (33) *rest* | *Tourist expend. col.* (34) | *Total exports cols.* (33) *&* (34) | *Total final demand cols.* (29) *to* (34) |
|---|---|---|---|---|---|---|---|---|---|
| *Imports* (29) | | | | | | | | | |
| Direct | 654.20 | | 415.95 | | | | 10.90 | 14.75 | 1084.90 |
| via inter-industry | 394.99 | 62.39 | 192.80 | 480.57 | 170.73 | 61.48 | 19.34 | 732.12 | 1382.30 |
| Total | 1049.19 | 62.39 | 608.75 | 480.57 | 170.73 | 61.48 | 30.24 | 746.87 | 2467.20 |
| *Indirect taxes (30)* | | | | | | | | | |
| Direct | 365.63 | | 2.89 | | | | 23.50 | 23.50 | 392.02 |
| via inter-industry | 186.24 | 85.54 | 33.65 | 107.36 | 54.61 | 19.22 | 10.46 | 191.65 | 497.08 |
| Total | 551.87 | 85.54 | 36.54 | 107.36 | 54.61 | 19.22 | 33.96 | 215.15 | 889.10 |
| *Less subsidies (31)* | | | | | | | | | |
| Direct | − 92.60 | | | | | | −6.00 | − 7.70 | −100.30 |
| via inter-industry | −69.38 | −12.04 | −14.23 | −60.28 | −33.23 | −11.45 | −3.89 | −108.85 | −204.50 |
| Total | −161.98 | −12.04 | −14.23 | −60.28 | −33.23 | −11.45 | −9.89 | −116.55 | −304.80 |
| *Wages and salaries (32)* | | | | | | | | | |
| Direct | | | | | | | | | nil |
| via inter-industry | 887.21 | 525.19 | 375.31 | 306.71 | 192.79 | 168.66 | 51.53 | 719.69 | 2507.40 |
| Total | 887.21 | 525.19 | 375.31 | 306.71 | 192.79 | 168.66 | 51.53 | 719.69 | 2507.40 |
| *Profits and deprec. (33)* | | | | | | | | | |
| Direct | | | | | | | | | nil |
| Via inter-industry | 538.81 | 183.62 | 107.73 | 310.94 | 112.60 | 132.94 | 31.36 | 587.84 | 1418.00 |
| Total | 538.81 | 183.62 | 107.73 | 310.94 | 112.60 | 132.94 | 31.36 | 587.84 | 1418.00 |
| Total primary | 2865.10 | 844.70 | 1114.10 | 1145.30 | 497.50 | 370.85 | 137.20 | 2153.00 | 6976.90 |

Table 10: *Direct plus indirect employment required per unit final demand, derived from the 28-sector(I–A) inverse of Table 5*

*Man years per £million of final demand*

| | *Food NI* (1) | *Food rest* (2) | *Text. NI* (3) | *Text. rest* (4) | *Cloth. NI* (5) | *Cloth. rest* (6) | *Wood NI* (7) | *Wood rest* (8) | *Paper NI* (9) | *Paper rest* (10) | *Chem. NI* (11) | *Chem. rest* (12) | *Struct. clay NI* (13) | *Struct. clay rest* (14) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Direct plus indirect employment required | 230.6 | 228.3 | 102.9 | 278.6 | 202.6 | 265.8 | 141.0 | 220.3 | 109.0 | 133.4 | 75.3 | 142.6 | 131.7 | 137.8 |
| | *Metal NI* (15) | *Metal rest* (16) | *Other man. NI* (17) | *Other man. rest* (18) | *Agri-cult.* (19) | *Solid fuel* (20) | *Stone* (21) | *Constr.* (22) | *Electr.* (23) | *Trans-port* (24) | *Trade* (25) | *Mats. for rep.* (26) | *Pack.* (27) | *Resid. bus. c.e.* (28) |
| Direct plus indirect employment required | 106.4 | 146.0 | 108.3 | 103.4 | 292.7 | 251.8 | 103.7 | 150.4 | 86.8 | 179.9 | 213.0 | 32.0 | 61.8 | 181.8 |

