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IRISH INPUT–OUTPUT STRUCTURES, 1976

E. W. HENRY

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The author sincerely thanks the referee, for diligently pointing out everything that was unsatisfactory and for urging him to consider marginal analysis. The considerably expanded Appendix 1 now contains a detailed account of how the 1976 transactions were compiled. The marginal analysis of Part 5, with explanatory Appendix 3, are also the author's response to the referee's demand for development of an appropriate marginal model.

The methods used in compiling and processing input-output data, the analysis of results and the opinions expressed in the paper are not necessarily those of the Economic and Social Research Institute. The author alone is responsible for any errors which still remain. Min Swords and Pat Hopkins have done fine work in typing and photocopying unwieldy input-output tables.

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General Summary

INPUT-OUTPUT techniques, as used in economic science, have various uses, including the comparison of the national economic product of one industry, or service, with that of another. 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.

Five main aspects of the present report follow below, under their respective headings.

(1) *Update of Irish Input-Output Published Tables and Analyses to 1976*

The Central Statistics Office has published detailed input-output (I–O) results for 1964 and 1969. This writer has published less detailed related studies for 1968 and 1974. The present report describes a 19-sector 1976 model, derived from Table 1.

The combined "direct and indirect" economic results associated with so-called "final demands" are a major result of an input-output model of the type considered in this report. A final demand here means, for example, a demand for exports of the output of the food sector, or capital formation consisting of output of the construction sector. The direct and indirect economic results associated with 1976 final demands are shown in Table 3.

Table 3 tells us that £1 m. of 1976 food exports is associated (directly and indirectly) with £259 thousand of imports, £272 thousand of wages and salaries, £466 thousand of gross profits. The *direct* effects alone are shown in Table 2, where we find that £1 million of food exports is *directly* associated with £86 thousand of imports, £111 thousand of wages and salaries, £51 thousand of gross profits (i.e., profits plus depreciation). The fuller information conveyed by the "direct and indirect" result is apparent.

Likewise, Table 3 tells us that £1 m. of capital formation by the construction sector was in 1976 directly and indirectly associated with £287 thousand of imports, £570 thousand of wages and salaries, £117 thousand of gross profits.

Comparison of Table 3 results for the two sectors shows that on the figures quoted, the £1 m. food export is better, being associated with £738 thousand of

wages plus profits, whereas the construction capital formation is associated with £687 thousand of wages and profits. The food sector also shows smaller imports associated with it, this is again better. By "better" we mean connected with larger national income or smaller cost of imports.

(2) *Employment and Gross Capital Stock Related to Economic Activity*

As an extra dimension to the I–O reports and models referred to aboye previously published by CSO and the writer, the present 1976 model has introduced employment and gross capital stock into the system. The "employment" row of Table 1 shows how the total 1976 employment of 1 035 thousand man-years is distributed to 16 sectors. The "gross capital stock" row of Table 1 shows the distribution of some £11 000 m. of capital stock, the estimated gross amount in the Irish sectors valued at 1976 prices. This "gross" stock is the estimated new equivalent amount in the system, *before being depreciated,* i.e., the replacement cost *new* at 1976 prices.

We can look at the "direct and indirect" employment (and capital stock) results in Table 3 in exactly the same way as already done for the imports etc. But aggregate results, given in Table 4, are of additional interest. Table 4 tells us that, of the total employment of 1 035 thousand man-years for 1976, 411 thousand relate to personal consumption, 318 thousand to exports, 195 thousand to net government current expenditure and 105 thousand to gross fixed capital formation. These are all "direct and indirect" results.

Table 4 shows that the "direct and indirect" result for one final demand does not overlap or duplicate that of another final demand. The entries in each row add up to the correct Table 1 row totals. This non-duplication property also holds for the more detailed "direct and indirect" coefficients of Table 3.

The capital stock row of Table 4 shows that, directly and indirectly, total 1976 personal consumption was associated with £4.6 billion of the equivalent new gross capital stock, exports were related to £3.4 billion, net government current expenditure £2.2 billion and gross fixed capital formation £0.8 billion (a thousand million being a billion).

(3) *What Economic Growth Between 1968 and 1976 Means in 1976 Units*

The present report has a third new dimension, by comparison with previous I–O reports. This new development is a so-called "marginal" I–O model, based on Table 6. Briefly, this marginal model is obtained by matching Table 1 of 1976 by a corresponding 1968 table, pricing the latter at 1976 prices and subtracting it from Table 1, to leave the marginal table, shown as Table 6, from which a marginal I–O model has been derived. Employment and capital stock,

wages, profits, all have been put into the marginal model at 1976 intensities or proportions, within each sector. This marginal model gives comparison with the "average" model of 1976 based on Table 1.

Perhaps the most interesting results of the marginal model appear in Table 8; let us consider employment. The growth of output during 1969–1976 has 237 000 standardised man-years associated with it, at average 1976 sectoral productivity levels. Of the total 237 000 man-years,exports are accredited 104 000, net government current expenditure 75 000, capital formation 26 000 and personal consumption 33 000.

The meaning of these standardised employment figures needs careful interpretation. Of the total 1035 000 man-years of employment during 1976 shown in Table 1, some 237 000 can be allocated to the growth of the economy during 1969–1976. By implication 1968 output could have been produced by 798 000 man-years (the 1976 total 1035 000 less 237 000) at 1976 levels of productivity. But 1968 output had in fact 1063 000 man-years of employment associated with it, at 1968 productivity levels. The need to distinguish carefully between "standardised man-years" as used by the present I–O model and "numbers at work" as published in a time series of official statistics, will be apparent. Some comments on the necessary distinction between these two employment measures appear in Part 5 of the paper.*

The marginal coefficients of Table 7 can be used like those of Table 3; not all of them, unfortunately, are equally trustworthy, as will appear below in Part 5 of this general summary.

(4) *How to use the Tabular Results*

The marginal sectors considered most reliable, being based on the largest values in Table 6, are the following: (1) food, (9) other manufactures, (10) agriculture, (13) construction, (16) trade and services, (17) artificial sectors.

As an illustration of how the marginal figures can be used, let us compare results of £1m. worth of food exports with £1m. worth of other manufactures.

From Table 7 "direct and indirect" coefficients we find the following set of comparisons, in £ thousand per £1m. final demand:

	Food	*Other manufactures*
Imports	232	256
Wages	251	321
Profits	375	310
Employment (man-years)	172	102
Capital stock	1 634	2 084

*An alternative way of making the above point would be to say that potential gains in employment were fully offset by gains in productivity."

This is a good example of less than complete scoring of one sector over another: In terms of lower imports and capital stock required, the food export is slightly better. In terms of employment the food export is far better, having 172 man-years (of which 104 are in agriculture) compared with 102 in the other manufactures export. Much of the "profits" entry under food is farmers' income, so let us compare wages plus profits; food 626, other manufactures 631. The wages plus profits per man-year is £3 640 for food and £6 186 for other manufactures.

Thus other manufactures yield higher wages plus profits per man-year, and per £1 m. of exports. One may conclude that the choice of one sector (of the two being compared) as the better depends on which aspect or economic result one considers important. Admittedly, the food sector wins on three scores out of four.

(5) *Data Limitations, and Reservations about Results*

The 1976 average results given in Tables 1 to 5 are essentially derived from 1969 and 1973 sector costings, inflated to 1976 price-levels. A 1976 Census of Industrial Production was not available, to give exact and detailed output products and input costs. This is the greatest single flaw of the 1976 results. The marginal table is inaccurate to the extent that the 1976 Table 1 is inaccurate and that the 1968 table subtracted from Table 1 has been inaccurately inflated. To do a thorough re-pricing of a 1968 or 1969 table to 1976 price-levels is a very complicated task. It is fairly obvious that major residuals or margins forming Table 6 and their derived "direct plus indirect" coefficients are more dependable than small margins.

Part 1

Purpose and Scope; the Input-Output Model Explained

AN input-output (I–O) study of the Irish economy for the year 1976 is the latest in the series of published results which covered 1964, 1968, 1969 and 1974 (CSO, 1970, 1978, Henry, 1972a, and 1977). Some explanation of the purpose and scope of the following essay is required. Readers should note that only a minimum of explanatory text is given with the tables; it is assumed either that readers already have some familiarity with I–O analysis or that novices might seek basic elucidation in O'Connor and Henry (1975) or elsewhere. There is also a summary description of the I–O system of analysis given below under the heading "the I–O model explained".

Purpose

The general purpose of providing further usable I–O analysis of the Irish economy can be set down under five heads:

(i) to update 1964 and 1968, 33-sector results with less emphasis on energy-producing and converting sectors that applied to the 1974 study (Henry, 1977);

(ii) to add an employment dimension to the earlier published analyses, which mostly dealt with values only, except for the full-employment experiments relating to 1975;

(iii) to use recent capital stock information, including UK industrial data, to estimate the capital per man-year for 1976, for individual sectors and for final demand aggregates;

(iv) to perform a marginal I–O analysis of Irish economic growth from 1968 to 1976.

(v) To illustrate how these or similar results can aid economic policy analysis.

Scope

This report gives: (*a*) a brief description of a 19-sector 1976 transactions table at producer prices; (*b*) the Leontief inverse of that table with primary input amounts associated with unit final demand; (*c*) primary input components of

final demand; (*d*) comparison of average and marginal coefficients; (*e*) examples of application to policy analysis. Both employment and capital stock are treated by the 1976 analysis as further primary inputs, and their absorption by 1976 final demands is an aspect of the Irish economy not analysed by previous studies of I–O transactions and models.

The Keynesian-type multiplier analysis first developed by Copeland and Henry (1975) for 1968 and updated to 1974 (Henry 1977) for a model of 19 sectors is not performed by the present study. It has been decided that in view of 1974 multipliers of this kind being available, a more interesting set of results would be furnished by employment and capital "partial" multipliers corresponding to the direct plus indirect amounts of the usual primary inputs per unit final demand. Some background to the employment and capital estimates is given in two appendices to the main text.

The Input-Output Model Explained

Input-Output techniques, as used in economic science, have various uses including the calculation of multipliers, to be described below. 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 only 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 shall be referring to the Irish I–O model for 1976 which contains a total of 24 sectors, of which the first 19 refer to groupings of similar industries or services and the remaining five are the sectors of final demand, namely, personal consumption, net government current expenditure, increases in stocks, fixed capital formation and exports.

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 provides goods and services for households, government, capital investment and exports, as the final outcome. These final uses (or final demands) in pounds sterling (£) 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 to labour and capital, tax revenues to government, demand for imports. The ratio of any of these associated amounts to the specified final demand is a multiplier. Thus a single demand has various multipliers, such as the wages and salaries generated by £1 of exports of food manufacturers, the cost of agricultural livestock required by £1 of such exports, and so on. How the model estimates the calculated amounts associated with detailed final demand will now be considered.

The input-output system breaks the economy up into sectors and shows the transactions between the contributions of each sector for a year. 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:

$$(x_{i_1} + x_{i_2} + x_{i_3}) + y_i = x_i \qquad (1.1)$$

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:

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

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 a sector are the sum of the intermediate inputs x_{ij} ($i = I$ to n) and primary inputs, i.e., the payments to labour, capital and imports. The total inputs to any sector i equal its gross output x_i.

In I–O, each unit of sectoral output (x_i) 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. Technical coefficients for any sector j ($j = I$ to n) are calculated by dividing the input entries (x_{ij}) ($i = I$ to n) in

column j by the total input x_j. The matrix of technical 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

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

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. Since final demand is assumed exogenous and output is endogenous in I–O, the equation (1.7) is a reduced-form equation.

Let a typical element in the $(I–A)^{-1}$ 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 i relates to a given amount z_i of primary inputs. Thus one unit of final demand for the output of sector j directly and indirectly relates to $(b_{1j}z_1 + b_{2j}z_2 + b_{3j}z_3)$ units of primary inputs (i.e., column j of the $(I–A)^{-1}$ premultiplied by the row of technical coefficients for primary inputs). Primary inputs are the factors of production (land, labour and capital) whose remuneration is factor income.

Since I–O tables are usually based on gross profits and valued at market prices, value added includes depreciation and net indirect taxes as well as factor incomes. It is, therefore, evident that by using the $(I-A)^{-1}$ matrix of interdependence and the technical coefficients z_{ij}, we can derive direct plus indirect amounts of primary inputs associated with a £ unit of final demand for the output of each sector, that is the *sectoral multipliers for primary inputs,* defined in a way suitable to our model.

We can treat imports as if they were a true primary input cost. It is important to note that sectoral multipliers, 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 an overestimate of the sectoral multipliers, since some of the direct and indirect output effects thus obtained would be due to the import transactions, which produce no reactions from domestic sectors.

The final relevant property of the I–O model under discussion is that aggregate primary input is equal to aggregate final demand; and a corresponding equality holds at sectoral level for the direct plus indirect amounts associated with unit final demand. Two results emerge: (i) each column of primary input coefficients (in Table 3) add to unity, subject to rounding errors; (ii) each column of final demand (in Table 4) is fully accounted for in terms of primary inputs.

Part 2

1976 Transactions and Direct Input Coefficients

Irish 1976 Transactions (Table 1)

THE 19-sector 1976 transactions are shown in Table 1, (p. 41) with direct input coefficients appearing as Table 2. Table 1 corresponds to the 1964 and 1968 33-sector transactions (Henry, 1972b) compressed into 19 sectors. Table 1 has all detail of government current purchases included in column (16), trade margin and services. Appendix 1 gives the background to Table 1. In this table there are 19 inter-industry sectors, of which nine are sub-divisions of manufacturing, in accordance with IDA interests. Sectors (17) to (19) are artificial. All imports are shown as a single row. There are four further primary inputs rows and rows for employment and capital stock. Readers might note that all 1 035 000 man-years are allocated to sectors (1) to (16); the artificial sectors (17) to (19) not having any direct employment. All current purchases occasioned by government net current expenditure are detailed in column (16), in so far as the available data permit; and the 64 000 man-years of public administration and defence are included among the 487 000 man-years allocated to column (16).

The final demand columns, numbered (20) to (24) are relatively aggregate. The column (20) array of personal expenditure includes tourist expenditure, valued at £137 m., and denoted "expenditure by non-residents" in the National Accounts. Net government current expenditure, value £846 m. shows one aggregate single purchase of £791 m. from "trade margin and services"; this purchase includes all expenses of government services generally, including health and education.

Column (22), increases in stocks, has only two entries, of which the £20 m. is the value of increases in livestock on farms. With better information, this column would have more entries. Gross fixed capital formation, column (23), mostly comprises two large entries: £580 m. of construction and £349 m. of imported capital goods. Column (24) shows exports of goods and services, and includes as "profits" £19 m. of net factor income from abroad.

Capital stock, divided by man-years, gives the capital per man-year ratios forming the last row of Table 1. At £73 000 per man-year, electricity far exceeds all others. Relatively high values, in the range £25 000 — £33 000 per man-

year, appear for (9) other manufacturing (including drink, oil refinery etc.), (7) structural clay and cement, (6) chemicals and plastics. The figure of £11 000 per man-year, for (16) trade margin and services, was chosen by considering United Kingdom levels for these services; this is explained in Appendix 2.

Direct Input Coefficients (Table 2)

The direct input coefficients for 1976 appearing in Table 2 (p. 42) are derived from Table 1 by dividing entries in each column by the total input value of the column for columns (1) to (19). Total input has the same value as gross output.

Subject to rounding errors, the figures in each column of Table 2 above the total input row add to unity. These direct input coefficients give the costs per £1 of output; for example, £1 worth of output of the 1976 Food industry requires £0.5133 worth of Irish agricultural produce.

The employment and capital stock direct coefficients are analogous to those of direct input costs. Four labour-intensive sectors are: (3) clothing; (16) trade margin and services; (10) agriculture; (11) solid fuel (including farmers' peat); these sectors have 0.18 to 0.23 man-years per £1 000 output. The three most capital-intensive sectors are electricity 4.1; structural clay 2.2; trade margin and services 2.1; the capital coefficients being capital stock in £ per £ of output of the sector.

Part 3

Total 1976 Inputs per Unit Final Demand

THE (I–A) inverse for Table 1 appears in Table 3 with direct and indirect primary input and employment and capital stock associated with final demand.

Sector Outputs

Rows (1) to (19) of each column of Table 3 indicate how much sector output is associated with £1 of final demand for the output of the sector whose name heads the column. For example, column (1), food, has 1.1781 in row (1) and 0.6098 in row (10); these numbers mean that £1 of final demand for manufactured food in 1976 is associated, on average, with £1.1781 worth of manufactured food altogether, and £0.6098 worth of produce from agriculture etc., altogether (i.e., directly and indirectly). This example illustrates how Table 3 can be used as a ready reckoner with one or more values of final demand.

Imports

The import coefficients shown as row (a) of Table 3 have the same meaning as those of the sector outputs. For example, £1 worth of final demand for food manufactures is associated with £0.2594 worth of imports. The four most import-intensive sectors in £ import per £ final demand are (17) materials for repair at 0.8257, (18) packaging at 0.7358, (5) paper and printing at 0.4642 and (6) chemicals and plastics at 0.4497. The least import-intensive, having only 0.0971 £ import per £ final demand is (16) trade margin and services.

Wages and Salaries

The wage and salary coefficient shows wide variation from sector to sector. The three maximal amounts, in £ per £1 final demand, are for (16) trade margin and services at 0.6480, (13) new and repair construction at 0.5707, and (15) transport at 0.5254. The three smallest coefficients are for (17) materials for repair at 0.0981, (10) agriculture at 0.1579 and (18) packaging at 0.1836. Note that these coefficients for (17) and (18) are indirect results, there being no direct employment or payment of wages in these two sectors.

Gross Profits

The gross profits (i.e., profits plus depreciation) coefficients appear as row (e) of Table 3. The two largest are 0.6732 for (10) agriculture and 0.4661 for (1) food, the latter being largely due to the indirect effect of the agricultural input to food manufacturing. The apparently large profit in agriculture is due to the fact that most farmers are self-employed, with income therefore classified as profit rather than wages and salaries, for inclusion in the National Accounts.

Employment

The employment rows of Table 3 are expressed in man-years per £1 000 of final demand. The first row shows total employment and the following row, in parentheses, shows the sector (10) (agriculture) content of the total employment.

According to the total employment row, the sector of the highest employment content is (10) agriculture, having 282 man-years per £ m. of final demand. The four next highest are (11) solid fuel at 271, (16) trade margin and services at 236, (1) food at 217 and (3) clothing and footwear at 214. The four sectors of minimum employment content are (17) materials for repairs at 32, (18) packaging at 37, (6) chemicals and plastics at 71 and (15) transport at 75.

