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IRISH 1990 INPUT-OUTPUT 13-SECTOR
APPROXIMATE STRUCTURES, WITH DERIVED
MULTIPLIERS FOR EMPLOYMENT, GNP, AND
IMPORTS

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1. INTRODUCTION AND BACKGROUND

The input-output (I-O) tables presented below for Irish 1990 economic activities are unofficial approximate estimates made by the writer. Previous similar unofficial tabulations were presented in Henry (1983a and b). The most recent official I-O tables are for 1985, published by the Central Statistics Office (1992) after heavy involvement of the writer in the process of compilation. The main purpose of this present report is to provide some usable results for 1990, as a five-year update of the 41-sector Central Statistics Office (CSO) 1985 official figures, before any possible CSO release for 1990. The 1990 results given below comprise a 13-sector inter-industry structure, much more aggregated than the 1985 41-sector structure used by CSO (and having 39 real sectors and 2 nullsectors).

More detailed 1990 results can be provided by Henry, for multipliers and impact analysis, as consultancy work for business. The arrangements for this can be made with the Secretary of the ESRI, Mr John Roughan. Part 5 below offers some examples of impact analysis by Henry for business interests, to date. Recommended reading in this context is the Deane and Henry paper appearing in the December 1993 issues of the *Irish Banking Review*.

The writer is grateful for generous cooperation by Mr Mick Lucey of the CSO, and his staff, by way of non-confidential data for 1990. Besides official publications (to be mentioned below), there are several sets of National Account's data at 25-sector level (R25) used as background by CSO for their official publications including tables for EUROSTAT. These 1990 data, kindly provided by Mr Lucey, have greatly improved the quality of the 1990 I-O tabulations, aggregated to 13 sectors for the tables following. These results are *approximations* of any official 1990 I-O tables which CSO might publish, in due course.

A Summary of Main 1990 Data Sources

Table 1 below comprises the final aggregated 13-sector 1990 transactions' data-set used as basis for average annual cost and multiplier calculations. Appendix 1 below shows how Table 1 aggregates and re-arranges the 41-sector structure of the CSO 1985 tables.

To reach Table 1 results, many data-sets were harmonised and fitted together. Indicative sources are the following (detailed in the References section below):

- (1) *National Income and Expenditure 1992*, compiled by CSO, July 1993. This gave all the control totals for 1990 National Accounting aspects, and much detail.
- (2) *Trade Statistics of Ireland, December 1991*, also by CSO, used for merchandise import and export detail.
- (3) *Census of Industrial Production 1990*, by CSO, July 1993. This covers industrial outputs in detail, and input costs in grouped descriptions.
- (4) Various CSO releases and reports, such as that on Agriculture, covering 1987-1991, in the September 1992 issues of the *Statistical Bulletin*.
- (5) Further taxation details, in the *Statistical Report of the Revenue Commissioners* for year ended 31 December 1991.
- (6) Annual reports, such as the C oras Iompair  ireann Group Annual Report for 1990.
- (7) Unpublished CSO material, including a 48-sector background version of the 1985 published I-O tables.
- (8) In parallel with the financial data, a listing of 1990 employment, derived from *Labour Force Survey 1990*, with an R25 version of background 1991 employment details.

Subject-Matter of Parts 2 to 5, Following

Part 2 below describes the main features of Table 1, which presents 13-sector 1990 Irish transaction values in   million at basic prices. with a bottom row of numbers employed in different sectors.

Part 3 looks at Table 2 average annual 1990 input cost structures and direct employment intensities, per £ million total receipts (same as aggregate input costs).

Part 4 considers "direct-plus-indirect" multiplier aspects of input costs and employment absorbed by (or implied by) £1 million-worth of "final output" of each sector of the economic system of Ireland in 1990, as portrayed by Tables 3 to 5, which are derived from Table 2. Final output, also referred to as "final demand", comprises purchases by households and Government, and output taken by exports, by stock increases, and by fixed capital formation. All of these destinations or purchases of sector outputs comprise the final outcome of the 1990 Irish economic activity.

Part 5 summarises some impact analyses by the writer, to date, illustrating how the detailed system described in Part 4 can be used, to estimate income and employment impacts of the demand for individual or grouped sector outputs.