Table 11: *Employment required by 1976 final demand in thousand man-years*

| | *Household expenditure* | *Govt. current expend.* | *Capital formation* | *NI exports* | *Rest exports* | *Exports from sectors (19) to (25)* | *Tourist expend.* | *Total exports* | *Total final demand* |
|---|---|---|---|---|---|---|---|---|---|
| | *Col.* (29) | *Col.* (30) | *Cols.* (31) *and* (32) | *Col.* (33) *part* | *Col.* (33) *part* | *Col.* (33) *rest* | *Col.* (34) | *Col.* (33) *and* (34) | *Cols.* (29) *to* (34) |
| Employment required | 381.9 | 176.9 | 107.2 | 183.3 | 99.9 | 63.4 | 22.4 | 369.0 | 1035.0 |

For manufacturing we can consider the employment requirements per £1 million final demand in two groups. The first group has the largest requirements; there are six sectors in the range 200 to 279, as follows: textiles Rest 278.6, clothing Rest 265.8, food NI 230.6, food Rest 228.3, wood Rest 220.3, clothing NI 202.6. These top six sectors include both NI and Rest.

The second group has smaller employment requirements; there are twelve sectors in the range 75–200, of which the top six are as follows: metal Rest 146.0, chemical Rest 142.6, wood NI 141.0, structural clay Rest 137.8, paper Rest 133.4, structural clay NI 131.7. We notice that these six sectors also include both NI and Rest.

The largest employment coefficients of all, of value 292.7, is for agriculture. There are two further non-manufacturing coefficients in excess of 200: solid fuel 251.8, and trade and services 213.0.

*Employment Required by Final Demand*

Table 11 gives a summary picture of how employment in 1976 was absorbed by final demands. There are eight columns shown for parts of final demand, as well as the column of the aggregate; again total exports are divided into four components, one component being tourist expenditure.

*Allocation of Total Employment*

Application of the Table 10 requirements coefficients to the final demand columns of Table 5 gives the results shown in Table 11, which allocates total employment to the various final demands. Of the total 1035 thousand persons or man-years employed during 1976, 382 thousand (37 per cent) were required by household expenditure, 369 thousand (36 per cent) by total exports, 177 thousand (17 per cent) by government current expenditure and 107 thousand (10 per cent) by capital formation. We see, therefore, that for the I–O model and final demands, as defined, household expenditure in 1976 was the biggest support to employment, absorbing 37 per cent. Exports absorbed 36 per cent, and, therefore, were the next best employment support. Government consumption was the support for about one job in six and fixed capital formation for about one job in ten.

Within total exports we see that NI exports required about half the employment, with Rest exports requiring roughly a further one-quarter.

Chapter 5

## *INCOME AND EMPLOYMENT EFFECTS DERIVED FROM THE RESULTS AND SOME CONCLUSIONS*

AN important purpose of this paper is to determine the effect which each sector (as defined) has on income and employment in the state and to compare sectors in this regard. For example, it is of interest for policy makers to determine the total income and employment effects associated with, say, the chemicals and plastics sector, and to compare these with similar figures for, say, textiles or clothing and footwear. Income and employment comparisons of this kind can be determined from an input-output table by a process which has come to be called Multiplier Analysis (see, for example, Miernyk (1965), O'Connor and Henry (1975), and Copeland and Henry (1975)).

A number of different types of multiplier can be obtained from an input-output table though some people would prefer to call them income and employment coefficients since the term multiplier as used by economists is often used in a more limited sense. Here we refer to two such operators, namely:

(1) Direct coefficients, or Type A multipliers, and

(2) Direct plus indirect coefficients, or Type B multipliers.

Both these show the amounts of income and employment associated both directly and indirectly with the different sectors — a Type C multiplier could also be calculated to show the income and employment arising from the expenditure of the income generated in the different producing sectors. We do not develop this multiplier here, however, since it relates to the expenditure of the household income and we do not have any evidence to show whether it differs from one activity to another. The Type A and Type B multipliers are discussed below.