Many objections can be raised against including agricultural employment on the same basis as employment in all other sectors. Many of the people classified as farmers are either men over 65 years of age or young men drawing social assistance payments. The Table (3) employment row in parentheses shows how sector (10) agricultural employment is distributed; the only two large entries are 282 (man-years per £ m. final demand) in sector (10) itself and 142 in (1) food. Excluding employment in agriculture, the three sectors of highest employment content (per £ m. of final demand) are (11) solid fuel at 270, (16) trade margin and services at 233 and (3) clothing and footwear at 211. Sector (16) is by far the most important of the latter three sectors.

Capital Stock

We will consider briefly the estimates of the gross capital stock associated with unit final demand. It comes as no surprise that the capital coefficient for electricity, at £4.4091 per £1 final demand for electricity, far exceeds that of any other sector. The two next highest coefficients are for (7) structural clay at 3.1087 and (16) trade margin and services at 2.6659. The three smallest coefficients are for (17) materials for repair at 0.5135, (18) packaging at 0.8037 and (13) new and repair construction at 1.0682. We should note that the capital coefficients for (17) and (18) are completely indirect, because sectors (17), (18) and (19) are artificial, having no direct capital or labour inputs.

Capital Stock per Man-year

This ratio is expressed in £ thousand per man-year and because it derives from direct and indirect amounts (associated with unit final demand) of both capital stock and employment, it is a more adequate measure or parameter than the direct ratio shown in the last row of Table 1.

By far the largest value, £51 630 per man-year, relates to (14) electricity. The three next largest are for (6) chemicals at £23 760, (7) structural clay at £23 570, and (9) other manufacturing at £18 450. The three smallest values of the ratio are for (10) agriculture at £5 400, (3) clothing at £5 550 and (13) new and repair construction at £6 950. The wide range of values is apparent. Agriculture is the least capital-intensive of all 19 sectors.

Part 4

Primary Input Components of 1976 Final Demand, with Allocations of Labour and Capital

IN the National Accounts, gross national product (GNP) expenditure in aggregate equals GNP by sector of origin. To both sides of this equation add imports. We now have, in input-output systems, that final demand in aggregate (household and government consumption, plus capital formation, plus exports) necessarily equals GNP by sector of origin, plus imports (the usual primary input rows, with imports).

By means of the coefficients of Table 3, in conjunction with the final demand columns of Table 1, it is possible to carry this equality of final demand with primary input a stage further and to completely account for final demand in terms of primary inputs (including imports). This analysis is explained in O'Connor and Henry (1975), and in other textbooks. We now look at 1976 results derived from Table 1.

Primary Input Components of 1976 Final Demand

Table 4 shows the primary input and employment and capital content of Total Final Demand, and of the five columns of final demand shown in Table 1. We can see that components (a) to (e) add to the correct total of each column; this result should emerge naturally, subject to rounding errors, from correct computation of the (I–A) inverse and derived input coefficients of Table 3, and correct treatment of the calculation. We see that personal consumption has the biggest share of rows (a) to (d) and accounts for about 40 per cent of total employment and of total capital stock. The capital stock of agriculture is almost completely required by personal expenditure and export demand.

Personal Consumption Expenditure

We now consider briefly some features of the main components of Table 4, starting with the first column, personal consumption expenditure, which includes £137 m. of expenditure by non-residents. Personal consumption provided during 1976 almost £940m. of payments of wages and salaries, and almost £550 m. of profits and depreciation, directly and indirectly. It absorbed almost £1 150 m. of imports. It supported about 410 000 man-years of employment, of which 98 000 were in agriculture etc. It related to about £4 600m. of gross capital stock. The capital stock per man-year was £11 300, which is slightly above the national average value of £10 650, for total final demand.

The paramount importance of personal consumption, as a support and stimulus to economic activity in 1976, is clearly shown by Table 4.

Tourist Expenditure

Expenditure by non-residents, i.e., tourist expenditure, was estimated to be £137 m. in aggregate during 1976. The following ten components show tourist expenditure, as broken down by the writer to accord reasonably with personal expenditure, after omission of consumer durables etc.

(Figures in £ m.):

Food (1)	23.8	Transport (15)	3.6
Textiles (2)	2.1	Trade margin (16)	58.0
Paper (5)	1.4	Imports	10.9
Other manufacture (9)	10.6	Indirect taxes	23.5
Agriculture (10)	9.1	Less subsidies	–6.0

It should be noted that these figures are rough estimates; more exact details are not available. Application of Table 3 coefficients, as appropriate, to the first seven components of tourist expenditure yielded estimates of 24 000 man-years of employment during 1976 and a fairly average capital intensity per man-year, about £11 000.

Net Government Current Expenditure

We see from the second column of Table 4 that net government current expenditure provided 195 000 man-years in 1976, that is 131 000 indirectly, in addition to the 64 000 given directly by public administration and defence. We also see that the capital intensity, at £11 300 per man-year, is above the national average £10 650. We see too that this final demand provided directly and indirectly £543 m. of wages and salaries, 22 per cent of the total £2 500 m.

Gross Fixed Capital Formation

Gross fixed capital formation during 1976 accounted for about £380 million of wages and salaries and almost 105 thousand man-years of employment. The capital stock per man-year, at about £7 700, is below average. It therefore appears that gross fixed capital formation is, or can be, a good employment stimulus at relatively cheap capital investment cost per job created or supported.

Exports, other than Tourist Expenditure

The second-last column of Table 4 shows the components of exports of goods and services during 1976. We can see how important these exports

are, for both wages etc., and gross profits, in that they accounted for well over £600m. of both in 1976. Almost 320 000 man-years of employment were accounted for through these exports; this consists of 183 000 man-years of non-agricultural employment and 135 000 man-years of agricultural employment. The capital cost per job was about average, at £10 600.

Percentage Distribution of 1976 Primary Input Components

Rows (a) to (e) of Table 4 expressed as percentage of column totals are given in Table 5. The first impression given by Table 5 is that, along each row, wide variability occurs in the component of various final demands allocated to a given primary input such as imports. The imports take 35 per cent of total final demand; but they take 53 per cent of fixed capital formation, 38 per cent of personal consumption, 33 per cent of exports, and only 11 per cent of net government current expenditure.

Indirect taxes are about 13 per cent of total final demand; they form 19 per cent of personal consumption, 12 per cent of government current expenditure and 8 per cent of exports.

Wages and salaries, at about the same share as imports, take 36 per cent of total final demand. They take 64 per cent of government current expenditure, 37 per cent of total gross fixed capital formation, 32 per cent of exports and 31 per cent of personal consumption.

Profits and depreciation form 20 per cent of total final demand, 32 per cent of exports, 18 per cent of household consumption, 15 per cent of government current expenditure and 8 per cent of gross fixed capital formation.

One may conclude that Table 5 percentages offer scope for estimating the primary input content of this or that final demand with better precision than by means of the global average percentage relating to total final demand. A selection of the most relevant column of Table 5 can only improve the estimate.

Part 5

A Tentative Marginal Analysis of Economic Growth between 1968 and 1976 at 1976 Prices, by Means of a 17-Sector Transactions Table

THIS part of the paper presents a tentative marginal analysis of Irish economic growth between 1968 and 1976, in the form of a table of I–O transactions at 1976 prices. Appendix 3 describes in detail how the marginal I–O transactions were obtained; essentially a 1968 I–O table was re-priced at 1976 prices and subtracted from Table 1 above, to give the table of residuals (the marginal table) which is Table 6. Tables 7, 8 and 9 perform the usual (I–A) inverse analysis of Table 6, primary input shares of final demand and comparison with the 1976 average shares given as percentages in Table 5 above. The closest relevant work quoted as reference is that of Middelhoek (1972), who used Netherlands I–O results to get marginal coefficients.

Advantages of Having a Marginal Analysis

If information is sufficient to permit I–O modelling (or other econometric modelling) of economic growth over a period such as 1968–1976, such a model has more relevance to growth analysis than a model describing average structures and flows of goods and services during one particular year. If we assume unchanged marginal structures and I–O proportions, then the marginal model is the better one; indeed it can be argued that a model of average annual proportions is not relevant for growth analysis.

Two particular objectives of Tables 6 to 9 are put forward:

(1) Comparison with 1976 parameters and results given in Tables 1, 3, 4 and 5.

(2) To see what Irish economic development between 1968 and 1976 has meant, in terms of 1976 standard units. If we have chosen 1976 as the standard, then all entries in our model must be in 1976 units. This has been done by re-working a 1968 table to be at 1976 prices, as explained in Appendix 3. Also employment, capital stock and the division of GDP at factor cost into 1976 proportionate shares of wages etc., and gross profits, all have been estimated for 1968 according to the production functions of 1976 inherent in Table 1. The 1968 table, re-priced at 1976 prices, with employment and capital stock at 1976 rates, has been subtracted from

Table 1. The marginal table, therefore, is necessarily in 1976 units and will give results fully consistent with 1976 averages.

The Tentative Nature of the Irish Marginal Table

Marginal final demand analysis, using a 1968 standard inter-industry matrix, was background work to the Copeland and Henry paper (1975). The results were not published as they differed only slightly from average 1968 results. Over a four-year time-span and with relatively little inflation, the situation was a contrast to that of 1968–1976.

A relevant study of marginal changes is that of Stäglin and Wessels (1972) who analysed the change in West German economic structures between 1954 and 1962, at 1962 prices. A note on their work appears in Appendix 3. Time series analysis of marginal inter-industry coefficients is another approach; a good paper on this is by Middelhoek (1972), who used Netherlands data for the fifteen years 1950–1964 with regression analysis to estimate such coefficients, nearest to those derived from Table 6.

The Irish data do not permit analyses of the kind mentioned above, not being plentiful enough or precise enough, for reasons given in Appendix 3. Yet the 1968 data and price inflators and the resulting marginal Table 6 are extra information and therefore at least give some comparisons with Table 1 data. The macro-results should be precise enough to bear comparison with 1976 corresponding results, e.g., the primary input contents of final demands. The finer detail is less reliable. This is mainly because the price inflators for the rows are not sensitive enough to precisely cover small changes in structure. Let us regard Tables 6 to 9 as a first start at Irish marginal analysis.

The Marginal Transactions, Employment and Capital Stock

Table 6 shows marginal transactions for 17 sectors and 4 final demands. There are 5 primary input rows and the employment and capital stock rows also. The three artificial sectors are combined into a single sector. All transactions are at 1976 prices. The employment and capital stock are at 1976 average intensities, in relation to GDP at factor cost. The latter is split between wages and profits, within each sector, in the 1976 ratio pertaining to Table 1.

The general picture shows a growth of £1 953 m. of final demand, at 1976 prices. After deduction of £935 m. of imports, the 8-year growth of GNP is £1 018 m., about 23 per cent of the 1976 level.

The growth of output during 1969–1976 has 237 000 standardised man-years associated with it, at average 1976 sectoral productivity levels. Of these 237 000 man-years, some 82 000 relate to trade and services, 53 000 to agriculture, 27 000 to construction.

The meaning of these standardised employment figures needs careful interpretation. Of the total 1035 000 man-years of employment during 1976 shown in Table 1, some 237 000 can be allocated to the growth of the economy during 1969–1976, at the level of detail shown in Table 6. By implication, 1968 output could have been produced by 798 000 man-years (the 1976 total 1035 000 less 237 000), standardised at 1976 levels of productivity. But 1968 output had in fact 1063 000 actual man-years of employment associated with it, at 1968 productivity levels.

Three comments emerge from the above discussion;

(i) In analysing employment time series, it is useful to standardise the unit; the 1976 man-years is the unit used consistently in the present paper.

(ii) The "number at work" or "number of jobs" as officially published each year for a period of years will generally differ from the the measures of employment obtained by the kind of I–O model being discussed; the official figures of employment are not usually standardised in the way explained in Appendix 3.

(iii) Any positive I–O marginal output will have positive marginal employment associated with it, and vice versa; this arises from the linear nature of the present model and the standardised man-year of employment.

The capital stock total is £2 795 m. there is little point in spelling out the row of figures.

In terms of 1976 levels of activity and man-years, therefore, the growth from 1968 is quite large. Its major features are available from Table 6.

Two Unsatisfactory Sectors

The clothing sector is one sector which is unsatisfactory. Column (3) inputs and entries show only some 70 man-years with a negative total input of –£13 m. Lack of precision of pricing combined with genuine small change in GDP (and thus employment and capital) make the set of entries in this column and row unreliable. Row and column (3) have been omitted from the (I–A) inverse calculations, to be described below.

A second unsatisfactory sector is that of solid fuel, sector (11); this has negative GDP and derived employment and capital, but a small positive gross output (i.e., total input). The amendment decided on here was to make gross output accord with GDP and employment. Amended entries are shown in parentheses in row and column (11). The new total input has been taken to be at the 1976 average gross output per man-year intensity.

The solid fuel sector has a special data problem, because it includes farmers' peat, which has little information about input costs. Production of farmers' peat has become intensely mechanised, between 1968 and 1976, making for further possible data problems. At less than 1 per cent of total employment, the sector, although unsatisfactory, is of negligible overall significance.

Criteria for Satisfactory Sectors in Table 6

A few fairly obvious rules are suggested:

(i) Gross output big changes, say £50 m. or more, are likely to have more reliable (less tentative) input and output distributions.

(ii) The GDP (with derived employment and capital stock) should have the same sign as the gross output. There is something badly wrong with one or the other, if they differ in sign.

(iii) The entries in a column should generally have the same sign as total input, and GDP. This is more important for large entries than for small entries.

We see that in Table 6—sectors (3) and (11) have both violated rule (ii).

Conflict in Pricing and Between Gross and Net Outputs

To get a really sound equivalent of Table 6 and to discuss and research the modelling background would, in itself, make a large research project. Here in the present report is perhaps the best place to summarise two inherent difficulties underlying the re-pricing of a table such as the 1968 Table A 3.1. These difficulties make for data problems with marginal tables such as Table 6.

(i) There are at least two ways of re-pricing the 1968 table. The first approach, used with A3.1 to give A3.4 is to specify the aggregate change in primary inputs $\Delta\pi'$ and use this to calculate $\Delta p'$ where

$$\Delta p' = \Delta \pi' [I-A]^{-1} \qquad (5.1)$$

To the extent that some of the price inflators of primary inputs are inaccurate, giving faulty elements of $\Delta \pi'$, the re-priced sector output(s) will be inaccurate. The second approach to pricing is essentially the well-known Geary-Fabricant formula used for volume index work; this is the inverse of (5.1). One specifies sector price changes $\Delta p'$ and calculates $\Delta \pi'$ as

$$\Delta \pi' = \Delta p' [I-A] \qquad (5.2)$$

Obviously one can specify primary input price changes for all but one row, each change giving a part of $\Delta\pi'$. The residual row of $\Delta \pi'$, which Geary

regards as a surplus, thus emerges as the re-priced profits row. But this does violence to the profits estimates obtained by applying a price inflator (specified) to the original profits row. In summary, we can see that good sector price control can mean bad GDP estimates, and vice versa.

(ii) Total input (gross output) after re-pricing will not be in original proportion to net output, here meaning GDP by sector of origin (salaries plus profits plus depreciation). No matter which way we re-price the system, this is true. Thus when we subtract re-priced 1968 transactions from those of 1976, in extreme cases we get a positive gross output combined with a negative net output, or vice versa. This is unlikely to happen if the margin is large. If one applies the 1976 employment and capital intensities to the 1968 re-priced GDP estimates (the most essential part of net output) such a 1968 production function is not suitable for gross output per man-year volume comparisons between 1968 and 1976, nor between the latter and the marginal Table 6.

All that is intended in this section is to indicate briefly that quite complicated problems underlie any attempt to compile a marginal table such as Table 6.

The (I–A) Inverse and Derivatives

Sixteen of the 17 sectors of Table 6 have been used in the usual way to obtain an (I–A) inverse and primary input coefficients, as given in Table 7. The clothing sector was omitted and the revised solid fuel estimate was included.

The direct plus indirect amounts of primary inputs are available for comparison with Table 3 1976 average results. The Table 7 primary input coefficients should add to unity, but because of the omission of clothing the Table 6 column sums are imperfect and thus small departures from unity are observed in Table 7 primary input aggregates. These primary input coefficients are better for the more robust Table 6 sectors, that is sectors (1), (4) to (10), (13) to (17), which is 12 of the 17 sectors of Table 6. The six largest Table 6 marginal changes relate to food (£418m.), other manufacturing (£213m.), agriculture (£254m.), construction (£201m.), trade and services (£607m.), artificial (£444m.). We expect relatively reliable Table 7 coefficients for these sectors.

There are total employment coefficients, with agricultural employment shown separately. Likewise capital stock coefficients are shown with agricultural capital stock stock separately. The capital stock per man-year derived from these capital and employment coefficients appears as the last row of Table 7. There is little point in commenting on the detailed figures, which the reader may pick out as required.

Primary Input Components of Final Demands

The allocation of primary inputs among the marginal final demands is given in Table 8, which parallels the 1976 Table 4. Employment and capital stock allocations also appear in Table 8; from these the usual capital stock per man-year ratios are derived.

The employment estimates are worth comment. Of the 237 000 standardised* man-years accounted for by 1968-76 growth, 104 000 are associated with export growth and 75 000 with expansion of government current expenditure. Growth of capital formation has 26 000 related to it. Personal consumption growth shows 33 000. The 53 000 agricultural man-years shows 42 000 related to exports and 11 000 to personal consumption.

Primary Input Percentage Shares of Final Demand, Average and Marginal

A comparison of the 1976 average primary input shares of final demands with the marginal 1968-1976 shares appears in Table 9, the last table of this part of the report.

For total final demand, imports take 48 per cent of the margin, versus 35 per cent of 1976 average. The marginal shares for both wages and profits show compensating reductions, versus average shares.

Marginal capital formation shows 61 per cent imports and 27 per cent wages; the average 1976 shares are 52 per cent imports and 36 per cent wages.

Marginal exports have smaller import content than the average (29 per cent versus 33); they have larger wage content (41 per cent versus 32) and smaller profits content (21 per cent versus 32).

Marginal government current expenditure has higher imports and indirect taxes and lower wages and profits.

The comparison of marginal and average personal consumption input shares reveals the largest changes observed. Marginal personal consumption has an input of 76 per cent imports, twice the 38 per cent import content of 1976 average consumption. Marginal shows three input shares much smaller than those of average: wages 13 per cent versus 31; indirect taxes 12 per cent versus 19; profits 11 per cent versus 18.

It therefore appears that in terms of minimum import content, and, therefore, maximum GNP content, the best growth was that of government current expenditure (only 16 per cent imports) followed by exports (29 per cent import content). Capital formation growth lags far behind as a GNP stimulus, with 61 per cent imports, while personal expenditure growth is even worse, having 76 per cent imports. Because of the limitations of data input it is

*On the interpretation of these figures, see discussion on p. 28.

dangerous to be over-confident about the precision of the figures quoted. Perhaps the only real surprise is the extraordinary import content of marginal personal expenditure, at 76 per cent, versus 38 per cent average for 1976.