### *Type A Multipliers (Direct Coefficients)*

These are the simplest of all multipliers and can be determined for any firm or sector without the use of an input-output table at all. The Type A income coefficient is the relationship between the output of the firm or industry and the income arising from it. For example, if the output of an industry is £1 million and the income in the form of wages, salaries, profits, etc., created is £300,000, then the direct income multiplier is 0.3. This is not a multiplier in the Keynesian

sense but if we take a national input-output table and multiply the total output of every sector defined by its direct income coefficient, we obtain the total income arising in the state in all the sectors. We can do exactly the same for employment. The direct employment coefficient is expressed as the numbers employed in an industry or sector per £1 million output of that industry or sector. Type A income coefficients are always less than unity because income is always only a fraction of total output. Various costs have to be deducted before arriving at income. The direct income and employment coefficients do not tell us a great deal on their own but their comparison with corresponding Type B coefficients give valuable insights into the structure of enterprises or sectors.

*Type B Multipliers (Direct plus Indirect Coefficients)*

By performing certain operations on the input-output transactions table (Table 5) we can obtain the direct plus indirect coefficients, not alone for income and employment, but also for other items like imports, indirect taxes, subsidies, etc. These coefficients differ from the direct multipliers in that they relate output, employment, etc., not to total output but to total sales (final demand). They show the relationship between the sales of a sector and the income and employment arising from these sales, not alone in the sector itself, but in the economy as a whole. For example, the clothing industry might sell goods to the value of £10 million and in the course of producing these goods give rise to £2.5 million income in clothing factories; in addition, through the purchase of raw materials and services from other sectors in the state these factories might also give rise indirectly to an equal amount of income in the other sectors. The total direct plus indirect income effect of the final sales from the industry would thus be £5 million and the Type B income multiplier would be 0.5.

We could extend this result by saying that every extra £1 final demand for the products of the clothing industry will be associated with extra income in all sectors in the state of £0.5. If we wish to make this extension, however, we must assume, among other things, that the raw materials used in making the extra clothing will not only be produced in the state but that they would not otherwise have been produced. These assumptions may or may not hold. New factories might use directly imported raw materials and thus have lower Type B multipliers than existing ones. Equally, new factories might use materials already produced at home which otherwise would have been exported. For such reasons we must always be careful about making general statements about multipliers of any kind. The multiplier for a sector tells us what is happening in that sector at a particular time but these results cannot *necessarily* be extrapolated to other times when technology may have changed. We must be

careful also about making specific statements regarding the introduction of new firms which may do no more than replace existing ones, or divert raw materials from other uses or from direct export.

The food industry must be treated with great caution in the latter regard. If a new meat plant is built which has a Type B multiplier of 0.8, we can say that every £1 million sold by that factory is associated with income in the state as a whole of £0.8 million but we cannot infer from this that the new factory has generated an extra £0.8 million in the state. What the new plant may have done is put some existing factory out of business, or diverted live exports to home processing (which might be a good thing) but it would be unlikely to make farmers produce extra animals. The erection of a vegetable processing plant, on the other hand, might have the effect of causing extra vegetables to be grown on contract for the plant and if these did not replace existing farm enterprise (which they might not) then it could be said that the erection of the vegetable processing plant would generate the extra income in the economy indicated by the Type B multiplier.

What this discussion of multipliers (both Type A and Type B) indicates, is that the figures for each sector must be treated only as a description of existing linkages. The results can be very useful in comparing one industry or sector with another. For example, an industry with a low Type A multiplier which has upstream linkages will probably have a high Type B multiplier because it purchases raw materials from other home industries and is associated with additional incomes and employment in the state through these purchases. On the other hand, an industry which has few upstream linkages, and imports directly most of its raw materials will have a Type B multiplier little greater than its Type A coefficient. Hence the magnitude of the Type B multiplier compared with the Type A gives a good indication of the existing upstream linkages and import content. Caution must be exercised, however, in drawing inferences from such data about (1) the cause of such linkages, (2) whether such linkages would hold in respect of an additional factory and (3) even if such linkages did hold, whether the linkage would involve a net addition in the production of raw materials.

A further point to be kept in mind is that an industry with a low Type B multiplier is not necessarily inefficient or undesirable. A plant set up to process imported raw materials and to export the end product will have low Type B income multipliers, but, nevertheless, its direct coefficients may show that it makes a high contribution to income and employment.

Finally, we should say that if the Type B income coefficients for each sector are multiplied by the respective total sales of each of these sectors we obtain the total income arising in the economy from all the sectors, just as we obtained the same result by multiplying the sectoral outputs by their direct income

coefficients. Similar results are obtained by multiplying the Type B labour coefficients by their respective final demands.

We can now summarise this discussion by saying that the multipliers, as defined above, are average relationships which tell us what is happening in the different sectors of an economy at a particular period of time. They do not necessarily tell us what will happen to further industries introduced into some sectors but they can often give us a useful indication. Multipliers will change over time as a result of technological and other changes, but for a whole national sector such changes will be slow. Also multipliers must be interpreted with caution and those for each sector treated on their own merits. The food industry is a case in point. The building of an extra food plant is not likely to increase agricultural output. It may do no more than put another factory out of business or shift resources from live exports. If it does the latter, however, it will undoubtedly be useful in generating extra income and employment in the processing sector and hence in the economy generally. The relationship between direct and indirect multipliers for any sector gives an idea of the upstream linkages of the sector and it is probably in this area that multipliers can be most useful.

*Application of Type A and Type B Multipliers to the Sectors Defined in this Study*

Type A and Type B income and employment multipliers for the different sectors defined in this paper are given in Table 12. Taking the GNP coefficients first, we see that the direct income coefficients for food NI is lower than that for the Rest. This would give the impression that the older food firms give rise to more income than the new ones. However, if we look at the direct plus indirect income coefficients for food we find that the two are about equal at 0.731 for new ones.

The textiles NI have both lower Type A and Type B coefficients than the Rest. The NI Type B coefficient is not much greater than the Type A, indicating that the industries in this group have not very strong linkages with the rest of the economy. Most of the raw materials for the new industries are imported. The older textile industries have fairly high direct coefficients and very high direct plus indirect ones. These indicate that they are more labour intensive than the new industries and also have more upstream linkages. These industries probably use a good deal of home produced wool or other such materials manufactured in the state.

The direct income coefficient for clothing NI is 0.357 as compared with 0.306 for the Rest. There is thus not a great deal of difference between the two coefficients. The direct plus indirect coefficients are 0.515 and 0.655 for NI and Rest respectively, again not a great deal of difference. This is not unexpected.

Table 12: *New industries and rest 1976: GNP and employment multipliers*

| *Sector* | *Type A Multiplier: direct GNP coefficient* | *Type B Multiplier: direct plus indirect GNP coefficient* | *Type A Multiplier: direct employment coefficient* | *Type B Multiplier: direct plus indirect employment coefficient* |
|---|---|---|---|---|
| *New industry* | | | | |
| Food | .088 | .731 | 18.5 | 230.6 |
| Textiles | .251 | .380 | 71.3 | 102.9 |
| Clothing | .357 | .515 | 160.6 | 202.6 |
| Wood | .427 | .635 | 62.9 | 141.0 |
| Paper | .294 | .485 | 68.5 | 109.0 |
| Chemicals | .280 | .496 | 32.3 | 75.3 |
| Structural clay | .337 | .652 | 76.7 | 131.7 |
| Metal | .325 | .491 | 70.8 | 106.4 |
| Other manufacturing | .342 | .578 | 53.8 | 108.3 |
| *Rest* | | | | |
| Food | .121 | .713 | 39.0 | 228.3 |
| Textiles | .270 | .720 | 152.9 | 278.6 |
| Clothing | .306 | .655 | 147.8 | 265.8 |
| Wood | .250 | .622 | 145.9 | 220.3 |
| Paper | .365 | .536 | 94.8 | 133.4 |
| Chemicals | .255 | .585 | 72.0 | 142.6 |
| Structural clay | .248 | .686 | 55.8 | 137.8 |
| Metal | .255 | .599 | 70.9 | 146.0 |
| Other manufacturing | .229 | .529 | 22.4 | 103.4 |

The clothing NI is still fairly labour intensive and had widespread linkages with other industries, particularly the textile industry.