Even if we have some reservations about the accuracy of the figures in Tables 6 to 9, we can still appreciate their usefulness as pointing out the need for marginal estimates, which can differ significantly from average annual estimates.

Part 6

Input-Output Analysis of Economic Policy Issues

THIS section illustrates the role of input-output analysis in providing various measures of the effects of one economic choice or policy in comparison with another. The third part of the O'Connor and Henry textbook (1975) and the fourth section of the Copeland and Henry paper (1975) have several illustrations of policy analysis. But what follows not merely shows how to use average or marginal data of Tables 1 to 9 of the present paper in a correct way; it also suggests how to improve their estimating power by allowing for likely changes in coefficients over time, if we want to apply them to events of the year 1980 or 1985.

Likely Changes to 1976-Type Economic Structures in Later Years

Since the marginal tables are at 1976 prices and factor intensities, we will refer to both 1976 annual and 1968-1976 marginal figures as 1976-type. Even if we cannot put precise figures on the effects of changes to 1976-type structures for years later than 1976, we do well to be aware of them, as qualifying any estimates the 19-sector I–O model provides. As will be seen shortly, some of these changes operate against others, which makes their net result less foreseeable. One may, however, give an unmodified 1976-type structure estimate and then add as many modified estimates as one wishes. The examples below will illustrate the procedure. The changes likely to affect 1976-type structures are of four kinds: (i) employment intensity; (ii) capital stock intensity; (iii) import intensity; (iv) energy intensity. We are always calculating at 1976 real prices, in what follows. Brief comment on these changes is desirable.

(i) Employment Intensity Decreasing

Murphy *et. al.* (1977) in their NESC report on alternative growth rates in Irish agriculture find an annual decrease of 2.1 per cent in agricultural employment regardless of what happens. Much of the underlying cause of this, as kindly pointed out to the writer by Professor R. O'Connor, is that the nominal employment in agriculture includes many rather young and rather old men and many partly-employed or unemployed men of normal working ages (20-65 years). Therefore a continuing leakage out of agriculture is likely as job opportunities arise in other sectors. It is, therefore, advisable to keep agricultural employment separable in any I–O results derived from 1976 Tables 1 to 9 and to scale down the agricultural employment by 2.1 per cent per

year, for each year later than 1976. Thus we are reducing the employment intensity of agriculture per unit final demand at the rate of 2.1 per cent per year.

Some other sectors may also have a decreasing employment intensity (with increasing capital intensity) as time goes on, as occurrred in Irish industry during 1960-68 (Henry 1972a). But if energy becomes increasingly scarce and dear, the continuous substitution of capital equipment for labour may slow down or even go into reverse.

(ii) Gross Capital Stock per Man-Year Increasing

Increasing gross capital stock per man-year was evident in all 14 industrial sectors during 1953 to 1968 (Henry, 1972a). This trend has persisted up to recently, if one assumes that increasing industrial productivity (real value added per man-year) is the direct result of increasing industrial mechanisation (gross capital stock per man-year). We might, therefore, increase the 1976-level estimate of capital stock relating to a 1980 economic issue, if we suppose the trend of increasing capital stock per man-year will continue into the future. The rate of increase will not be discussed at this point. But energy scarcity may slow down or reverse the process.

(iii) Import Intensity Increasing

By means of Table 9 data for 1976, and 1968 data from Appendix 1.2 of the Henry (1972b) paper on 1968 input-output structures, it appears that in 1976 the import share of total final demand was 35.3 per cent, compared with 29.9 per cent for 1968, at current prices. The apparent increase in import intensity, about 0.7 per cent of total final demand per year, can be interpreted as either a volume increase, or a "real price" increase, or (most probable) a combination of both. Only a detailed volume-index import analysis would answer this question. We may, however, reasonably assume that this trend in increasing import intensity will persist. It can be explained by the severe increases in energy prices (meaning that at 1976 real prices energy *now* costs more than in 1976) and their carry-over on to all other import prices. A further real increase in import prices could arise from the punt (Irish £) losing value against sterling and other foreign currencies. Note that we are here considering average annual structures.

But if imports absorb a larger share of final demand, then of necessity the GNP components (indirect taxes, subsidies, wages, etc., profits, etc.) have a smaller share left to them. For a given final demand at 1976 average prices (e.g., after deflation by the consumer price index based on unity for 1976) if imports have a bigger share, GNP necessarily has a smaller share, than pertained in 1976. Here again we are discussing the 1976 annual model.

In view of the tentative nature of the marginal model it would be well to use data from Tables 6 to 9 without adjustment.

(iv) Energy Intensity Stable or Decreasing

For the medium-term future (up to 1990) it will probably be necessary to import up to 90 per cent of Ireland's fuels and energy supply. The energy imports are included in the general import bill discussed under (iii) above, so that any increasing real cost of energy will not appear separately from the general cost of imports.

But for energy costs increasing in real terms, with perhaps genuine scarcity or limited amounts available, two likely events are the following:

(a) energy conservation will give a specified output for less energy input than in 1976;

(b) the increase in intensity of capital and decrease in intensity of employment may slow down or cease, which would counteract the trends considered possible in (i) and (ii) above, namely less labour with more machinery to produce a given output.

Thus it is possible that by 1985 or 1990 some "freeze" of labour and capital intensity (per unit final demand) will have occurred, as a direct result of the energy constraint. But so little can be clearly predicted about what will happen that it is not possible to make projections with any degree of certainty.

The two examples which follow use "1976-type" input-output data, with further variations which take some account of points (i) to (iv) above. The first example compares two export schedules; the second examines a governmental choice between spending on capital construction or services. We consider both average and marginal evidence, in our illustrations.

Example 1: *Comparison of economic implications of £1 m. of exports of food with those of a like export of metal and engineering products*

In order to compare the effects of food exports with those of metal and engineering we start with "direct plus indirect" coefficients, columns (1) and (8) of Tables 3 and 8. Table 10 gives the 1976-type unmodified coefficients for £1m. of final demand by way of exports. Implicit assumptions are that these exports can be sold at the stated prices and that all inputs are available at the assumed input costs and proportions. We consider average structures first, then marginal structures.

Comparison of Average Structures

The food export appears to be the much better investment for the national economy since £1 m. worth is associated with (i) £0.74 m. of GNP (which is also export excess balance) compared with £0.58 m. for metal (ii) nearly twice as many man-years of work (217 versus 110), and (iii) £1.80 m. of capital stock versus £1.45 m. for metal, which seems efficient for an extra 107 man-years. The average capital cost per man-year for food is about £8 300 as compared with some £13 200 for metal etc.

Table 10: *Estimated economic outcome in 1976 of £1m. of exports of food and of metal via 1976 unmodified structures, at 1976 prices*

	Average		*Marginal*	
Item	*(1) Food*	*(8) Metal*	*(1) Food*	*(8) Metal*
	£m.	£m.	£m.	£m.
(a) Imports	0.259	0.425	0.232	0.143
(b) Indirect Taxes	0.072	0.088	0.111	0.117
(c) Less subsidies	−0.069	−0.028	.042	−0.065
(d) Wages etc.	0.272	0.352	0.251	0.553
(e) Profits + deprec.	0.466	0.163	0.375	0.254
[GNP = (b)+(c)+(d)+(e)]	[0.741]	[0.575]	[0.779]	[0.859]
Capital Stock required	1.799	1.450	1.634	2.204
	man-years	*man-years*	*man-years*	*man-years*
Total employment (man-years)	216.7	110.1	171.7	171.5
(Agriculture employment)	(142.3)	(0.7)	(104.4)	(1.2)
(Non-agricultural employment)	(74.4)	(109.4)	(67.3)	(170.3)

We note that food man-years include 142 man-years in agriculture, leaving 74 man-years of non-agricultural employment versus 109 man-years for metal. Even if the Agriculture nominal man-years are given a value 0.5 each, the food sector still has a "conservative" total employment of 145 man-years. The reason for conservative acceptance of agriculture man-years has been discussed earlier in this section but a realistic scaling-down ratio is not known.

Comparison of Marginal Structures

The metal export appears to be the slightly better investment for the national economy since £1 m. worth is associated with: £0.86 m. of GNP compared with £0.78 m. for food, (ii) about 172 man-years of employment with negligible agricultural content compared with the same including 104 man-years of agricultural employment, (iii) more expensive capital stock of £2.20 m. compared with £1.63 m. for food. The average capital stock per man-year for metal is £12 850 compared with £9 520 for food, both these ratios approximating the average-structure figures quoted above.

It is interesting that the marginal model gives results which disagree with the clear-cut superiority of food emerging from the average-structure model. The marginal model gives some advantages to the metal export.

Modification of 1976 Type Results for the Average Structure

We now attempt to improve Table 10 estimates by considering likely changes to 1976 structure, as discussed above, up to the year 1981.

Employment: reduce 1976 estimates by 11 per cent for agriculture, by 5 per cent (1 per cent per year) for non-agriculture.

Capital stock: increase by 25 per cent (i.e., linear 5 per cent per year), in accordance with 1968-1972 growth of capital per man-year suggested in the production function estimated by Henry (1972a).

Imports: increase by 4 per cent per year, linear, twice the general rate observed for 1968-76 at current prices. This means a 20 per cent increase from 1976 to 1981.

Energy: assume that there is no significant change from 1976; thus the employment, capital stock and import modifications just stated above do not need amendment.

The modified Table 10 results are shown in Table 11 and the uncertain size of the amendments should be noted.

Table 11: *Estimated economic outcome in 1981 of £1m. of exports of food and of metal at 1976 prices, via modified 1976 I-O structures (average only)*

Item	*(1) Food*	*(8) Metal*
	£m.	£m.
Imports	0.311	0.510
Real GNP	0.689	0.490
Total final demand	1.000	1.000
Capital stock required	2.249	1.813
	man-years	*man-years*
Total employment (man-years)	197.3	104.5
(Agricultural employment)	(126.6)	(0.6)
(Non-agricultural employment)	(70.7)	(103.9)

The comparative position of food versus metal is unchanged by the differences between Table 10 and Table 11. This suggests that large differences between sectors will persist for the kind of changes illustrated, so that choices can be made on unmodified 1976 results. Of course where Table 11 loses out is in its lack of precision for 1981 or some such post-1976 period, apart from any question of its validity as being average, rather than marginal.

Outside the scope of this paper, but well worth mention, is the fact that information on a new food industry or a new engineering industry can be used, to include an extra one or more rows and columns to Tables 1 or 6, (the latter being background) and perform analysis of the kind shown in Tables 2 to 4 and 7 to 9 for the enlarged matrix. In this way the new industry (or industries) can be fitted into a national economic background and seen in a further light, in addition to direct information. The marginal Table 6 is probably the better general background to use.

Example 2: *The choice between public capital investment in construction and expenditure on public services*

We suppose that government wishes to make a comparative analysis of the economic outcome of £1 m. invested in (13) new and repair construction versus £1 m. spent on (16) trade margin and services. Before performing the analysis it is well to realise that sectors (13) and (16) of Tables 1 or 6 (and derived results) are too aggregate to give satisfactory answers to the kind of problem being considered here. A much more detailed table would be needed, to provide a more refined analysis. Or Tables 1 or 6 could be used as background and framework for separately detailed information, along the lines explained in the last paragraph of Example 1.

In view of the aggregate nature of the data for the problem being considered we will use 1976 unmodified estimates to illustrate the comparison. Example 1 has already illustrated the possible modifications for years following 1976.

Comparison of Average Structures

Table 12 sets out the comparative analysis. The comparison is interesting, as it shows conflicting results as follow:

(i) For GNP and employment, sector (16), trade margin and services, is superior; since the agricultural employment content is negligible we do not have doubts about the employment estimates of the kind which arose in Example 1.

Table 12: *Estimated economic outcome in 1976 of £1m. spent on construction and services at 1976 prices*

	Average		*Marginal*	
Item	*(13) Construction*	*(16) Trade*	*(13) Construction*	*(16) Trade*
	£m.	£m.	£m.	£m.
(a) Imports	0.287	0.097	0.352	0.156
(b) Indirect Taxes	0.046	0.129	0.079	0.329
(c) Less subsidies	−0.021	−0.029	−0.028	−0.167
(d) Wages etc.	0.571	0.648	0.507	0.536
(e) Profits + deprec.	0.117	0.154	0.090	0.150
[GNP = (b) + (c) + (d) + (e)]	[0.713]	[0.902]	[0.648]	[0.848]
Capital Stock required	1.068	2.666	0.808	2.323
	man-years	*man-years*	*man-years*	*man-years*
Total employment (man-years)	153.7	235.6	139.4	195.3
(Agriculture employment)	*(negligible)*	*(negligible)*	*(negligible)*	(6.0)

(ii) For capital stock per man-year, (13) construction is more efficient, having £6 950 man-year versus £11 320 per man-year for trade.
(iii) For import content and balance of payments, trade is preferable, having 10 per cent versus 29 per cent for construction.

Comparison of Marginal Structures

The marginal comparison shows parallel conflicting results, as follows:

(i) For GNP and employment, trade is better than construction.
(ii) For capital stock per man-year, construction is more efficient, having £5 790 per man-year compared with £11 890 for trade.
(iii) For import content and balance of payments, trade is preferable, having 16 per cent versus 35 per cent for construction.

In this example the marginal model gives the same kind of evidence as the average model, namely, that for some economic aspects trade is the better and for other aspects construction is the better.

Social and Economic Problems not Measurable by the I–O Models of this Report

Our analysis cannot go into the deeper question of the human need for, or the human utility of, the capital construction versus the service. It is obvious that both housing construction and, e.g., medical services are required. The result of £1 m. spent on housing construction, illustrated by the figures for sector (13) in Table 12, means that in addition to Table 12 results we have a capital structure worth £1 m. and usable for 25 or 50 years ahead. The result of £1 m. spent on medical services, illustrated by the figures for sector (16) in Table 12, means that in addition to Table 12 results we have members of the public in better health.

It is, however, possible to investigate further the economic costs and benefits surrounding each of two choices such as the columns of Table 12; only a mention will be made here of some such further considerations. If the choice is for housing, the loss of medical service, means (or may mean) unemployment benefits payable by government and various compensations due to illness. If the choice is for medical services the loss of the extra housing may mean considerable human inconvenience, not measurable by our model, and perhaps relatively high rental payments for private accommodation.

It is clear, therefore, that only partial answers to some problems of choice can be provided by I–O models or similar analyses, but fairly complete answers are possible for other types of problems. The I–O analysis has a useful role to play in assisting decision-making; it does not claim to provide answers covering all aspects of these problems.

Table 1: *Irish input-output transactions for 1976. All imports shown in one row.*

£ million at producers prices (approximate basic)		Food	Textiles	Clothing and footwear	Wood + furniture	Paper and printing	Chemicals + plastics	Structural Clay	Metal + engineering	Other manu-facturing	Codes	Agricult., forestry fishing	Solid fuel	Stone ores gravel	New and repair construc-tion	Electricity + townsgas	Transport	Trade margin and services	Material for repair	Packaging	Codes	Residual business current expenditure	Personal* consump. (household + tourist expenditure)	Net government current expenditure	Increases in stocks	Gross fixed capital formation	Exports except tourist expenditure	Total output	Codes
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)		(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)		(19)	(20)	(21)	(22)	(23)	(24)		
Food	(1)	133.00								14.42	(1)	89.00					5.50	18.45			(1)	6.46	394.17				618.72	1279.72	(1)
Textiles	(2)		36.60	7.50	0.60	0.10				4.62	(2)	1.80			1.50			0.50		3.54	(2)	10.98	35.00				131.00	233.74	(2)
Clothing + footwear	(3)			3.50							(3)										(3)		12.33				76.32	92.15	(3)
Wood + furniture	(4)				18.25				0.88		(4)				22.62						(4)	7.61	20.00			6.00	16.58	91.94	(4)
Paper + printing	(5)					11.79				0.41	(5)		0.11				0.69	40.75		36.51	(5)	10.00	22.50				39.04	161.80	(5)
Chemicals + plastics	(6)	22.41		0.22	1.62		2.46		5.04	0.13	(6)	36.39			2.24			10.10	0.98	3.51	(6)		28.23				207.70	321.03	(6)
Structural Clay	(7)							14.20	1.20		(7)	0.30		1.00	55.00			4.80	7.40	6.63	(7)	13.92	12.00				32.21	148.66	(7)
Metal + engineering	(8)				0.60				4.00		(8)	6.00	0.03		7.00	1.00	8.00	5.00	7.97	3.72	(8)		73.77			46.26	361.80	525.15	(8)
Other manufacturing	(9)	11.48	1.88	8.10	0.97	1.54	3.03	6.67	4.81	21.98	(9)	7.00	0.10	1.14	4.80	0.42	5.91	8.00	0.86		(9)	117.64	174.79				159.48	540.60	(9)
Agr., for., fish.	(10)	656.83	10.78		0.50					15.67	(10)	6.00						3.40			(10)		150.40	2.80	20.00	5.50	169.67	1041.55	(10)
Codes		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	Codes	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	Codes	(19)	(20)	(21)	(22)	(23)	(24)	Total	Codes
Solid fuel	(11)										(11)					15.97		5.40			(11)		12.19				5.69	39.25	(11)
Stone, ores, gravel	(12)	0.21						10.85			(12)	5.60		0.80	26.69						(12)						29.54	73.69	(12)
New + repair construction	(13)										(13)			2.00	48.00		7.50	38.10			(13)	4.00		51.90		579.50		731.00	(13)
Electricity + townsgas	(14)	8.57	3.36	0.69	1.11	1.85	3.41	3.58	5.70	3.51	(14)	5.11	0.56	2.66	25.00	3.60	0.90	31.35			(14)	1.33	89.29					191.58	(14)
Transport	(15)	0.35							0.28		(15)	7.00					3.00	40.74			(15)	20.00	60.00			15.00	124.80	271.17	(15)
Trade margin + services	(16)	29.37	1.10	0.20	0.30	0.50	0.90	3.77	14.21	6.27	(16)	52.00	0.44	1.12	24.71	0.50	4.21	221.40	5.12		(16)	397.48	962.00	791.30	4.00	30.00	29.10	2580.00	(16)
Material for repair	(17)	7.45	3.29	0.20	0.37	1.88	2.65	4.28	2.77	3.48	(17)		2.80	1.38	3.03	10.79	2.22	44.03			(17)	9.32						99.94	(17)
Packaging	(18)	41.99	6.34	1.78	0.49	2.78	18.29	3.79	4.74	21.67	(18)		0.60	2.01				10.00			(18)							114.48	(18)
Codes		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	Codes	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	Codes	(19)	(20)	(21)	(22)	(23)	(24)	Total	Codes
Residual business Current expenditure	(19)	58.30	16.81	4.40	9.80	13.80	54.10	16.10	54.80	71.88	(19)	74.08	7.19	16.33	35.20	2.00	12.15	251.55			(19)							698.49	(19)
All imports		109.47	71.13	23.47	21.13	60.53	109.11	22.97	190.95	171.96	Imports	100.02	2.10	1.91	135.13	60.51	63.30	39.64	75.61	60.57	Imports	81.32	711.80			348.85	3.85	2465.33	Imports
Indirect taxes		20.18	7.16	2.91	3.30	5.53	11.65	5.91	23.28	17.71	Tax	7.05	0.02	0.69	2.93	8.65	2.71	203.77	2.00		Tax	171.63	389.13			2.89		889.10	Tax
Less subsidies		−27.30									Sub	−25.80									Sub	−153.20	−98.60				−1.70	−306.60	Sub.
Wages and salaries		142.06	63.35	35.20	22.13	51.69	46.86	39.39	142.69	92.00	Wage	50.00	15.67	22.56	300.89	37.52	121.60	1321.39			Wage							2505.00	Wage
Profits + depreciation		65.35	11.94	3.98	10.77	9.81	68.57	17.15	69.80	94.89	Prof.	620.00	9.63	20.09	36.26	50.62	33.48	281.63			Prof.						19.00	1422.97	Prof.
Total input		1279.72	233.74	92.15	91.94	161.80	321.03	148.66	525.15	540.60	Total	1041.55	39.25	73.69	731.00	191.58	271.17	2580.00	99.94	114.48	Total	698.49	3049.00	846.00	24.00	1034.00	2022.80		Total
Employment (man-years)		40 575	19 700	16 275	7 600	15 550	11 790	11 600	43 150	24 560	Employ	243 000	9 150	5 225	76 000	10 790	13 000	487 035			Employ							1035000	Employ
Codes		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	Codes	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	Codes	(19)	(20)	(21)	(22)	(23)	(24)	Total	Codes
Gross capital stock (£ million)		732.8	317.0	62.2	73.3	174.6	387.7	320.3	555.3	623.8	Cap	1000.0	55.5	97.1	196.0	784.9	286.0	5357.4			Cap							11023.9	Cap
Capital per man-year (£ thousand)		18.06	16.09	3.82	9.64	11.23	32.88	27.61	12.87	25.40	Cap/my	4.12	6.07	18.58	2.58	72.74	22.00	11.00			Cap/my								

*Tourist expenditure i.e., expenditure by non-residents was £137m. for 1976 which is 4.5 per cent of total personal expenditure

Note The word underlined in each sector title will be used in the text as reference label for the sector.

Table 2: *Direct input coefficients for Irish 1976 Transactions*

		Food	*Textiles*	*Clothing and footwear*	*Wood and furniture*	*Paper and printing*	*Chemicals and plastics*	*Structural clay*	*Metal and engineering*	*Other Manu-facturing*	*Row codes*	*Agricult., forestry, fishing*	*Solid fuel*	*Stone, ores, gravel*	*New + repair const.*	*Electricity + townsgas*	*Transport*	*Trade margin + services*	*Materials for repair*	*Packaging*	*Residual business current expenditure*	*Row codes*
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)		(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	
Food	(1)	.1039								.0267	(1)	.0855					.0203	.0072			.0092	(1)
Textiles	(2)		.1566	.0814	.0065	.0006				.0085	(2)	.0017			.0021			.0002		.0309	.0157	(2)
Clothing + footwear	(3)			.0380							(3)											(3)
Wood + furniture	(4)				.1989				.0017		(4)				.0309						.0109	(4)
Paper + printing	(5)					.0729				.0008	(5)		.0028				.0025	.0158		.3189	.0143	(5)
Chemicals + plastics	(6)	.0175		.0024	.0176		.0077		.0096	.0002	(6)	.0349			.0031			.0039	.0098	.0307		(6)
Structural clay	(7)							.0955	.0023		(7)	.0003		.0136	.0752			.0019	.0740	.0579	.0199	(7)
Metal + engineering	(8)				.0065				.0076		(8)	.0058	.0008		.0096	.0052	.0295	.0019	.0797	.0325		(8)
Other manufacturing	(9)	.0090	.0080	.0879	.0106	.0095	.0094	.0449	.0092	.0407	(9)	.0067	.0025	.0155	.0066	.0022	.0218	.0031	.0086		.1684	(9)
Agriculture, forestry, fishing	(10)	0.5133	.0461		.0054					.0290	(10)	.0058						.0013				(10)
Column codes		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)		(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	
Solid fuel	(11)										(11)					.0834		.0021				(11)
Stone, ores, gravel	(12)	.0002						.0730			(12)	.0054		.0109	.0365							(12)
New + repair construct.	(13)										(13)			.0271	.0657		.0277	.0148			.0057	(13)
Electricity + townsgas	(14)	.0067	.0144	.0075	.0121	.0114	.0106	.0241	.0109	.0065	(14)	.0049	.0143	.0361	.0342	.0188	.0033	.0122			.0019	(14)
Transport	(15)	.0003							.0005		(15)	.0067					.0111	.0158			.0286	(15)
Trade margin + service	(16)	.0230	.0047	.0022	.0033	.0031	.0028	.0254	.0271	.0116	(16)	.0499	.0112	.0152	.0338	.0026	.0155	.0858	.0512		.5691	(16)
Mats. for repair	(17)	.0058	.0141	.0022	.0040	.0116	.0083	.0288	.0053	.0064	(17)		.0713	.0187	.0041	.0563	.0082	.0171			.0133	(17)
Packaging	(18)	.0328	.0271	.0193	.0053	.0172	.0570	.0255	.0090	.0401	(18)		.0153	.0273				.0039				(18)
Resid, busin. curr. exp.	(19)	.0456	.0719	.0477	.1066	.0853	.1685	.1083	.1044	.1330	(19)	.0711	.1832	.2216	.0482	.0104	.0448	.0975				(19)
Column codes		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)		(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	
All imports		.0855	.3043	.2547	.2298	.3741	.3399	.1545	.3636	.3181	imp.	.0960	.0535	.0259	.1849	.3158	.2334	.0154	.7566	.5291	.1164	imp.
Indirect taxes		.0158	.0306	.0316	.0359	.0342	.0363	.0398	.0443	.0328	tax	.0068	.0005	.0094	.0040	.0452	.0100	.0790	.0200		.2457	tax.
Less subsidies		-.0213									subs.	-.0248									-.2193	subs.
Wages and salaries		.1110	.2710	.3820	.2407	.3195	.1460	.2650	.2717	.1702	wage	.0480	.3992	.3061	.4116	.1958	.4484	.5122				wage
Profits and depreciation		.0511	.0511	.0432	.1171	.0606	.2136	.1154	.1329	.1755	prof.	.5953	.2454	.2726	.0496	.2642	.1235	.1092				prof.
Total input		1.–	1.–	1.–	1.–	1.–	1.–	1.–	1.–	1.–		1.–	1.–	1.–	1.–	1.–	1.–	1.–	1.–	1.–	1.–	
Employment man years/£1,000		.0317	.0843	.1766	.0827	.0961	.0367	.0780	.0822	.0454	empl.	.2333	.2331	.0709	.1040	.0563	.0479	.1888				empl.
Capital stock £/£		.5726	1.3562	.6750	.7973	1.0791	1.2077	.1546	1.0574	1.1539	cap.	.9601	1.4140	1.3177	.2681	4.0970	1.0547	2.0759				cap.
Column codes		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)		(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	

Table 3. *(I–A) Inverse for Irish 1976 transactions; primary inputs associated with unit final demands of table 1*

Source of inputs		*Food*	*Textiles*	*Clothing and footwear*	*Wood and furniture*	*Paper and printing*	*Chemicals and plastics*	*Structural clay*	*Metal and engineering*	*Other manu-facturing*	*Row codes*	*Agriculture forestry, fishing*	*Solid fuel*	*Stone ores, gravel*	*New + repair cons*	*Electricity + townsgas*	*Transport*	*Trade margin + services*	*Materials for repair*	*Packaging*	*Residual business current expenditure*	*Row Codes*
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)		(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	
Food	(1)	1.1781	0.0085	.0057	.0050	.0029	.0050	.0062	.0036	.0399	(1)	.1045	.0052	.0070	.0031	.0010	.0266	.0130	.0018	.0018	.0261	(1)
Textiles	(2)	.0058	1.1894	.1041	.0135	.0039	.0064	.0054	.0032	.0159	(2)	.0048	.0051	.0069	.0053	.0008	.0019	.0033	.0010	.0386	.0237	(2)
Clothing + footwear	(3)			1.0395							(3)											(3)
Wood + furniture	(4)	.0019	.0015	.0012	1.2499	.0015	.0028	.0025	.0039	.0024	(4)	.0016	.0030	.0049	.0428	.0005	.0022	.0025	.0007	.0009	.0159	(4)
Paper + printing	(5)	.0198	.0150	.0121	.0081	1.0886	.0262	.0174	.0080	.0215	(5)	.0067	.0153	.0186	.0055	.0020	.0061	.0247	.0036	.3497	.0344	(5)
Chemical + plastics	(6)	.0445	.0040	.0042	.0237	.0013	1.0106	.0025	.0109	.0049	(6)	.0401	.0024	.0026	.0051	.0010	.0019	.0058	.0113	.0320	.0052	(6)
Structural clay	(7)	.0077	.0067	.0045	.0056	.0054	.0100	1.1171	.0074	.0083	(7)	.0044	.0130	.0288	.0940	.0063	.0055	.0094	.0840	.0672	.0312	(7)
Metal + engineering	(8)	.0068	.0036	.0019	.0101	.0024	.0038	.0053	1.0094	.0034	(8)	.0076	.0085	.0048	.0126	.0108	.0318	.0055	.0812	.0341	.0062	(8)
Other manufacturing	(9)	.0402	.0303	.1114	.0432	.0304	.0459	.0850	.0330	1.0740	(9)	.0291	.0420	.0657	.0308	.0095	.0362	.0283	.0201	.0180	.2019	(9)
Agriculture, for. fish.	(10)	.6098	.0606	.0111	.0115	.0027	.0044	.0061	.0031	.0528	(10)	1.0610	.0044	.0061	.0031	.0009	.0150	.0092	.0017	.0033	.0215	(10)
Column codes		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)		(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	
Solid fuel	(11)	.0015	.0018	.0011	.0018	.0014	.0014	.0031	.0014	.0011	(11)	.0010	1.0018	.0040	.0039	.0852	.0007	.0039	.0006	.0008	.0027	(11)
Stone, ores. gravel	(12)	.0042	.0009	.0004	.0006	.0005	.0009	.0827	.0007	.0010	(12)	.0062	.0011	1.0144	.0466	.0005	.0017	.0015	.0063	.0050	.0031	(12)
New + repair construct.	(13)	.0035	.0020	.0015	.0029	.0019	.0035	.0059	.0027	.0032	(13)	.0033	.0039	.0343	1.0740	.0007	.0315	.0201	.0017	.0012	.0193	(13)
Elect. + townsgas	(14)	.0148	.0197	.0116	.0183	.0144	.0142	.0339	.0137	.0105	(14)	.0092	.0181	.0431	0.441	1.0213	.0066	.0168	.0047	.0080	.0153	(14)
Transport	(15)	.0106	.0047	.0034	.0064	.0043	.0077	.0072	.0060	.0072	(15)	.0124	.0085	.0106	.0045	.0014	1.0142	.0226	.0023	.0024	.0436	(15)
Trade margin + serv.	(16)	.1461	.0779	.0569	.1061	.0720	.1271	.1427	.1100	.1228	(16)	.1296	.1493	.1859	.1051	.0289	.0632	1.1781	.0820	.0411	.0702	(16)
Mats. for repair	(17)	.0134	.0215	.0076	.0112	.0167	.0151	.0415	.0105	.0130	(17)	.0059	.0789	.0303	.0145	.0649	.0117	.0243	1.0054	.0092	.0316	(17)
Packaging	(18)	.0443	.0348	.0284	.0111	.0207	.0611	.0356	.0121	.0462	(18)	.0081	.0187	.0328	.0063	.0022	.0033	.0074	.0050	1.0120	.0143	(18)
Resid. busin. curr. exp.	(19)	.1300	.1061	.0817	.1587	.1065	.1949	.1699	.1258	.1667	(19)	.1082	.2099	.2624	.0959	.0329	.0659	.1283	.0325	.0572	1.1135	(19)
Column codes		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)		(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	
Direct plus indirect amounts associated with unit final demand:																						
(a) Imports		.2594	.4438	.3770	.3646	.4642	.4497	.3003	.4249	.4290	Imp.	.1715	.1865	.1620	.2868	.3917	.2956	.0971	.8257	.7358	.2918	Imp.
(b) Indirect taxes		.0717	.0727	.0660	.0972	.0717	.0990	.1048	.0876	.0896	tax.	.0498	.0696	.0962	.0464	.0591	.0357	.1292	.0431	.0371	.3423	tax.
(c) less subsidies		.0687	-.0250	-.0183	-.0352	-.0235	-.0430	-.0375	-.0277	-.0387	sub.	-.0522	-.0463	-.0579	-.0212	-.0073	-.0154	-.0286	-.0072	-.0127	-.2453	sub.
(d) Wages + salaries		.2715	.3876	.4860	.3861	.4002	.2442	.4329	.3519	.2755	wag.	.1579	.5068	.4653	.5707	.2574	.5254	.6480	.0981	.1836	.4624	wag.
(e) Profits and depreciation		.4661	.1208	.0894	.1873	.0874	.2500	.1996	.1633	.2446	Pro.	.6732	.2833	.3343	.1173	.2991	.1587	.1543	.0403	.0562	.1488	Pro.
(a) + (b) + (c) + (d) + (e) (in theory unity)		1.0000	0.9999	1.0001	1.0000	1.0000	0.9999	1.0001	1.0000	1.0000	Sum.	1.0002	0.9999	0.9999	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	Sum.
Total employment, man-year/£1,000(x)		.2167	.1353	.2141	.1343	.1230	.0707	.1319	.1101	.0919	emp.	.2824	.2707	.1246	.1537	.0854	.0745	.2356	.0321	.0568	.1631	emp.
Column codes		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)		(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	Ag.emp.
(Agriculture employment)		(.1423)	(.0141)	(.0026)	(.0027)	(.0006)	(.0010)	(.0014)	(.0007)	(.0123)	Ag. Emp.	(.2475)	(.0010)	(.0014)	(.0007)	(.0002)	(.0035)	(.0022)	(.0004)	(.0008)	(.0050)	
Capital stock £/£(y)		1.7985	2.0033	1.1876	1.4449	1.4521	1.6796	3.1087	1.4500	1.6958	Cap	1.5236	1.9334	2.1147	1.0682	4.0491	1.3696	2.6659	0.5135	0.8037	2.0099	Cap.
(of which agriculture)		(.5855)	(.0581)	(.0107)	(.0110)	(.0026)	(.0042)	(.0059)	(.0030)	(.0507)	Ag. Cap	(1.0187)	(.0042)	(.0059)	(.0030)	(.0008)	(.0144)	(.0089)	(.0016)	(.0032)	(.0206)	Ag.Cap
Capital stock per man-year(y)/(x), £ thousand		8.30	14.81	5.55	10.76	11.81	23.76	23.57	13.17	18.45	Cap m/y	5.40	7.14	16.97	6.95	51.63	18.38	11.32	16.00	14.15	12.32	Cap/my

Table 4: *Primary input components of final demand, for Irish 1976 transactions*

	Input	*Personal consumption (household + tourist) expenditure*	*Net government current expenditure*	*Increases in stocks*	*Gross fixed capital formation*	*Exports except tourist expenditure*	*Total final demand*
	Primary			*£m.*			
(a)	Imports	1148.77	92.22	3.82	545.19	675.33	2465.33
(b)	Indirect taxes	590.54	104.77	1.51	39.09	153.19	889.10
(c)	Less subsidies	−176.05	−23.91	−1.16	−15.14	−90.34	−306.60
(d)	Wages and salaries	937.32	542.82	5.75	377.50	641.61	2505.00
(e)	Profits and depreciation	548.42	130.10	14.08	87.36	643.01	1422.97
	Total primary (a) + (b) + (c) + (d) + (e)	3049.00	846.00	24.00	1034.00	2022.80	6975.80
	Total employment (thousand man-years) (x)	410.57	195.22	6.59	104.72	317.90	1035.00
	(of which, agriculture)	(98.47)	(2.44)	(4.96)	(1.95)	(135.18)	(243.00)
	Total capital stock (£ million) (y)	4636.6	2169.2	41.1	803.6	3373.4	11023.9
	(of which, agriculture)	(405.2)	(10.0)	(20.4)	(8.0)	(556.4)	(1000.0)
	Capital stock per man-year (y)/(x) (£ thousand)	11.29	11.25	6.24	7.67	10.61	10.65

Table 5: *Percentage distribution of primary input components of 1976 Irish final demands*

	Primary Input	*Personal consumption expenditure, including tourist*	*Net govt. current expenditure*	*Increases in stocks*	*Gross fixed capital formation*	*Exports except tourist. expenditure*	*Total final demand*
(a)	Imports	37.7	10.9	15.9	52.7	33.4	35.3
(b)	Indirect taxes	19.4	12.4	6.3	3.8	7.6	12.7
(c)	Less subsidies	−5.8	−2.8	−4.8	−1.5	−4.5	−4.4
(d)	Wages + salaries	30.7	64.2	24.0	36.5	31.7	35.9
(e)	Profits + depreciation	18.0	15.4	58.7	8.4	31.8	20.4
	Total primary	100–	100–	100–	100–	100–	100–

Table 6: *Irish 17—sector marginal transactions 1968–1976, at 1976 prices £m. producer prices*