The wood NI has a higher direct income coefficient than the Rest, 0.427 as against 0.250, but the direct plus indirect coefficients are about the same for both, 0.6. Coefficients of this magnitude indicate fairly widespread linkages in the state. Indeed both wood NI and Rest now use high proportions of native timber.

The paper NI has lower income coefficients than the Rest but here again the differences are not too great. Both NI and Rest have reasonable linkages with the other industries as indicated by the direct plus indirect coefficient of 0.485 for the NI and 0.536 for the Rest. The coefficients for the remaining industries, i.e., chemicals, structural clay, metal and other, are all very much alike and there is not a great deal of difference between those for the NI and the corresponding ones for the Rest.

The simple average of all the direct income coefficients is 0.30 for the NI and 0.255 for the Rest. The average for the direct plus indirect is 0.55 for the NI and 0.63 for the Rest. For both NI and Rest the food industry has the lowest direct coefficients, but has the highest direct plus indirect coefficients except for textiles (Rest). Wood NI has the highest direct coefficient of all.

The industry with the highest direct employment coefficient is clothing NI. The employment here is 161 man-years per £1 million output. Others with high direct employment multipliers are textiles (Rest) and clothing (Rest).

The industry with the lowest direct employment coefficient is the food NI – 18.5 man-years per £1 million output. The next lowest is chemicals NI at 32.3 man-years per £1 million output. Food (Rest) has a direct coefficient of only 39.0 indicating that the food NI or Rest, is not now highly labour intensive.

The industry with the highest direct plus indirect employment coefficient is textiles (Rest) followed closely by clothing, food and wood (all Rest); of the NI that with the highest direct plus indirect employment coefficient is food (231 per £1 million final demand). NI food has in fact the third largest Type B employment multiplier and NI clothing is also relatively high. All of the other NI have much lower coefficients than this. That with the smallest is chemicals at 75 man-years per £1 million final demand.

The simple average for all the direct employment coefficients is 68 man-years per £1 million output for the NI compared with 89 man-years per £1 million final demand for the Rest. The corresponding direct plus indirect coefficients are 134 and 184 respectively. These figures indicate that, as one might expect, the older industries are more labour intensive than the newer ones.

*Conclusions*

Six conclusions are drawn:

1 The input-output study of the performance of new manufacturing industry in Ireland in 1976 has been useful as well as interesting. It enables industrial sectors to be compared in ways not possible outside the I-O system of analysis. We have been able to make comparisons between 18 industrial sectors, nine of which are NI 1976.

2 The study is, admittedly, limited by being confined to the year 1976. Since then new industry has grown considerably. Thus, absolute figures for 1976 are out of date, but the various multipliers are relevant: being ratios, these are still of the right order of magnitude, provided we allow for post-1976 inflation of sales of output.

3 The various multipliers give comparisons between sectors, not otherwise obtainable. They show which are the more efficient sectors for sustaining or boosting employment and GNP. Also it is possible to estimate employment related to any given menu of exports or of capital formation, *provided we allow for post-1976 inflation of sales of output.* But caution is necessary, in such uses of multipliers, as pointed out in Chapter 5.

4 We found that some sectors of the rest of manufacturing were competitive with NI, by having multipliers of the same magnitude or greater.

5 The performance of manufacturing NI is of major importance to our economic development. In 1976 there were 74,400 persons employed in new industry, 70 per cent of whose sales formed exports. These same exports (direct and indirect) employed 183,000 persons, some 18 per cent of the total 1976 working population.