Input	*Output*	*Food*	*Textiles*	*Clothing*	*Wood*	*Paper*	*Chemicals*	*Clay*	*Metal*	*Other manufactures*	*Agriculture*	*Solid fuel*	*Sectors*	*Stone*	*Construction*	*Electricity*	*Transport*	*Trade*	*Artificial*	*Personal*	*Government*	*Capital form*	*Exports*	*Total output*	*Sectors*
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)		(12)	(13)	(14)	(15)	(16)	(17)						
Food	(1)	44.30		-0.73			-1.11			7.03	1.23		(1)				4.90	11.35	6.46	51.86		-11.95	305.00	418.34	(1)
Textiles	(2)		-1.67	-1.10	-0.29	0.07	-0.03	-0.11	-0.19	3.65	0.45		(2)		-0.04			-1.90	13.58	-28.22		-7.20	49.06	26.06	(2)
Clothing	(3)			3.50	-0.05		-0.16		-0.13				(3)					-1.45		-41.90		-1.07	28.28	-12.98	(3)
Wood	(4)			-0.19	9.86	-0.08	-0.03	-0.08	0.34	-0.40		-0.03	(4)		16.51			-0.54	1.53	2.52		-1.74	8.65	36.32	(4)
Paper	(5)		-0.24	-1.00	-0.03	-12.90		-0.77	-0.24	-0.65		0.11	(5)				0.51	7.11	27.55	7.27		-3.56	19.37	42.53	(5)
Chemicals	(6)	15.89	-0.52	-0.32	-0.37	-1.06	-12.08	-0.24	-1.97	0.13	-2.80		(6)	-0.19	-5.78			1.38	2.13	1.61		-9.59	169.22	156.18	(6)
Clay	(7)		-0.05		-0.08			6.29	-0.09		0.25		(7)	0.61	25.12	-0.05		3.88	18.44	3.13		-3.10	14.76	69.11	(7)
Metal	(8)			-1.59		-0.86	-0.43	-0.55	2.29	-0.28	-5.96	-0.07	(8)		-16.37	0.97	-14.57	-3.92	-53.24	-8.90		-23.88	268.04	140.68	(8)
Other manufactures	(9)	10.85	1.55	5.08	0.62	0.31	3.03	4.46	-3.93	4.66	2.18	-0.28	(9)	0.81	1.75	-6.11	3.62	-4.31	95.55	101.66		-1.63	-6.57	213.30	(9)
Agriculture	(10)	179.64	10.11		0.42	-0.96				5.90	2.45		(10)				-0.60	1.20		29.22	1.17	-3.64	29.12 (-4.32)	254.03	(10)
Solid fuel	(11)	-0.67		-0.03		-0.13	-0.05	-0.26	-0.10	-0.28			(11)		-0.10	2.66		-0.52		-2.42		-1.54	3.95	0.51	(11)
Sectors		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	Sectors	(12)	(13)	(14)	(15)	(16)	(17)	Pers	Gov	Cap	Exp	Total	Sectors
Stone	(12)	0.11	-0.03	-0.03	-0.03		-0.18	5.31	-0.08	-0.05	2.30		(12)	0.49	10.71	-0.03						-0.60	5.44	23.33	(12)
Construction	(13)												(13)	1.00	-29.01		1.36	10.16	4.00		10.89	202.51		200.91	(13)
Electricity	(14)	3.30	1.29	-0.03	0.49	0.04	1.42	0.97	2.40	1.37	2.14	0.15	(14)	1.14	23.19	1.30	0.69	17.36	1.33	23.94			-0.13	82.36	(14)
Transport	(15)	0.35							-0.01		-2.71	-0.76	(15)		-11.81	-0.21	0.48	2.34	9.50	19.84		0.83	18.71	36.55	(15)
Trade	(16)	17.81	-0.04	0.20	0.19	0.04	0.53	2.71	11.67	3.67	-5.99	-0.93 (0.10)	(16)	0.75	3.64	-2.70	-3.21	55.72	178.16	56.02	375.08	17.64	-104.41	606.55	(16)
Artificial	(17)	12.75	-5.71	-5.04	4.02	-0.79	37.68	10.25	18.01	40.57	73.86	6.08 (-0.50)	(17)	9.26	3.19	4.89	2.04	221.99	9.32	-2.30		44.19	-39.93	444.33	(17)
Imports		-4.95	3.60	-14.69	4.30	40.83	46.22	13.52	9.62	28.45	63.86	1.79	Imp	-1.70	57.38	53.47	12.26	-44.47	126.70	416.40	-3.40	148.46	-22.34	935.31	Imp
Indirect taxes		18.11	6.99	2.83	3.13	5.28	11.48	5.41	3.84	17.30	-28.71	-0.56	Tax	0.03	0.69	8.21	-9.49	61.77	148.26	40.61		-15.84	-46.91	232.43	Tax
Less subsidies*		44.19									4.60		Sub						-144.94	-55.63			38.03	-113.75	Sub
Wages + salaries		52.51	9.07	0.14	9.01	10.71	28.37	15.47	66.65	50.32	10.98	-3.09	Wage	5.89	108.73	8.50	30.24	222.09						625.59	Wage
Profits + deprec.		24.15	1.71	0.02	4.39	2.03	41.52	6.73	32.60	51.91	135.90	-1.90	Prof.	5.24	13.11	11.46	8.32	47.31			-17.65	44.30	-138.35	272.80	Prof.
Total input		418.34	26.06	-12.98	36.32	42.53	156.18	69.11	140.68	213.30	254.03	(7.76) 0.51	Total	23.33	200.91	82.36	36.55	606.55	444.33	614.71	366.09	372.59	598.99		Total
Sectors		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	Sector	(12)	(13)	(14)	(15)	(16)	(17)	Pers.	Gov.	Cap	Exp.	Total	Sector
Employment (thousand man-years)		15.00	2.82	0.07	3.10	3.22	7.14	4.55	20.15	13.43	53.26	-1.81	Empl.	1.36	27.46	2.44	3.23	81.80						237.22	Empl.
Gross Capital Stock (£million)		270.9	45.4	0.3	29.9	36.1	234.8	125.8	259.3	341.2	218.3	-11.0	Cap	25.4	70.8	177.8	71.1	899.8						2795.9	Cap

*A positive subsidy entry means in effect, an indirect tax.

Table 7: *(I–A) Inverse of Irish 1968–1976 Marginal Transactions with Primary Inputs, Employment, Capital Stock, Per Final Demand. (16 Sectors; Clothing Omitted)*

		Food	*Textiles*	*Wood*	*Paper*	*Chemicals*	*Clay*	*Metal*	*Other manufactures*	*Agriculture*	*Solid fuel*	*Row codes*	*Stone*	*Construction*	*Electricity*	*Transport*	*Trade*	*Artificial*
Source of inputs		(1)	(2)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)		(12)	(13)	(14)	(15)	(16)	(17)
Food	(1)	1.1337	.0001	.0090	−.0010	.0042	.0149	.0084	.0488	.0207	.0215	(1)	.0227	-.0037	-.0018	.1539	.0429	.0481
Textiles	(2)	.0096	.9376	−.0032	.0003	.0093	.0087	.0042	.0252	.0135	.0023	(2)	.0179	.0017	.0002	.0031	.0132	.0403
Wood	(4)	.0011	−.0007	1.3736	−.0022	.0011	−.0002	.0044	−.0014	.0017	.0057	(4)	.0068	.0987	.0006	.0020	.0029	.0060
Paper	(5)	.0138	−.0130	.0102	.7656	.0148	.0059	.0098	.0117	.0184	.0159	(5)	.0284	.0029	.0024	.0102	.0366	.0653
Chemicals	(6)	.0364	−.0215	.0144	−.0176	.9298	−.0020	−.0117	.0028	−.0078	.0013	(6)	−.0054	−.0222	−.0001	.0089	.0056	.0076
Clay	(7)	.0146	−.0078	.0078	−.0016	.0150	1.1187	.0103	.0143	.0199	.0046	(7)	.0637	.1262	.0012	.0041	.0369	.0656
Metal	(8)	−.0510	.0070	−.0300	−.0108	−.0427	−.0501	.9985	−.0408	−.0787	−.0411	(8)	−.0793	−.0627	.0068	−.4141	−.0825	−.1770
Other manu.	(9)	.0955	.0295	.0716	−.0018	.0845	.1420	.0145	1.0874	.0948	.0624	(9)	.1626	.0263	−.0662	.1211	.1122	.2946
Agriculture	(10)	.4978	.3683	.0206	−.0179	.0076	.0136	.0058	.0613	1.0262	.0103	(10)	.0212	.0018	−.0027	.0541	.0285	.0441
Solid fuel	(11)	-.0015	.0016	.0005	−.0023	−.0001	−.0036	−.0002	−.0012	.0002	.9993	(11)	.0014	.0026	.0329	.0004	−.0001	−.0004
Column codes		(1)	(2)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)		(12)	(13)	(14)	(15)	(16)	(17)
Stone	(12)	.0063	.0016	−.0002	−.0003	.0004	.0884	.0005	.0017	.0114	.0008	(12)	1.0292	.0575	−.0003	.0028	.0045	.0066
Construction	(13)	.0050	−.0018	.0033	−.0005	.0044	.0085	.0044	.0045	.0058	.0059	(13)	.0474	.8759	.0002	.0312	.0243	.0195
Electricity	(14)	.0206	.0479	.0232	−.0004	.0145	.0284	.0241	.0144	.0156	−.0123	(14)	.0686	.1086	1.0148	.0152	.0448	.0261
Transport	(15)	.0122	.0012	.0051	−.0011	.0066	.0064	.0047	.0068	.0192	.1008	(15)	.0106	−.0501	.0015	1.0118	.0154	0293
Trade	(16)	.1538	−.0654	.1012	−.0143	.1298	.1793	.1787	.1390	.1298	.1470	(16)	.2806	.0587	−.0140	−.1244	1.3289	.5586
Artificial	(17)	.2660	−.1210	.2164	−.0321	.2924	.2977	.2009	.2765	.3667	.0585	(17)	.5605	.0849	.0432	.0061	.5270	1.2874
Direct plus indirect amounts associated with unit final demand:																		
(a) Imports		.2322	.2073	.2624	.7148	.3907	.3320	.1425	.2566	.3988	.1232	Imp	.1887	.3523	.6685	.3824	.1559	.4798
(b) Indirect taxes		.1106	.1661	.2070	.0830	.1895	.2183	.1170	.1977	.0297	.0865	Tax	.2444	.0790	.1117	−.2694	.3289	.5228
(c) Less subsidies*		.0420	.0462	−.0693	.0100	−.0948	−.0953	−.0645	−.0839	−.0989	−.0166	Sub	−.1800	-.0280	−.0143	.0152	−.1669	−.4141
(d) Wages + salaries		.2514	.3255	.3969	.1749	.2370	.3661	.5525	.3214	.1159	.5431	Wage	.4376	.5069	.1023	.6717	.5359	.2852
(e) Profits + depreciation		.3747	.2626	.2055	.0168	.2791	.1794	.2541	.3097	.5765	.2927	Pro	.3105	.0902	.1327	.2005	.1499	.1285
(a) + (b) + (c) + (d) + (e)		1.0109	1.0077	1.0025	.9995	1.0015	1.0005	1.0016	1.0015	1.0220	1.0289	Sum	1.0012	1.0004	1.0009	1.0004	1.0037	1.0022
Column codes		(1)	(2)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)		(12)	(13)	(14)	(15)	(16)	(17)
(x) Total employment man-year per £1000		.1717	.1719	.1390	.0488	.0658	.1112	.1715	.1020	.2357	.2656	empl.	.1204	.1394	.0336	.0447	.1953	.1003
(Agricultural employ.)		(.1044)	(.0772)	(.0043)	(−.0037)	(.0016)	(.0029)	(.0012)	(.0128)	(.2151)	(.0022)	(ag)	(.0045)	(.0004)	(−.0006)	(−.0113)	(.0060)	(.0092)
(y) Total capital stock £/£		1.6342	1.9639	1.4642	.5523	1.7590	2.6436	2.2041	2.0837	1.2453	1.8864	cap	2.0400	.8075	2.1320	1.4444	2.3229	1.4312
(of which Agriculture)		(.4278)	(.3165)	(.0177)	(−.0154)	(.0066)	(.0120)	(.0050)	(.0527)	(.8818)	(.0088)	(Ag)	(.0182)	(.0015)	(−.0023)	(.0465)	(.0245)	(.0379)
(y)/(x): Capital stock per man-year, £ thousand		9.52	11.42	10.53	11.32	26.73	23.77	12.85	20.43	5.28	7.10	Cap/My	16.94	5.79	63.45	32.31	11.89	14.27

*A positive subsidy entry means, in effect, an indirect tax.

Table 8: *Primary input components of final demand, Irish 1968–1976 marginal transactions at 1976 prices (clothing omitted)*

	Input	*Personal consumption including tourism*	*Net government current expenditure*	*Capital formation (fixed plus stock)*	*Exports except tourism*	*Total final demand*
	Primary					
(a)	Imports	496.20	59.38	226.59	166.04	948.21
(b)	Indirect taxes	78.04	124.24	19.67	8.26	230.21
(c)	Less subsidies*	−74.55	−63.01	−24.28	48.96	−112.88
(d)	Wages + salaries	82.63	205.25	99.96	239.56	627.40
(e)	Profits + depreciation	74.29	40.23	51.72	119.25	285.49
	Total primary (a) + (b) + (c) + (d) + (e)	656.61	366.09	373.66	582.07	1978.43
	Total employment thousand man-years	32.62	75.00	25.86	103.67	237.15
	(agricultural employment)	(11.28)	(2.50)	(−2.06)	(41.54)	(53.26)
	Total capital stock (£ m.)	478.6	881.5	141.0	1294.5	2795.6
	(Agriculture capital stock)	(46.4)	(10.2)	(−8.5)	(170.2)	(218.3)
	Total capital stock per man-year £ thousand	14.67	11.75	5.45	12.49	11.79

* A positive subsidy entry means, in effect, an indirect tax.

Table 9: *Comparison of Irish 1976 average primary input percentage shares of final demand with those of marginal final demand 1968–1976, at 1976 prices*

Primary input	*Personal consumption*		*Government current*		*Capital formation*		*Exports ex tourism*		*Total final demand*	
	Average	*Marginal*	*Average*	*Marginal*	*Average*	*Marginal*	*Average*	*Marginal*	*Average*	*Marginal*
	Percentage of column total									
Imports	37.7	75.6	10.9	16.2	51.9	60.6	33.4	28.5	35.3	47.9
Indirect taxes	19.4	11.9	12.4	33.9	3.8	5.3	7.6	1.4	12.7	11.6
Less subsidies*	−5.8	−11.4	−2.8	−17.2	−1.5	−6.5	−4.5	8.4	−4.4	−5.7
Wages + salaries	30.7	12.6	64.2	56.1	36.2	26.8	31.7	41.2	35.9	31.7
Profits + depreciation	18.0	11.3	15.4	11.0	9.6	13.8	31.8	20.5	20.4	14.4
Total primary	100–	100–	100–	100–	100–	100–	100–	100–	100–	100–

* A positive subsidy entry means, in effect, an indirect tax

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Appendix 1

Compilation of the 19-Sector Input-Output Transactions Table Shown as Table 1 and Allocation of Employment Among Sectors

THE following notes give a summary of the work and stages required to reach the 19-sector national I-O table shown as Table 1. See the list of references at the end of this Appendix. The 1976 transactions' table shown as Table 1 is necessarily imprecise, since a Census of Industrial Production (CIP) was not available for 1976 at the time of compilation.

Sectors

The number of sectors required were 9 for the IDA study of manufacturing and a reasonable further number for all other economic activity; the latter has been subdivided into 6 sectors, with a further 4 artificial sectors such as packaging; thus 19 sectors are the inter-industry number.

Agreement with National Accounts

The rows of Table 1 for each of imports, indirect taxes, subsidies, wages and salaries, profits and depreciation, have totals agreeing with National Accounts entries in *National Income and Expenditure 1976;* these rows show, in an I-O setting, the GNP by sector of origin. The reader may verify that the I-O row totals agree with 1976 entries in Table A.2 of *National Income and Expenditure 1976* where direct comparison is possible without aggregating Table A.2 figures, or re-arranging them.

In like manner, the aggregate values of columns (20) to (24) of Table 1 agree with GNP expenditure items, as given in Table A.5 for 1976. For example, the total for gross fixed capital formation is £1 034 million, both in Table 1 and in Table A.5.

In summary, Table 1 aggregates agree with 1976 national income and expenditure levels, as published in *National Income and Expenditure 1976.*

Sector Outputs

Since 1976 CIP data were not available, various estimation procedures had to be used. All of 1973 CIP annual results were available, as published in various issues of the *Irish Statistical Bulletin.* The 1976 quarterly volume indices were

used, with 1973 as base, to estimate quantity changes since 1973 in each CIP industry covered by the Quarterly Inquiry, (i.e., transportable goods). An average of 4 quarters gave the 1976 annual estimate. Price index data, from either the wholesale price series or the consumer price index series, were used to apply price changes to volumes. Thus 1976 volumes based on 1973, together with price indices, gave estimated 1976 sector outputs (total inputs) for Table 1 sectors (1) to (9), (11) (part) and (12). The rest of sector (11), solid fuel, came from the annual report of Bord na Mona and the "turf" output of agriculture as published by CSO. This CSO report on Irish 1976 Agriculture provided material for sector (10), when *Irish Statistical Bulletin* data on forestry operations and sea fishing were added.

Output of new construction is directly available from the *National Income and Expenditure* gross fixed capital formation details. The 1964 and 1969 I-O tables were used to estimate how much should be added, for repair construction. Thus output of sector (13) was estimated. The annual reports of the Electricity Supply Board and the Dublin Gas Company gave the core of the output of sector (14).

Most of the transport (sector (15)) output particulars came from annual reports, on public transport. Further up-to-date information, on licensed road hauliers, is published in the *Irish Statistical Bulletin*. Docker and storage workers had a *per capita* estimate of output included; their numbers were based on 1971 Census of Population counts (industrial classification of persons gainfully occupied).

Sector (16), trade margin and services, contains many diverse activities. Several different methods were used, to get sector outputs. Most of net government current expenditure goes to purchase of government services, after allowance for Local Authority expenditure on road and building repair and maintenance. Thus the output of government services, defined in this way, is fairly readily obtained. Direct inquiries to the CSO obtained the GDP content of "Distribution", which is wholesale and retail trade. The CSO 1971 Census of Distribution results were used, to give gross margin as a proportion of GDP. For other parts of services, CSO information supplied directly on GDP was scaled up to sector output level by using equivalent 1969 I-O 92-sector proportions.

The output of (17), materials for repair, emerged as the sum of its row entries. These entries came, for industry, from 1973 CIP known amounts (the annual census asks for "cost of materials for repairs") scaled up, via total input, to 1976 levels. They also came in the same way from the 1969 92-sector I-O transactions, grouped suitably for parts of the services. The 1976 annual reports also were used. The row (17) entry in column (19) was found necessary to permit a more reasonable column (17) (*pro rata* 1969) input structure, without forcing

likely imports of materials to appear in the wrong columns. This aspect will be considered below under "imports".

The output of (18), packaging, was determined in the same way as that of (17). The 1973 CIP gave usable ratios between "Costs of Containers, Packaging etc." and total inputs. The 1969 I-O transaction gave the ratio of packaging to total input, for the grade margin sector; this ratio was applied to 1976 total input of the trade margin sector. The sum of row (18) outputs gave sector (18) total input.

The output of (19), residual business current expenditure, emerged as a row and column of positive residuals, the row formally developed from 1973 CIP "Remainder of Net Output" less profits and depreciation. If all other arithmetic is correct, total output will equal total input. The row entries are the "unaccounted for" part of input costs; there will automatically be row residuals in certain rows to fill in a colunm of residuals. Some further light on sector (19) will appear below in this appendix in the section "Completing the Inter-industry Transactions".

It is clear that this kind of estimation of 1976 sector outputs lacks the precision available through more direct data.

Personal Consumption Expenditure

The control total appears in several of the National Accounts. This includes tourist expenditure, for which there are no official estimates of how the total £137 m. is broken down among various kinds of goods and services. But this writer made estimates of tourist expenditure items as mentioned in the main text. Basic data on 15 items of personal consumption expenditure are shown in Table A.11 of *National Income and Expenditure 1976*. But these amounts are shown at purchaser prices and have to be broken down into four components: (i) trade margin: (ii) indirect taxes such as excise duty on drink and tobacco; (iii) c.i.f. import value of imported share of the item; (iv) Irish share, at producer prices, of the item.

The 15 items of Table A.11 do not correspond closely with the rows of the 19-sector I–O table; thus considerable estimation work is required, to match the I–O framework. Each item is built up by the CSO from domestic and imported value or quantity information, combined with either retail price margin or retail price per unit, where appropriate. Where annual census data are not available quarterly amounts or values of industrial commodities (also required for the quarterly volume index) are used. The CSO re-scales the sum of the 15 commodity first estimates, so as to match the control total.

A *summary* description of how the personal consumption figures of Table 1 column (20) were obtained, is the following:

(a) Mr J. Madden of CSO gave the author about 40 subtotals of 15 published items. A subtotal was either domestic or imported, at purchaser prices. The subtotals approximately matched Table 1 rows (1) to (11), (14), (15), part of (16), imports.

(b) The CSO 1971 Census of Distribution as well as the *Irish Statistical Bulletin* report on Hotels and Guesthouses in 1976 enabled such margins to be deducted from components of (a).

(c) In consultation with Mr. Madden, and using the *Revenue Commissioners' Report,* the indirect tax and VAT components of (a) less (b) and of (b) were estimated.

(d) Various subsidies or parts of subsidies were now aggregated and corresponding adjustments made to various items such as transport. But the control total for subsidies was already determined, as described above in the subsidies part of this appendix.

(e) A final scaling was carried out, to make the initial estimates fit the column (20) control total, less any entries (subsidies) already finalised.

Net Government Current Expenditure

This is confined to three items: (i) current expenditure on forestry, (ii) current expenditure on road and house repairs etc., (iii) current expenditure on general government services. The control total for the aggregate is available in the National Accounts. Current expenditure on forestry is available from the Department of Forestry. The CSO can provide estimates of the housing and roads parts of (ii). The third part emerges as a residual.

Increases in Stocks

Data are very scarce on this item. The control total of £24 million is part of the National Accounts. About £20 million is specified for value of changes in livestock on farms. It was decided that it was not worthwhile to distribute the remaining £4 million in proportion to 1969 non-agricultural items.

Gross Fixed Capital Formation

The *National Income and Expenditure* table A.14 provided the control total and major components which can be grouped into the categories (i) building and construction, (ii) other capital goods. The imported component came from the *Trade Statistics* allocation to capital goods. Additional direct information was

obtained from CSO, concerning transport, trade margin, furniture and indirect taxes. The entry in the agriculture row is capital work in forestry, shown in Table A.21 of the *National Income and Expenditure* publications.

Exports

The detail of exports, as given in the *Trade Statistics of Ireland,* is quite readily grouped into the sector categories required by the I-O table; but these are merchandise exports only. The invisible exports are published annually in some detail in the *Irish Statistical Bulletin;* and these 1976 figures, as well as corresponding control totals in *National Income and Expenditure 1976* were used to fit the 1976 invisible exports into the I-O framework.

Wages and Salaries

Table A.2 of *National Income and Expenditure 1976* shows five major subdivisions of "Remuneration of Employees", which has been taken as "Wages and Salaries" for I-O Table 1. The CSO have revealed a few further subdivisions of "Industry", of "Distribution, Transport and Communication" and of "Other domestic".

The 1973 CIP gave wages and salaries as a proportion of total input, thus enabling such proportions to give a first estimate of wages etc., for each manufacturing sector, when applied to the total inputs estimated for 1976 as described above. Global scaling of these first estimates across manufacturing gave agreement with CSO control total, a revealed subsection of "Industry".

Published Annual Reports of transport companies gave a large part of the transport estimate. There were other direct sources of information, e.g., the annual report of the Electricity Supply Board is the major part of I-O electricity and townsgas.

As a final scaling method, the 1969 I-O 92-sector transactions gave a ratio of wages etc., to total input, after aggregation of 92-sector activities to cover activities still missing from the wage estimates. This ratio, when applied to 1976 total input of the missing sector gave a first estimate. The aggregate of these first estimates was then scaled, so as to give results in harmony with National Accounts.

Profits and Depreciation

Table A.2 of *National Income and Expenditure 1976* has four sub-aggregates for "other" which is taken as "profits" for I-O Table 1, and four corresponding subaggregates for "Provision for Depreciation" which is I-O "Depreciation". Further items of Table A.2 entering the I-O Profits row are "Adjustment for

stock appreciation" (netted out of I-O "profits" row and "increases in stocks" column) and "net factor income from the rest of world", entered in the I-O export column of the profits row.

In order to avoid tedium of exposition, it may be said that the allocation of national accounts' profits to the I-O row "Profits and Depreciation" follows precisely the methods described for wages and salaries, in the previous section of this appendix. Likewise for depreciation.

Subsidies

Table A.19 of *National Income and Expenditure 1976* has a list of values of 29 different kinds of subsidies. Mr J. Madden of CSO kindly provided further breakdown of the EEC subsidy of £141.3m.

In general, subsidies are distributed with the item they subsidise. For example, the CIE subsidy of £32.1m. is entered direct in the personal consumption column, and CIE output is entered in transport at full cost. Likewise, the dairy produce subsidy of £23.8m. is entered in the I-O food column, and the milk output of agriculture sold to Food at full receipts by farmers.

About half the total subsidy value is of such a general nature that it has been entered in the I-O column of "residual business current expenditure" as reducing costs to business in general. Much of the EEC subsidies were of this nature, or seemed to be. By reducing costs, they increased business profits.

Indirect Taxes

Table A.18 of *National Income and Expenditure 1976* quotes 11 items of "Taxes of Expenditure" within a control total of £889m. The Revenue Commissioners' report for 1976 provides much background detail and particulars of the 1976 indirect taxes.

Value Added Tax (VAT), at £253m. was distributed per details shown in Table 109 of the 1976 Revenue Commissioners report. One hundred and thirty-five million pounds was allocated as input to trade and services, this being the VAT paid by shops, hotels, entertainments, services. Thirty million pounds given as "other", was allocated direct to personal consumption. Some £8.65m. went as input to electricity and gas. The rest was allocated to manufacturing sectors *pro rata* GDP by sector of origin.

Major direct allocations to personal consumption were taxes on drink and tobacco, amounting to £257m. Direct allocations to residual business current expenditure included EEC taxes, stamp duties and motor vehicle duties (part), amounting to £79m.

Rates on property amounted to £110m. CSO suggested that £60m. of this might be related to the *notional* service sector *"Rent of Dwellings"* which makes up part of National Accounts profits. Thus this £60m. was allocated to the trade and services sector. The remaining £50.4m. being rates on business property, was allocated to residual business current expenditure.

The only other major indirect tax is that on petroleum products, amounting to £126m. The CSO estimates of this tax included in petroleum share of personal consumption was £58m. The 1969 sector data, when scaled up to 1976 levels (via an unpublished row of 1969 92-sector indirect taxes on petroleum products) gave some 1976 estimates. The CSO provided detailed fuel costs of 60 CIP industries for 1972, to this writer. An estimate of tax on petroleum was extracted. After scaling up to 1976, the combined sector estimates so far considered were £37m. short of the total. This £37m. was allocated to residual business current expenditure.

Imports

At a control total value of £2 465m. imports are a major input to the I-O scheme. The *Trade Statistics of Ireland year 1977 and December 1977* (TSI) has thirteen hundred commodities on its import list. These had to be harmonised with the sector framework and allocated to the 24 I-O columns of Table 1. It should be mentioned that some subtractions of re-exports are made from the TSI figures in order to get the control total £2 465m. These adjustments are done by the CSO which is the place to query their detail. There was an additional £165.4m. of invisible imports, besides the merchandise.

The CSO breaks down the aggregate value of merchandise imports into four categories: (i) capital, (ii) consumer, (iii) further production in agriculture, (iv) other further production. These four components are published with each issue of TSI. The CSO, however, were not willing to show the detailed listing used to get each of these categories. Some entries will be obvious: drink and manufactured foods are consumer goods. Other entries require division between two or more categories. At all events four CSO sub-aggregates were available as guides. The capital goods (i) are for gross fixed capital formation. The consumer goods (ii) are for personal consumption. Materials for further production in agriculture (iii) go to agriculture or animal food manufacture or chemical fertiliser industries. Materials for other further production (iv) go mostly to industry, but partly to electricity and transport.

At this point it is well to realise that *company reports* are the only available detailed 1976 input data. This means that 1973 CIP had to be used for import input estimation, together with 1969, 92-sector I-O structures for services. Four stages of the import allocation were used:

(1) Company reports and telephone inquiries, for Bord na Mona, CIE, ESB, Aer Lingus and a few smaller enterprises. Their Table 1 columns (or parts of) then had imports entered at that stage.
(2) Maximum use of 1973 CIP and 1969 I-O data. A framework of Table 1 rows was applied to these data, with some further queries to CSO on large unspecified inputs published in the *Irish Statistical Bulletin* reports of 1973 CIP. Various listed inputs were adjudged wholly or partly imported, and thus each CIP industry had a 1973 input allocation. Next, the volume index numbers 1973-1976 gave important estimates for 1976 at 1973 prices. Then import price inflators (like Table A3.2) were used to re-price imports so as to give them at 1976 prices. After suitable aggregation of CIP industries and I-O 92-sector columns, there was therefore available a first estimate of 1976 imports for each column of Table 1. We note that the imports to final demand columns (20) to (24) have already been determined and are *not* to be revised.
(3) Scale the import estimates for columns (1) to (19) so as to give the correct control total £2 465m., in conjunction with pre-determined imports of columns (20) to (24). We could, at this stage, accept the import estimates as adequate.

(4) Use detailed TSI data to try and improve the estimates described in (3). By means of a table of 47 rows and 24 columns, 47 categories of 1976 imports were set out, with a view to allocating them to the 24 columns of Table 1. There were 46 rows of merchandise and 1 row of invisible imports. The control total of each column, as obtained in (3) above, was entered as a column total of the table to be constructed. In attempting to allocate imports along one row, the TSI item or group was carefully considered. Crude petroleum, at £85.59m. had is own row and was allocated to column (9), other manufacturing. Packaging items, whether paper, plastic, or metal, were allocated to column (18), packaging. Food items went either to agriculture or to personal consumption. Next, the final demand column import totals were made out in detail by working from items known with certainty (e.g., food, clothing and footwear) to parts of items that were possible. It should be pointed out here that CSO has the problem of making up the list of items and their quantities and values (c.i.f.) plus mark-up going to make up (a) personal expenditure, (b) gross fixed capital formation. These lists were not available to the writer, so he himself had to make the detailed "guesstimates" required to reach the control totals.

Now the final test was: for columns (1) to (19) in whole or in part not yet fully finalised through annual reports, can the detailed imports, remaining to be allocated, be distributed in a way that looks sensible, without doing violence to the control total for each column? A specially detailed allocation was made of petroleum products (five kinds) in proportion to 1973 CIP and 1969 I-O allocations.

At least two improvements emerged:

(i) the prior estimate in sector (9) was increased, due to severe crude petroleum price inflation.

(ii) sector (18), packaging, received an unexpectedly large allocation of imports and its prior import estimate was increased.

The other column estimates were scaled down so as to still agree with the control total £2 465m.

As a final comment, it may be stated that for competitive (or similar) imports, interchangeable with domestic products, direct inquiries to purchasers is necessary to estimate import share. The 1973-based CIP and 1976 TSI information is not enough to fully satisfactorily allocate 1976 imports.

Completing the Inter-Industry Transactions

At this stage, with final demand fully filled in and likewise primary input (including imports) the total input of sector (19) has to be determined. One way is to fill in its column in proportion to 1969 inputs, using total primary 1969 and 1976 for the ratio.

As if we were preparing to do a RAS on the (19 × 19) inter-industry transactions, we can make border totals (for each of the 19 rows and columns) of the values to be distributed within the inter-industry matrix. Also, at this point some columns or parts of columns (Agriculture, Bord na Mona, ESB and others) are complete and finalised.

Also available for 16 of the 19 columns are existing scaled-up 1973 CIP entries or 1969 I-O 92-sector grouped entries. Scaled-up 1969 entries could now be made for columns (17) and (18), since total inputs are now finalised for those columns.

One way of finishing out is (i) to subtract all finalised entries out of the inter-industry borders and replace them by zeros in the inter-industry transactions; (ii) use RAS to distribute the border residuals in accordance with non-zero remaining inter-industry 1973 or 1969 entries; (iii) add back the final entries subtracted out in (i).

The way, in fact, chosen was less neat but possibly better. This was to look carefully at the expected large entries in each row (by reference to 1973 or 1969), with the import detailed estimates also on view. If the row aggregate seems far too small, look for necessary import substitution among the imports, and adjust them accordingly. Conversely, if the row aggregate seems far too large, cut back on imports in some columns. The nature of the row and the necessary kind of import substitute must make sense. In either case, allocate the rows thus, starting with row (1). As there are no construction, electricity or service imports, the rows (13) to (19) must be adjusted to fill the columns

properly. This means in effect a RAS treatment of such rows, after final adjustment of imports. The superiority of this method is that it allows improved substitution and exchange between domestic outputs and known kinds of imports. We are using extra information. If we use RAS as in stage (ii) above, the import inputs are frozen at their stage (i) pattern. It is clear that neither RAS nor the alternative (arguably better) method can give much precision, by comparision with CIP data.

If, or when, a full CIP report is available, the extra detailed information relates to (i) outputs, in product detail for hundreds of products, (ii) inputs (in less product detail than outputs) but still for hundreds of products. The treatment of imports in that case is different to what has been described above. Competitive (also called "Similar") imports are matched with domestic products, in great detail. Non-competitive (also called "Complimentary") imports are listed separately, in considerable detail. A standard list of products is used for outputs, imports and inputs. The CIP inputs are expressed in this way, subject to aggregation. They are identified with either complimentary imports or joint "domestic plus similar import" products. Finally, the similar imports can be extracted from each joint row, by simple proportion, or otherwise. In conjunction with detailed product listing, there should also be some 100 or 150 columns. Such matrices can be aggregated to smaller dimensions.

It is fairly obvious that the only ultimate check on estimates obtained as described above is to confront them with figures derived from a full actual CIP of 1976. One other check, much less rigid than CIP comparison, gave highly satisfactory results. Dr. P. O'Farrell's industry estimates for the IDA, which included some fairly aggregated costs, should fit comfortably within the I–O structure appearing above as Table 1, if Table 1 is generally sound. The O'Farrell estimates are grossed up sample results, which cover 1976 outputs and costs of all IDA-aided firms. In fact, the O'Farrell estimates have been taken out of the nine manufacturing rows and columns of Table 1 with very little data adjustment required in a related study by the writer, for the IDA.

Valuation at Producer Prices

As implied above in the note on personal consumption expenditure, all values in Table 1 are at so-called *producer prices*. By implication imports are valued c.i.f. (cost, insurance and freight), which means their value at the point of having been unloaded. Producer price is the factory price of producing the item; thus it includes all costs of materials and other inputs and VAT, but it generally excludes large taxes such as the excise duty on drinks, tobacco and petrol. It also excludes subsidy payments on the item itself: the subsidy on

bread is part of the negative entry in the personal consumption column (20); it is not a negative entry in the food column (1).

It is to be noted that valuation at producer prices takes full account of total cost: the cost to the purchaser is broken down (so far as the information permits) into the four components listed above in the note on personal consumption with sometimes a further component for cost of transport. Each component has a row of the I-O table to carry it; thus the aggregate of each column is the full purchase cost of the inputs to that column.

Allocation of Employment

Quarterly CIP employment data for 1976 have been published in the *Irish Statistical Bulletin* for each of the Transportable Goods industries, which number 52 in all, before groupings. The *Economic Review and Outlook*, June 1977 has estimated employment data for 1976 in its Table 10, which shows number of persons at work in the main branches of economic activity at mid-April 1976. There are nine branches, one being agriculture, forestry and fishing having 243 000 persons at work.

A *summary description* of the allocation of employment is the following:

(a) The CIP data are averaged over four quarters to give an annual average and then grouped into I-O sectors. CSO help was obtained with employment in rubber and plastics, a part of "miscellaneous manufactures" so that employees of rubber and plastics could be put in the chemical group. The CIP data covered the same sectors as described in the Sector Outputs section above.

(b) Various minor amendments were made to relevant entries of Table 10; for example, some 3 000 Electricity/Gas/Water employees were allocated to construction (ESB capital work) and services (waterworks).

(c) Several sources were used to reallocate or breakdown Table 10 entries:

  (i) Industrial classification in the 1971 Census of Population gave proportions between numbers employed in various services.

  (ii) Periodic employment data published in the *Irish Statistical Bulletin,* e.g., CIE railroad employees, updated the 1971 Census figures.

  (iii) The CSO 1971 Census of Distribution, in conjunction with the more complete Census of Population coverage of people at work in Distribution, was compared with 1966 corresponding data and the trends projected to 1976.

The above lists are the main sources. The CSO has more detail than that appearing in Table 10 and may make available some sub-estimates, upon request.

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Appendix 2

Sources of the Capital Stock Estimates Shown in Table 1

FOR the nine manufacturing sectors the 1976 capital stock estimates shown in Table 1 were obtained in the way shown by Table A2.1 and its note (p. 65).

A similar process based on a paper by Henry (1972a) permitted 1976 estimates to be made for a further four sectors: solid fuel (11), stone etc. (12), construction (13), electricity etc. (14). Table A2.2 and its note describes how these estimates were made.

A Central Statistics Office estimate of gross fixed capital stock in Agriculture has been kindly supplied by Mr E. Embleton. At current replacement values, the order of magnitude at June 1976 was £950m., covering agricultural machinery, vehicles and farm buildings. This figure is not to be taken as exact. If we allow a further £50 million for forestry and fishing, the 1976 capital stock estimate for (10) agriculture, forestry and fishing, is £1000m.

A further two sectors had no Irish data available. Recourse was had to the UK Central Statistical Office publications (CSO, 1978, 1979) to get 1976 capital stock per man-year for transport, and for trade margin and services. The capital stock for trade margin and services excludes all dwellings. For transport and for trade margin and services, the writer chose two-thirds of the UK capital per man-year, as appropriate to Irish conditions. The following scheme sets out the estimates used for Table 1.

Sector	*Capital per man-year £ thousand at 1976 prices*	*Irish 1976 Employment thousand*	*Estimated Irish 1976 capital stock (1) × (2) £ million*
	(1)	(2)	(3)
Transport (15)	22.0	13.0	286.0
Trade margin and services (16)	11.0	423.0	4653.4

Comparison of Irish and UK Output and Capital per Man-Year

In view of the methods used to estimate the 1976 capital stock shown in Table 1, some check on their magnitudes is advisable. The UK CSO published results, referred to above, are an obvious source of capital stock comparison.