6 We have seen that the NI in 1976 was export-oriented, having 70 per cent of its output exported direct. This indicates its vigour, in international competition. With our small population of only some 3.5 million we have limited scope for import substitution. Therefore exports seem to be our main hope of expanding employment, with specialisation a necessary preparation for export.

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## Appendix 1

### *THE INPUT-OUTPUT METHOD OF ECONOMIC ANALYSIS*

Input-output techniques, as used in economic science, have various uses. As a basic textbook, see O'Connor and Henry (1975). An input-output model breaks down economic activity by type or sector, (such as food manufacturing), and shows how each sector buys goods and services from other sectors and sells its outputs to them. Parts of the cost of production for each sector are the purchase of labour, the rent of capital, the purchase of imports, the taxes to government and the depreciation of capital stock. The national economy is made up of a large number of different, but interdependent, activities and can be adequately described by a model which incorporates the National Accounts' variables at a disaggregated level. Such a disaggregated description of the economy is provided by the input-output (I–O) system, which shows the flows of goods and service in money units for a given time period between the major sectors of the economy. The latter sectors, which can vary in number depending on the level of aggregation, constitute groupings of similar economic activities. In this paper we refer to the Irish I–O model for 1976 which contains a total of 34 sectors, of which the first 28 refer to groupings of similar industries or services and the remaining six are the sectors of final demand, namely, household consumption, government current expenditure, increases in stocks, gross fixed capital formation, exports except tourist, tourist expenditure. We now describe the model as three stages or phases, numbered (i) to (iii) following.

(i) *Transactions between Sectors*

We now consider how this accounting or distributive model of the system operates. The complicated interacting system of buying and selling goods and services within and between sectors ultimately provided goods and services for household consumption, government, capital investment and exports, as the final outcome. These final uses (or final demands) in pounds (£), are treated by our model as directly and indirectly accounting for all economic activity. A specified final demand for the output of one sector (for example, exports of food manufactures) has, associated with it, calculated amounts of the outputs of industries and services, payments of labour and capital, tax revenue to government, demand for imports. How the model estimates the calculated amounts associated with detailed final demand will now be considered.

The input-output system subdivides the economy into sectors and shows the transactions between the contributions of each sector for a year. Part of it can

be thought of as a system of disaggregated National Accounts. In general, if an economy contains $n$ producing sectors, then for any sector $i$ its gross output $(x_i)$ will be made up of: (a) intermediate product, which is used for further production in the economy; and (b) final product $(y_i)$ which goes to final demand. Typically I–O transactions are expressed in money units. If $x_{ij}$ represents the sales of sector $i$ to sector $j$, then row $i$ in a 3-sector transactions table with three producing sectors can be described by the equation:

$$(x_{i1} + x_{i2} + x_{i3}) + y_i = x_i \tag{1.1}$$

which means that intermediate product + final product = gross output of sector $i$. There are three of these rows so we have the following transaction flows:

$$\begin{pmatrix} x_{11} + x_{12} + x_{13} \\ x_{21} + x_{22} + x_{23} \\ x_{31} + x_{32} + x_{33} \end{pmatrix} + \begin{pmatrix} y_1 \\ y_2 \\ y_3 \end{pmatrix} = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} \tag{1.2}$$

Row Sums of inter-industry transactions matrix | Vector of final demands | Vector of sector outputs

It can easily be seen that, while $x_{ij}$ represents the sales of output by $i$ to $j$, it also represents the purchases of output from $i$ by $j$. Thus column $j$ of the transactions matrix represents the inputs to sector $j$. The total inputs to sector $j$ are the sum of the intermediate inputs $x_{ij}$ $(i = 1$ to $n)$ and primary inputs, i.e., the payments to labour, capital and imports, as well as government receipts by way of taxes on expenditure also called indirect taxes, and government subsidy payments. The total inputs to any sector $j$ equal its gross output $x_j$.