Table A2.1: *Projection of Capital Stock of Irish Manufacturing to 1976*

Manufacturing sector of 1976 I–O table		*Capital stock 1970 £m. at 1970 prices*	*Average employment 1970 thousand man-years*	*Cap/empl. 1970 (1)/(2) £1000 per man-year*	*Capital stock 1973 £m. at 1970 prices*	*Average employment 1973 thousand man-years*	*Cap/employ. 1973 (4)/(5) £1000 per man-year*	*Cap./employ. 1976 via (3) and (6) £1000 per man-year*	*Cap./employ. ratio 1976 at 1976 prices (7) × 2.405*	*Manufact. employ. 1976 thousand man-years*	*Estimated 1976 capital stock (gross) in manufacturing £m. current (8) × (9)*
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Food	(1)	224.5	43.41	5.17	271.4	42.78	6.34	7.51	18.06	40.575	732.8
Textiles	(2)	90.1	25.70	3.51	115.3	22.59	5.10	6.69	16.09	19.700	317.0
Clothing and footwear	(3)	28.1	24.01	1.17	30.6	22.13	1.38	1.59	3.82	16.275	62.2
Wood and furniture	(4)	22.5	7.96	2.83	27.7	8.10	3.42	4.01	9.64	7.600	73.3
Paper and printing	(5)	60.1	16.84	3.57	68.6	16.65	4.12	4.67	11.23	15.550	174.6
Chemicals	(6)	59.1	8.03	7.36	90.2	8.54	10.56	13.76	32.88	11.790	387.7
Struct. clay etc.	(7)	68.0	8.97	7.58	105.3	11.05	9.53	11.48	27.61	11.600	320.3
Metal etc.	(8)	116.7	38.72	3.01	172.9	41.37	4.18	5.35	12.87	43.150	555.3
Other manufact.	(9)	175.5	23.92	7.34	215.7	24.10	8.95	10.56	25.40	24.560	623.8
Total Manufact.		844.6	197.56		1097.7	197.31					3247.0

Note on Table A2.1:

The index 2.405 is price inflator to give 1976 values at 1976 prices; this is the overall implicit inflator, via *National Income and Expenditure* 1976 tables A13 + A14. Drink and tobacco are included in sector (9), other manufactures. The capital stock figures for 1970 and 1973 are taken from Vaughan (forthcoming). The 1976 estimate at 1970 prices is a linear extrapolation of 1970 and 1973 available data. The average employment data came from the CIP for 1970 and 1973, and the average of four calendar quarters for 1976, all these data having appeared in various issues of the *Irish Statistical Bulletin*.

Table A2.2: *Projection of capital stock of four Irish non-manufacturing sectors to 1976*

Sector of 1976 I–O table	*1976 cap. stock per man-year estimate: £000 at 1958 prices*	*Price inflator to give 1958 values at 1976 prices*	*1976 Estim. cap. stock man-year at 1976 prices £000 (1) × (2)*	*1976 employment 000 man-years*	*1976 Estim. cap. stock at 1976 prices £m. (3) × (4)*	
					Actual	*Adjusted*
	(1)	(2)	(3)	(4)	(5)	(6)
Solid fuel (11)	3.225	3.758	12.12	9.150	110.9	55.5
Stone, ores, gravel (12)	4.947		18.59	5.225	97.1	97.1
New + rep. construc. (13)	0.916		3.44	76.000	261.4	196.0
Electricity + gas (14)	19.355		72.74	10.790	784.9	784.9

Note on Table A2.2:

By using *National Income and Expenditure* values for total GFCF, current and constant prices, typically Tables A12 and A13, the following price changes emerge, all for £m.

1968 at current and at 1958 prices	$\frac{251.0}{187.3} = 1.340$
1970 at current and at 1968 prices	$\frac{356.3}{305.5} = 1.166$
1976 at current and at 1970 prices	$\frac{1034}{430} = 2.405$

The chain inflator is 3.758, given by $1.340 \times 1.166 \times 2.405$

For the four sectors shown above, the Henry (1972a) paper on production functions included mid-year capital stock per man-year, for 1960 and 1968. These two benchmarks were linearily extrapolated to give column (1) estimates of Table A2.2 above, at 1958 prices.

The "adjusted" entries of column (6) of that table have reasons, as follows. About half the man-years for solid fuel relate to farmers' peat, of negligible capital intensity. About one-third of the construction work employment occurs in small firms, of relatively low capital intensity. Column (5) figures derive from CIP data and thus might over-estimate the sector average. Column (6) entries are used in Table 1.

The electricity and gas estimate is reasonable, as will appear from the following. It is mostly ESB stock. Schedule D of the ESB annual report for year ending 31 March 1977 shows capital assets of £359 million at end of March 1976 and £410m. at end of March 1977 at current prices ("at cost") and *excluding* both accumulated depreciation and "work in progress". Thus some £380 m. is mid-1976 value of usable fixed assets "at cost" at current prices. To bring up to 1976 prices for all such assets might require doubling or more. Thus the estimate of £785 m. shown in Table A2.2 is of the right order of magnitude.

These are given at 1975 prices in Table 11.12 of (CSO 1978); they have been re-estimated at 1976 prices, in the results set out in Table A2.3 following, by applying to each industry group estimate (Table 11.12) the price inflator given by gross fixed capital formation 1976 at current prices, (Table 10.6) compared

with same at 1975 prices (Table 10.7). Only a single price inflator is available for manufacturing, namely, 1.1833; mining etc. had 1.1739, construction 1.2000, electricity etc. 1.1755 and agriculture etc. had 1.1736. The UK gross outputs are at 1976 prices.

Table A2.3: *UK/Ireland 1976 ratios for gross output per man-year and capital stock per man-year*

Group	*UK gross output per man-year £000*	*Irish gross output per man-year £000*	*Gross output ratio (1)/(2)*	*UK Capital stock per man-year £000*	*Irish capital stock per man-year £000*	*Capital stock ratio (4)/(5)*
	(1)	(2)	(3)	(4)	(5)	(6)
Total manufacture	15.85	17.79	0.89	16.06	17.02	0.94
Food (drink & tobacco)	27.48	31.54	0.87	19.81	18.06	1.10
Chemicals	42.40	27.23	1.56	48.65	32.88	1.48
Metal, eng. etc.	13.16	12.17	1.08	13.51	12.87	1.05
Rest of manufacture	11.34	13.32	0.85	11.75	16.49	0.71
Mining and quarrying	9.18	7.86	1.17	14.00	10.62	1.32
Construction	11.29	9.62	1.17	5.32	2.58	2.06
Elec., gas, water	22.12	17.76	1.25	134.37	72.74	1.85
Agr., forestry, fishing	15.63	4.29	3.64	29.41	4.12	7.14

Readers should note that the UK sector classifications are only approximations to the Irish ones; for example, the nearest UK equivalent to the Irish food sector is "food, drink and tobacco".

Columns (1) and (2) may first be compared. Agreement is satisfactory except for chemicals and agriculture etc., both of which have a much higher UK output per man-year. Of the remaining seven comparisons three show a higher level per man-year. We may recall that the Irish gross output levels are not very accurate because of lack of CIP data.

Column (3) shows the ratio UK gross output per man-year/Irish gross output per man-year. For Total Manufacture, the ratio is 0.89, satisfactorily close to unity. UK Chemicals has 1.56 times the Irish level; UK agriculture etc. has 3.64 times the Irish level, the latter partly due to the Irish output being net of almost all inter-farm transactions. The net output ratio for agriculture etc. is 2.24. The other seven ratios vary between 0.85 and 1.25, which is satisfactory.

Columns (4) and (5) show the comparison of capital stock per man-year. A huge difference between estimates occurs for electricity and gas, the UK ratio being £61 000 per man-year greater than the Irish ratio. This UK excess is to be expected, due to the large natural gas pipe system originating at points in the North Sea and the capital-intensive nuclear power stations. A further large difference occurs for agriculture, some £25 000 per man-year.

Column (6) shows the capital stock per man-year ratios. For Total Manufacture the ratio is 0.94. Omitting agriculture we find the ratio varying from 0.71 for rest of manufactures to 2.06 for construction. Electricity, of course, has a high ratio, at 1.85 because of North Sea gas. The Agriculture ratio, at 7.14, shows that UK agriculture etc. is seven times as capital-intensive per man-year as Irish agriculture.

Column (6) ratios become more meaningful when compared with column (3) ratios. The comparison implies that, for both countries, output per man-year within an industry group increases with capital stock per man-year. This hypothesis is plausible for eight of the nine groups shown in Table A2.3, since we find a column (3) ratio below unity matched by a similar ratio in column (6), and a like matching between ratios in excess of unity. The exception is food, which has a gross output ratio of 0.87 and a capital stock ratio of 1.10; it has been observed above that the UK group is in fact food, drink and tobacco, thus not strictly comparable with the Irish food group.

The general impression to be gained from the above comparison of Irish and UK gross output and capital stock per man-year is that the Irish estimates are satisfactory, if by that we mean fairly close to UK levels per man-year, or differing for known causes. The UK scale of operations is vast, in comparison with the Irish one, as the following employment figures (in thousands) show: (a) total manufacturing, UK 7 371, Ireland 191; (b) construction, UK 1 397, Ireland 76; (c) mining, UK 337, Ireland 14. In view of such differences in scale, one might accept larger contrasts than those of Table A2.3. There is admittedly a noticeable contrast for agriculture: the UK gross output per man-year is 3.64 times that of Ireland, and its capital stock per man-year is 7.14 times the Irish value.

Appendix 3

Preparation of an I–O Transactions Table Showing the Change between Irish 1968 and 1976 Economic Structures, at 1976 Prices

THIS appendix describes how a marginal I–O table was obtained, showing the estimated change of structure of the Irish economy between 1968 and 1976, at 1976 prices. The reasons for a marginal table, and its possible uses, are discussed above in Parts 5 and 6 of the main report. What follows below is intended only to explain clearly the steps followed and to show in four tables the figures used to compile the marginal table which appears as Table 6 of the main report. A West German example is now considered.

Analysis of Structural Change in the German Economy

The kind of I–O analysis described in the present appendix is commonplace and fairly obvious. As one fairly recent (1972) example, Stäglin and Wessels (1972) have given a clear exposition of how they analysed an 8-year change in the West German economy. The 8-year time-span was 1954 to 1962. There were 56 productive sectors, 7 final demand vectors and 5 primary inputs. In order to break down the 8-year span into two 4-year spans, a 1958 transactions table was used, as well as those of 1954 and 1962.

The 1954 and 1958 tables were first deflated so as to be at 1962 prices. Generally, only one deflator per row could be developed. The change between 1954 (at 1962 prices) and 1962 was expressed in two parts (i) that due to final demand change, (ii) that due to inter-industry structural change, which includes changes in technology and input substitution as two major factors.

The Analysis of Irish 1968 and 1976 Data

It is clear that in order to calculate and define the change in two parts, as Stäglin and Wessels did, one must have precise data. The Irish data are not very precise, as is explained in the last part of this Appendix. So all that is aimed at in the present analysis is the association of a marginal inter-industry Irish structure with a marginal final demand structure (for 1968 to 1976), and the usual Leontief inverse, primary input content of final demand and so on. Quite a large research project would be required to make a thorough marginal analysis, with perhaps 40 to 60 sectors.

A 1968 Transactions Table to Match 1976 Table 1

Table A3.1 gives 17-sector 1968 transactions approximating the 1976 Table 1 transactions, if the latter sectors (17) to (19), all artificial, are combined into a single sector, and the two capital formation columns are combined.

The basic 1968 source was the 33-sector table given as Appendix 4.1 of the Copeland and Henry report (1975), with original primary input rows of that table being used for 17-sector aggregation. The following main operations were performed on the 33-sector 1968 table, some operations overlapping others:

(1) The 33 sectors were aggregated to 17 in a fairly obvious way, with drink and tobacco put into 17-sector other manufacturing.
(2) £122m. of intra-industry transactions was removed from agriculture.
(3) The hosiery and knitting activity was transferred from 33-sector clothing to 17-sector textiles.
(4) The fellmongery and tanning was transferred from 33-sector clothing to 17-sector other manufacturing.
(5) Plastic products was transferred from 33-sector other manufacturing to 17-sector chemicals.

The objective of these operations was to get a 1968 sectoring matching as closely as possible the 1976 structure chosen by the IDA as their core of nine manufacturing sectors. The original 1968 33-sector had the ten manufacturing sectors usually used by this writer for 33-sector analysis.

In order to perform operations 3, 4, 5, it was necessary to use 1969 data from the CSO 92-sector table (CSO 1978). Data for 1968 were not available directly. Sectors 39, 46 and 54 were used as proxy for 1968 hosiery, fellmongery, plastics, respectively. The 1969 detail gave both a row of output and a column of input for each of these activities, in a form suitable for working within the 33-sector and 17-sector frameworks.

Inflating Table A3.1 so as to be at 1976 Prices

Stage 1: Suitable Price Inflators for 1968 Primary Inputs

The price inflation of Table A3.1 has to be done in four stages, as will appear below. The first stage requires suitable inflators for 1968 primary inputs. These inflators are set out in Table A3.2, with the numbers used to obtain them. At this point it must be made clear that the limited data available are not sufficient to do a good job of inflating 1968 primary inputs to be at 1976 prices. One would require a specific inflator for each primary input to each sector, to improve precision.

The basic data sources are tables A3 to A6 of *National Income and Expenditure* 1973 and 1976, and Table 3A of the wholesale price index number results in December 1977 issue of the *Irish Statistical Bulletin.*

There are available four inflators for imports, one for subsidies, one for taxes on expenditure, seven for Gross Domestic Product (GDP) at factor cost (wages, salaries, profits, depreciation, all combined) according to five major sectors and two combinations of these. The subsidy, tax and GDP inflators are all from national accounts; wages is not deflated separately from gross profits. The lack of detailed data is apparent. The inflators numbered (1) to (8) in Table A3.2 are the result of two time intervals, 1968–70 and 1970–76.

Stage 2: Inflating 1968 Primary Inputs

The inflators of Table A3.2 are now applied to Table A3.1 primary inputs to give the latter at 1976 prices. This is shown in the first 10 columns of Table A3.3.

In order to go on to Stage 3, it is necessary to find the aggregate extra cost of primary inputs in each sector, and this is given in Column (13) of Table A3.3.

Columns (14) to (20) of Table A3.3 will be commented on later in this Appendix.

Stage 3: Computing Sector Inflators from Primary Input

The primary input extra costs given in column (13) of Table A3.3 are now used, in combination with direct input coefficients of Table A3.1, to calculate consistent inflators of total input (same as total output) for each sector. This I–O basic formula may be stated:

$$\Delta p' = \Delta\pi' \, (\mathrm{I}-\mathrm{A})^{-1}$$

The row vector $\Delta p'$ is the set of sector price inflators based on 1.0 for each sector for 1968, and showing the *increase* above 1.0 to be applied for 1976 pricing. The row vector $\Delta\pi$ is the column (13) values of Table A3.3, each divided by Total Input values of Table A3.1, for 17 columns only. The $(\mathrm{I}-\mathrm{A})^{-1}$ is the 17-sector Leontief inverse of the A-matrix of direct input coefficients derived from Table A3.1, these coefficients being the transactions values divided by total inputs, for 17 columns only.

The numerical estimates of Δp^1, with unity added to each, appear as column (20) of Table A3.3. At typical values of about 2.6 they show how severe inflation was, over the 1968-76 period.

Stage 4: Applications of Sector Inflators to give a Complete Set of 1968 Transactions at 1976 Prices

Application of Table A3.3 column (20) inflators, row by row, to the first 17 rows of Table A3.1, gives the first 17 rows of Table A3.4. This latter table is the

1976-priced transactions of Table A3.1. The rest of the I–O transactions, except total inputs, can be copied directly from Table A3.3 columns (3), (5), (7) and so on. We now add up each column, to get Total Input, which should equal Total Output corresponding, for sectors (1) to (17). Very small rounding errors have been corrected for.

Stage 5: Get Marginal Table.

(i) *Breakdown of inflated GDP between wages and profits*

In order to make the repriced 1968 table as comparable as possible with 1976, *for marginal purposes,* the GDP has been broken down within each column according to 1976 proportions shown in Table 1 for wages etc. versus profits etc. This breakdown is shown in columns (14) and (15) of Table A3.3, before entry in Table A3.4.

(ii) *1968 employment at 1976 output levels*

Column (16) of Table A3.3 shows GDP per man-year 1976 results derived from the employment and GDP data of Table 1. Within Table A3.3 these column (16) data are divided into column (10) values to get column (17) results, which are the 1968 employment at 1976 output per man-year levels. These column (17) results have been copied into the employment row of Table A3.4.

(iii) *1968 capital stock at 1976 per man-year rates*

Table 1 capital stock per man-year ratios appear as column (18) of Table A3.3. When multiplied by column (17) employment estimates, they yield the capital stock values appearing in column (19) of Table A3.3. This column is copied into the Gross Capital Stock row of Table A3.4.

(iv) *Table 6 17–sector marginal transactions*

Subtraction of Table A3.4 from Table 1 yields the marginal transactions appearing as Table 6 of the main report. It should now be clear from discussion in the present appendix that Table 6 has all transactions at 1976 prices. The gross capital stock is at 1976 prices and 1976 per man-year levels. The employment within each sector is in 1976 proportion to GDP originating within that sector. The breakdown of GDP between wages etc. and profits etc. within each sector is in 1976 proportions.

It is therefore apparent that, subject to data limitations and errors, we have a genuine 1976 marginal table, with a 1976 production function applying to each sector. It may be said here that Table 6 is generally satisfactory, except for clothing and solid fuel. Part 5 of the main report analyses Table 6 in some detail.

Data Deficiencies Inherent in Tables A4.4 and 6

Any data fault in either Table A4.4 or Table 1 will cause a corresponding fault in Table 6. Two major limitations are the following (if we ignore imperfect matching of 1968 17-sector Table A3.1 with 1976 Table 1 collapsed to 17 sectors):

(1) The 1976 transactions are not as precise as if based on CIP data for manufacturing. We do not know what distortions occur in rows or columns on this account.

(2) The price inflators of Table A3.1 primary inputs are not available at sectoral level, which is how they should be to give precise total output inflators.

We may, therefore, be prepared to find some unusable sectors in Table 6.

Table A3.1: *Irish 1968 17-sector transactions matching those of 1976 £m. at 1968 prices*

	Food	*Textiles*	*Clothing*	*Wood*	*Paper*	*Chemicals*	*Clay*	*Metal*	*Other man.*	*Ag./for./ fish.*	*Solid fuel*	*Sectors*	*Stone*	*Constr.*	*Electricity*	*Transport*	*Trade*	*Artificial Sector n.e.s.*	*Person*	*Government*	*GFCF + stock*	*Exports*	*Total Output*	*Sectors*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)		(12)	(13)	(14)	(15)	(16)	(17)						
Food(1)	34.22		0.28			0.43			2.85	33.86		(1)				0.23	2.74		132.06		4.61	121.03	332.31	(1)
Textiles(2)		14.19	3.19	0.33	0.01	0.01	0.04	0.07	0.36	0.50		(2)		0.57			0.89	0.35	23.44		2.67	30.38	77.00	(2)
Clothing + footwear (3)				0.02		0.06		0.05				(3)					0.54		20.20		0.40	17.89	39.16	(3)
Wood + furniture (4)			0.07	3.13	0.03	0.01	0.03	0.20	0.15		0.01	(4)		2.28			0.20	2.27	6.53		2.89	2.96	20.76	(4)
Paper + print (5)		0.09	0.38	0.01	9.35		0.29	0.09	0.40			(5)				0.07	12.74	7.18	5.77		1.35	7.45	45.17	(5)
Chem. + plast. (6)	2.40	0.19	0.20	0.46	0.39	5.35	0.09	2.58		14.42		(6)	0.07	2.95			3.21	0.87	9.79		3.53	14.16	60.66	(6)
Struct. clay (7)		0.02		0.03			3.01	0.49		0.02		(7)	0.15	11.37	0.02		0.35	3.62	3.37		1.18	6.64	30.27	(7)
Metal + engineering (8)			0.63	0.24	0.34	0.17	0.22	0.68	0.11	4.75	0.04	(8)		9.28	0.01	8.96	3.54	25.78	32.83		27.85	37.23	152.66	(8)
Other manufacturing (9)	0.23	0.12	1.11	0.13	0.45		0.81	3.21	6.36	1.77	0.14	(9)	0.12	1.12	2.40	0.84	4.52	8.43	26.87		0.60	60.99	120.22	(9)
Ag./for./fish.(10)	184.09	0.26		0.03	0.37				3.77	1.37*		(10)				0.23	0.85		46.75	0.63	11.24	54.22	303.81	(10)
Solid fuel (11)	0.26		0.01		0.05	0.02	0.10	0.04	0.11			(11)		0.04	5.19		2.31		5.70		0.60	0.68	15.11	(11)
Stone/ores/gravel(12)	0.04	0.01	0.01	0.01		0.07	2.13	0.03	0.02	1.27		(12)	0.12	6.15	0.01						0.23	9.27	19.37	(12)
New + repair constr. (13)												(13)	0.38	29.33		2.34	10.64			15.62	143.58		201.89	(13)
Electr. + townsgas (14)	2.04	0.80	0.28	0.24	0.70	0.77	1.01	1.28	0.83	1.15	0.16	(14)	0.59	0.70	0.89	0.08	5.42		25.31			0.05	42.30	(14)
Transport(15)								0.11		3.70	0.29	(15)		4.50	0.08	0.96	14.63	4.00	15.30		5.40	40.42	89.39	(15)
Trade(16)	4.05	0.40		0.04	0.16	0.13	0.37	0.89	0.91	20.31	0.48	(16)	0.13	7.38	1.12	2.60	58.03	78.61	317.31	145.78	5.73	46.76	691.19	(16)
Art. sect. n.e.s. (17)	34.35	11.63	4.13	2.40	6.97	13.51	5.04	16.02	20.42	0.08	1.63	(17)	3.78	12.67	2.86	4.46	30.23		0.81		-15.98	14.44	169.45	(17)
Sectors	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)		(12)	(13)	(14)	(15)	(16)	(17)	Pers.	Govt.	GFCF	Exports	Total	
(a) Imports	39.97	23.59	13.33	5.88	6.88	21.97	3.30	74.88	50.13	12.63	0.11	Imp	1.26	27.16	2.46	17.83	29.38	31.72	113.00	1.30	82.75	9.15	568.68	Imp
(b) Indirect tax	0.75	0.06	0.03	0.06	0.09	0.06	0.18	7.03	0.15	12.93	0.21	Tax	0.24	0.81	0.16	4.41	51.34	9.17	126.01		6.77	16.96	237.42	Tax
(c) Less subsidies	-22.06									-9.38		Sub						-2.55	-13.26			-12.26	-59.51	Sub
(d) Wages + salaries	35.61	18.22	11.82	5.85	14.65	9.22	8.37	33.09	20.56	21.09	5.50	Wag.	4.30	74.05	12.33	33.58	307.41					9.60	625.25	Wag
(e) Profits + Depreciation	16.36	7.42	3.69	1.90	4.73	8.88	5.28	11.92	13.09	183.34	6.54	Pro	8.23	11.53	14.77	12.80	152.22			5.50	-16.33	48.40	500.27	Pro
(a) to (e) *total primary*	70.63	49.29	28.87	13.69	26.35	40.13	17.13	126.92	83.93	220.61	12.36	Prim	14.03	113.55	29.72	68.62	540.35	38.34	225.75	6.80	73.19	71.85	1872.11	Prim
total input	332.31	77.00	39.16	20.76	45.17	60.66	30.27	152.66	120.22	303.81	15.11	Total	19.37	201.89	42.30	89.39	691.19	169.45	897.79	168.83	269.07	536.42		Total
Sectors	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)		(12)	(13)	(14)	(15)	(16)	(17)	Pers	Govt.	GFCF	Exports	Total	

*£122 m intra-industry omitted from (10) Agriculture

Table A3.2: *Inflators for the 1968 Irish primary inputs*

Primary input	*Inflator 1968 to 1970 (1)*	*Inflator 1970 to 1976 (2)*	*Resultant inflator 1968-76 (1)×(2) (3)*
GDP at factor cost:			
(Wages, profits, depreciation)			
(1) Agriculture etc.	231.5/205.3 = 1.1114	670/291 = 2.3024	2.5589
(2) Industry	449.4/374.6 = 1.1997	1317/628 = 2.0971	2.5159
(3) Distribution transport and communication	225.4/190.9 = 1.1807	666/313 = 2.1278	2.5123
(4) Public admin. etc.	78.1/60.4 = 1.2930	283/114 = 2.4825	3.2099
(5) Other domestic	319.3/256.3 = 1.2458	1087/434 = 2.5046	3.1202
(Total GDP at factor cost)	(1303.7/1090.5 = 1.1955)	(3910/1723 = 2.2693)	(2.7129)
(3) + (4) + (5)	622.8/507.6 = 1.2270	2036/861 = 2.3647	2.9015
(6) *Taxes on expenditure*	295.3/236.7 = 1.2476	889/401 = 2.2170	2.7659
(7) *Subsidies*	72.0/58.8 = 1.2245	307/116 = 2.6466	3.2408
(8) *Imports, total:*	627.4/563.3 = 1.1138	2465/960 = 2.5677	2.8599
of which:			
(9) Imports for personal consumption	358.4/137.1 =		2.6142
(10) Imported materials for further production	389.9/136.2 =		2.8627
(11) Imported capital goods	341.2/140.9 =		2.4216

Note: The col. (1) inflator is from 1968 items at two prices; the col. (2) inflator is from 1976 items at two prices.

Sources: GDP, Taxes, Subsidies, Total imports:

Tables A3 to A6 of *National Income and Expenditure* 1973 and 1976.

Imports' three subdivisions:

Table 3A of "Wholesale Price Index Numbers" in December 1977 issue of *Irish Statistical Bulletin*

Table A3.3: *Irish 1968 17-sector primary inputs and total outputs repriced at 1976 prices, with employment and capital stock at 1976 intensities.*

Input output sector	*Imports*			*Indirect Taxes*		*Subsidies*		*Wages, profits, deprec.*			*Total Primary*			*Breakdown of (10) according to 1976 proport.*		*1976 Wages + Profits + Deprec. per man-year £000*	*1968 Employ. at 1976 rates (10) ÷ (16) '000*	*1976 Cap. per man-year £000*	*1968 Capital stock at 1976 rates (18) × (17) £m.*	*I-O 1968 sector inflator computed from (13)*
	1968 Original £m.	*Inflator 1968-76*	*Repriced £m*	*1968 Original £m.*	*Repriced ×2.7659 £m.*	*1968 Original £m.*	*Repriced ×3.2408 £m.*	*1968 Original £m.*	*Inflator 1968-76*	*Repriced £m.*	*1968 Original (1)+(4)+(6)+(8)*	*Repriced (3)+(5)+(7)+(10)*	*Difference (12)–(11) £m.*		*Wages etc.*	*Profits + Deprec.*					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)		(14)	(15)	(16)	(17)	(18)	(19)	(20)
Food	(1) 39.97	2.8627	114.42	0.75	2.07	-22.06	-71.49	51.97	2.5159	130.75	70.63	175.75	105.12	(1)	89.55	41.20	5.112	25.577	18.06	461.9	2.592090
Textiles	(2) 23.59	2.8627	67.53	0.06	0.17			25.64	2.5159	64.51	49.29	132.21	82.92	(2)	54.28	10.23	3.822	16.879	16.09	271.6	2.697194
Clothing	(3) 13.33	2.8627	38.16	0.03	0.08			15.51	2.5159	39.02	28.87	77.26	48.39	(3)	35.06	3.96	2.407	16.211	3.82	61.9	2.684570
Wood	(4) 5.88	2.8627	16.83	0.06	0.17			7.75	2.5159	19.50	13.69	36.50	22.81	(4)	13.12	6.38	4.329	4.505	9.64	43.4	2.679051
Paper	(5) 6.88	2.8627	19.70	0.09	0.25			19.38	2.5159	48.76	26.35	68.71	42.36	(5)	40.98	7.78	3.955	12.329	11.23	138.5	2.640540
Chemicals	(6) 21.97	2.8627	62.89	0.06	0.17			18.10	2.5159	45.54	40.13	108.60	68.47	(6)	18.49	27.05	9.791	4.651	32.88	152.9	2.717568
Clay	(7) 3.30	2.8627	9.45	0.18	0.50			13.65	2.5159	34.34	17.13	44.29	27.16	(7)	23.92	10.42	4.874	7.046	27.61	194.5	2.628137
Metal	(8) 74.88	2.4216	181.33	7.03	19.44			45.01	2.5159	113.24	126.92	314.01	187.09	(8)	76.04	37.20	4.924	22.998	12.87	296.0	2.518473
Other	(9) 50.13	2.8627	143.51	0.15	0.41			33.65	2.5159	84.66	83.93	228.58	144.65	(9)	41.68	42.98	7.610	11.125	25.40	282.6	2.722529
Agriculture	(10) 12.63	2.8627	36.16	12.93	35.76	-9.38	-30.40	204.43	2.5589	523.12	220.61	564.64	344.03	(10)	39.02	484.10	2.757	189.742	4.12	781.7	2.592134
Solid	(11) 0.11	2.8627	0.31	0.21	0.58			12.04	2.5159	30.29	12.36	31.18	18.82	(11)	18.76	11.53	2.765	10.955	6.07	66.5	2.563910
Stone	(12) 1.26	2.8627	3.61	0.24	0.66			12.53	2.5159	31.52	14.03	35.79	21.76	(12)	16.67	14.85	8.163	3.861	18.58	71.7	2.599794
Construction	(13) 27.16	2.8627	77.75	0.81	2.24			85.58	2.5159	215.31	113.55	295.30	181.75	(13)	192.16	23.15	4.436	48.537	2.58	125.2	2.625643
Electricity	(14) 2.46	2.8627	7.04	0.16	0.44			27.10	2.5159	68.18	29.72	75.66	45.94	(14)	29.02	39.16	8.169	8.346	72.74	607.1	2.582000
Transport	(15) 17.83	2.8627	51.04	4.41	12.20			46.38	2.5123	116.52	68.62	179.76	111.14	(15)	91.36	25.16	11.929	9.768	22.00	214.9	2.624627
Trade	(16) 29.38	2.8627	84.11	51.34	142.00			459.63	2.9015	1333.62	540.35	1559.73	1019.38	(16)	1099.30	234.32	3.291	405.232	11.00	4457.6	2.855153
Artificial	(17) 31.72	2.8627	90.80	9.17	25.36	-2.55	-8.26				38.34	107.90	69.56	(17)							2.765312
Personal expenditure	113.00	2.6142	295.40	126.01	348.53	-13.26	-42.97				225.75	600.96	375.21	Pers.							
Govt. expend.	1.30	2.6142	3.40					5.50	3.2099	17.65	6.80	21.05	14.25	Govt.		17.65					
Capital form.	82.75	2.4216	200.39	6.77	18.73			-16.33	2.7129	-44.30	73.19	174.82	101.63	Cap		-44.30					
Exports	9.15	2.8627	26.19	16.96	46.91	-12.26	-39.73	58.00	2.7129	157.35	71.85	190.72	118.87	Exp		157.35					
Total	568.68		1530.02	237.42	656.67	-59.51	-192.85	1125.52		3029.58	1872.11	5023.42	3151.31		1879.41	1150.17		797.762		8228.0	

Table A3.4: *Irish 1968 17-sector transactions at 1976 prices; with wages, profits, employment, capital stock; all in average 1976 proportions to GDP at factor cost £m., producer prices.*

Output / *Input*		*Food* (1)	*Textiles* (2)	*Clothing* (3)	*Wood* (4)	*Paper* (5)	*Chemicals* (6)	*Clay* (7)	*Metal* (8)	*Other manuf.* (9)	*Agric-culture* (10)	*Solid fuel* (11)	*Sectors*	*Stone* (12)	*Constr uction* (13)	*Electricity* (14)	*Transport* (15)	*Trade* (16)	*Artificial* (17)	*Personal*	*Govern-ment*	*Capital form*	*Exports*	*Total Output*	*Sectors*
Food	(1)	88.70		0.73			1.11			7.39	87.77		(1)				0.60	7.10		342.31		11.95	313.72	861.38	(1)
Textiles	(2)		38.27	8.60	0.89	0.03	0.03	0.11	0.19	0.97	1.35		(2)		1.54			2.40	0.94	63.22		7.20	81.94	207.08	(2)
Clothing	(3)				0.05		0.16		0.13				(3)					1.45		54.23		1.07	48.04	105.13	(3)
Wood	(4)			0.19	8.39	0.08	0.03	0.08	0.54	0.40		0.03	(4)		6.11			0.54	6.08	17.48		7.74	7.93	55.62	(4)
Paper	(5)		0.24	1.00	0.03	24.69		0.77	0.24	1.06			(5)				0.18	33.64	18.96	15.23		3.56	19.67	119.27	(5)
Chemicals	(6)	6.52	0.52	0.54	1.25	1.06	14.54	0.24	7.01		39.19		(6)	0.19	8.02			8.72	2.36	26.62		9.59	38.48	104.85	(6)
Clay	(7)		0.05		0.08			7.91	1.29		0.05		(7)	0.39	29.88	0.05		0.92	9.51	8.87		3.10	17.45	79.55	(7)
Metal	(8)			1.59	0.60	0.86	0.43	0.55	1.71	0.28	11.96	0.10	(8)		23.37	0.03	22.57	8.92	64.93	82.67		70.14	93.76	384.47	(8)
Other manuf.	(9)	0.63	0.33	3.02	0.35	1.23		2.21	8.74	17.32	4.82	0.38	(9)	0.33	3.05	6.53	2.29	12.31	22.95	73.13		1.63	166.05	327.30	(9)
Agriculture	(10)	477.19	0.67		0.08	0.96				9.77	3.55		(10)				0.60	2.20		121.18	1.63	29.14	140.55	787.52	(10)
Solid fuel	(11)	0.67		0.03		0.13	0.05	0.26	0.10	0.28			(11)		0.10	13.31		5.92		14.61		1.54	1.74	38.74	(11)
Sectors		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	Sector	(12)	(13)	(14)	(15)	(16)	(17)	Pers.	Gov.	Cap.	Exp.	Total	Sectors
Stone	(12)	0.10	0.03	0.03	0.03		0.18	5.54	0.08	0.05	3.30		(12)	0.31	15.98	0.03						0.60	24.10	50.36	(12)
Construction	(13)												(13)	1.00	77.01		6.14	27.94			41.01	376.99		530.09	(13)
Electricity	(14)	5.27	2.07	0.72	0.62	1.81	1.99	2.61	3.30	2.14	2.97	0.41	(14)	1.52	1.81	2.30	0.21	13.99		65.35			0.13	109.22	(14)
Transport	(15)								0.29		9.71	0.76	(15)		11.81	0.21	2.52	38.40	10.50	40.16		14.17	106.09	234.62	(15)
Trade	(16)	11.56	1.14		0.11	0.46	0.37	1.06	2.54	2.60	57.99	1.37	(16)	0.37	21.07	3.20	7.42	165.68	224.44	905.98	416.22	16.36	133.51	1973.45	(16)
Artificial	(17)	94.99	32.15	11.42	6.64	19.25	37.36	13.92	44.30	56.46	0.22	4.51	(17)	10.46	35.04	7.90	12.33	83.59		2.30		-44.19	39.93	468.58	(17)
Imports		114.42	67.53	38.16	16.83	19.70	62.89	9.45	181.33	143.51	36.16	0.31	Imp.	3.61	77.75	7.04	51.04	84.11	90.80	295.40	3.40	200.39	26.19	1530.02	Imp
Indirect taxes		2.07	0.17	0.08	0.17	0.25	0.17	0.50	19.44	0.41	35.76	0.58	Tax	0.66	2.24	0.44	12.20	142.00	25.37	348.52		18.73	46.91	656.67	Tax
Less subsidies		-71.49									-30.40		Sub						-8.26	-42.97			-39.73	-192.85	Sub
Wages + salaries		89.55	54.28	35.06	13.12	40.98	18.49	23.92	76.04	41.68	39.02	18.76	Wages	16.67	192.16	29.02	91.36	1099.30						1879.41	Wages
Profits + deprec.		41.20	10.23	3.06	6.38	7.78	27.05	10.42	37.20	42.98	484.10	11.53	Prof.	14.85	23.15	39.16	25.16	234.32			17.65	-44.30	157.35	1150.17	Prof.
Total input		861.38	207.68	105.13	55.62	119.27	164.85	79.55	384.47	327.30	787.52	38.74	Total	50.36	530.09	109.22	234.62	1973.45	468.58	2434.29	479.91	685.41	1423.81		Total

Sectors	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	Sectors	(12)	(13)	(14)	(15)	(16)	(17)	Pers	Gov.	Cap.	Exp.	Total	Sectors
Employment (thousand man-years)	25.58	16.88	16.21	4.50	12.33	4.65	70.05	23.00	11.13	189.74	10.96	Empl	3.86	48.54	8.35	9.77	405.23						797.78	Empl
Gross capital stock (£million)	461.9	271.6	61.9	43.4	138.5	152.9	194.5	296.0	282.6	781.7	66.5	Cap	71.7	125.2	607.1	214.9	4457.6						8228.0	Cap.

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