(ii) *Direct Input Coefficients*

In I–O, each unit of sectoral output $(x_j)$ is assumed to be produced from a fixed (average) pattern of inputs. The value of output is distributed over inputs so that it equals the sum of the values of inputs. Direct input coefficients for any sector $j$ $(j = 1$ to $n)$ are calculated by dividing the input entries $(x_{ij})$ $(i = 1$ to $n)$ in column j by the total input $x_j$. The matrix of direct input coefficients or matrix A with the typical element $a_{ij}$ is as follows:

$$\begin{pmatrix} a_{11}\, a_{12}\, a_{13} \\ a_{21}\, a_{22}\, a_{23} \\ a_{31}\, a_{32}\, a_{33} \end{pmatrix} = \begin{pmatrix} x_{11}/x_1\; x_{12}/x_2\; x_{13}/x_3 \\ x_{21}/x_1\; x_{22}/x_2\; x_{23}/x_3 \\ x_{31}/x_1\; x_{32}/x_2\; x_{33}/x_3 \end{pmatrix} \tag{1.3}$$

We can thus rewrite the transactions flows as follows:

$$\begin{pmatrix} a_{11}\, a_{12}\, a_{13} \\ a_{21}\, a_{22}\, a_{23} \\ a_{31}\, a_{32}\, a_{33} \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} + \begin{pmatrix} y_1 \\ y_2 \\ y_3 \end{pmatrix} = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} \tag{1.4}$$

In matrix notation:

$$Ax + y = x \tag{1.5}$$

Therefore,

$$\begin{aligned} y &= x - Ax \\ &= Ix - Ax \\ &= (I - A)x \end{aligned} \tag{1.6}$$

Thus,

$$x = (I - A)^{-1}y \tag{1.7}$$

(iii) *Interdependence (Direct plus Indirect) Coefficients*

The matrix $(I - A)^{-1}$, called the $(I - A)$ inverse matrix or matrix of interdependence coefficients, relates gross output to final demand for each sector.

Let a typical element in that $(I - A)^{-1}$ be $b_{ij}$; then in the 3 × 3 framework we have:

$$\begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} b_{11}\, b_{12}\, b_{13} \\ b_{21}\, b_{22}\, b_{23} \\ b_{31}\, b_{32}\, b_{33} \end{pmatrix} \begin{pmatrix} y_1 \\ y_2 \\ y_3 \end{pmatrix} = \begin{pmatrix} b_{11}y_1 + b_{12}y_2 + b_{13}y_3 \\ b_{21}y_1 + b_{22}y_2 + b_{23}y_3 \\ b_{31}y_1 + b_{32}y_2 + b_{33}y_3 \end{pmatrix} \tag{1.8}$$

This system says that one unit of final demand for the output of sector $j$ requires $b_{1j}$ units of output from sector 1, $b_{2j}$ units output from sector 2, etc. The output required by one unit of final demand is referred to as the "direct plus indirect

output associated with unit final demand". But each unit of output of any sector $j$ requires a given amount $z_j$ of primary inputs. Thus one unit of final demand for the output of sector $j$ directly and indirectly requires $(b_{1j}\, z_1 + b_{2j}\, z_2 + b_{3j} z_3)$ units of primary inputs (i.e., column $j$ of the $(I-A)^{-1}$ premultiplied by the row of direct input coefficients for primary inputs). Primary inputs are the factors of production (land, labour and capital) whose remuneration is factor income. Taxes on expenditure, subsidies, and imports are also treated as primary inputs. Since I–O tables are usually based on gross profits and valued at market prices, value added includes depreciation cost and indirect taxes less subsidies as well as factor incomes. It is, therefore, evident that by using the $(I-A)^{-1}$ matrix of interdependence and direct input coefficients $z_i$, we can derive direct plus indirect amounts of primary inputs associated with a £ unit of final demand for the output of each sector, defined in a way suitable to our model.

We treat imports as if they were a true primary input cost. It is important to note that direct plus indirect coefficients, which relate changes in exogenous expenditure to the consequent changes in wages, profits, etc., can be derived only from an I–O model which has all imports removed from the inter-industry transactions and treated as primary inputs. The inclusion of some imports in the transactions matrix would lead to wrong results by way of an overestimate of the direct plus indirect coefficients, since some of the direct and indirect output effects thus obtained would be due to the import transactions, which, in fact, produce no reactions from domestic sectors.

## Appendix 2

### *EFFECTS OF GREATER OR LESSER DISAGGREGATION OF I-O STRUCTURES ON PRIMARY INPUT CONTENT OF FINAL DEMAND*

The primary input content of each major kind of final demand can be affected by the degree of detail contained in the inter-industry matrix. It is of interest to see how different are the primary input components of 1976 final demand derived from two different but related I-O analyses.

The first (or previous) set of results comes from the Henry (1980) paper *Irish Input-Output Structures, 1976,* the I-O model in that paper having 19 inter-industry sectors, of which nine relate to manufacturing. The second (or present) set of results comes from Table 9 of the present paper, the I-O model having 28 inter-industry sectors of which 18 relate to manufacturing (9 NI and 9 rest).

Table A2 sets out the comparisons between the previous and present primary input components, as percentages of the total of each of four kinds of final demand. These four kinds are: personal consumption including tourist expenditure, net government current expenditure, gross fixed capital formation, exports other than tourist expenditure. Five primary input components are considered.

For personal consumption, none of the five pairs of percentages shows a difference in excess of 2 percentage points. We may conclude that this aggregate is relatively insensitive to the degree of disaggregation used.

In the government expenditure set of percentages, two differences in excess of 3 percentage points occur. The previous import percentage is 10.9 compared with 7.4 for the present. The previous profits etc., percentage is 15.4, which is considerably smaller than the present value of 21.7. It is to be concluded that net government current expenditure is indeed sensitive to the degree of detail used for inter-industry.

Gross fixed capital formation is relatively insensitive to degree of detail of analysis. The biggest percentage difference is 3.2 points, occurring for wages and salaries. All the other differences are much smaller than this.

Exports also are relatively insensitive to the degree of detail of analysis. By far the largest percentage point difference is 4.2 and this occurs for profits etc.

In summary, we may conclude that of the four kinds of final demand examined, net government current expenditure is the kind showing most sensitivity to degree of detail of analysis. The input structures of the previous and present I-O models are certainly different, but this does not automatically imply substantially different results. It follows that we may place considerable reliance on the stability of primary input content of most major kinds of final demand, from analysis by a reasonably detailed inter-industry matrix.

Table A2: *Comparison of previous and present percentage primary input components of Irish 1976 final demands*

| *Primary input component* | *Personal consumption including tourist expenditure* | | *Net government current expenditure* | | *Gross fixed capital formation* | | *Exports excluding tourist expenditure* | |
|---|---|---|---|---|---|---|---|---|
| | *Previous* | *Present* | *Previous* | *Present* | *Previous* | *Present* | *Previous* | *Present* |
| | *Per cent* | | | | | | | |
| Imports | 37.7 | 36.0 | 10.9 | 7.4 | 52.7 | 54.6 | 33.4 | 35.4 |
| Indirect taxes | 19.4 | 19.5 | 12.4 | 10.1 | 3.8 | 3.3 | 7.6 | 9.0 |
| Less subsidies | −5.8 | −5.7 | −2.8 | −1.4 | −1.5 | −1.3 | −4.5 | −5.2 |
| Wages and salaries | 30.7 | 31.3 | 64.2 | 62.1 | 36.5 | 33.7 | 31.7 | 33.2 |
| Profits and depreciation | 18.0 | 19.0 | 15.4 | 21.7 | 8.4 | 9.7 | 31.8 | 27.6 |
| Total Primary input | 100 – | 100 – | 100 – | 100 – | 100 – | 100 – | 100 – | 100 – |

*Sources:* Previous, Table 5 of Henry's *Irish input-output structures 1976*, having 19 inter-industry sectors.

Present, Table 9 of present paper, having 28 inter-industry sectors.

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