2. DESCRIPTION OF 1990 TRANSACTIONS

Table 1 sets out the 1990 13-sector I-O transactions table, with a matching row of employment for each of 12 sectors. The transactions table comprises two sets of data, one complete set being the rows across, down to and including the row "Total Input". The second set is a reworked version of the group of rows above, denoted "Other Inputs", with some additions and changes in columns (14) to (17), including revised "Total Input" values.

Employment

This single row may well be mentioned first, as fairly uncomplicated. The aggregate of 1,126,000 persons, and part of the sectoral detail, comes from the *Labour Force Survey 1990* results from April 1990. Where possible, *quarterly average* employment data were used, from CSO Industrial reports in the *Statistical Bulletin*. In principle, the data for each of the

12 sectors of relevance are "annual average". Sector (13) is "artificial", comprising business costs not detailed by source for individual sectors of purchase, so this sector has no employment in its input column (13).

Various difficulties occur, in detailed matching of employment with, say, the 39 real sectors of the CSO 1985 I-O tables. However, all available relevant data were used for the estimation, including a 25-sector (ESA R25) listing of 1991 Labour Force background data, by courtesy of Dr G. Hughes of ESRI.

Within the 12 sectors, three show relatively large 1990 numbers employed: the Agriculture (2) group shows some 165,000; the Market Services (11) group shows about 395,000; and the Non-Market Services (12) groups shows 211,000.

Table 1 Transactions Rows down to "Total Input"

The transactions are "at Basic Prices" in IR£ million. The valuation at basic prices means in effect "at farm or factory gate", without any product taxes added and including full receipts by farmers for subsidised produce. Thus, to show full purchase cost of items such as Beverages by Households, part of the cost falls in the Indirect Tax row of column (14), part in the Market-Services (11) row, and parts in the Food, Beverages, Tobacco (3) row and the Merchandise Imports row.

As mentioned above, sector (13) is artificial; its row (13) gives input costs not detailed by source, while its column (13) gives the estimated sectoral make-up of some £2,596m., its row output-aggregate.

The rows (1) to (12) distribute outputs (at basic prices) of 12 domestic economic sectors to some 17 purchasing sectors or destinations, in the columns numbered (1) to (17). The sectoral connection of the 12 sectors with the 39 real sectors of the CSO 1985 I-O "Table A1", is detailed in Appendix 1 below. Table 1 is an aggregate 1990 version of the

1985 "Table A1" in CSO (1992a); in the latter the "artificial" sector components were fully dissolved by source, meaning in effect that Table 1 column (13) would be dissolved among columns (1) to (12), to use up row (13) amount in each column, to complete the match with 1985 "Table A1".

In parallel with the 1985 "Table A1", Table 1 row (2) to column (2) includes £643m. of crops consumed "on farm"; row (1) to column (1) includes £94m. for estimated value of electricity "network losses". Readers are invited to look at the larger entries for themselves.

A useful grouping of the output of rows (1) to (13) is to take aggregates of columns (1) to (13), denoted "Total Intermediate", and aggregates of columns (14) to (17), denoted "Total Final", demand or output. These row sub-aggregates are shown as the right-hand last two columns of Table 1. Their sum gives the "Total Output", which for rows (1) to (13) is domestic, without any imported goods included.

From the point of view of producers selling their output, rows (1) to (12) mean receipts for sales (at basic prices). We now consider costs of production, represented by columns (1) to (13), first of all. The full cost for each sector is "Total Input", exactly matching "Total Output" of the corresponding sector row. For example, sector (1) Energy has both Total Output and Total Input of value £1,490.43m. Part of the costs comprises rows (1) to (13) considered already, and aggregated in the row "Total Domestic".

The rest of the costs comprises the rows headed "Other Inputs". These cover costs of Merchandise and Invisible Imports, and row components of Gross Domestic Product (GDP), namely Indirect Taxes, negative Subsidies, Total Labour Costs, Gross Profits (including depreciation allowance).

The Gross Profits row has an aggregate value £10,904.8m., which includes £2,585.4m. depreciation allowance. In reaching this aggregate, £529.3m. "Adjustment for stock

appreciation" was distributed along the row. An amount £1,033.8m. "Adjustment for financial services" had to be removed from the row and relocated in the Market Services (11) row. This removal includes moving £246m. of "Interest payable" by Agriculture for 1990 from the Gross Profits row of column (2) to be relocated in the Market Services (11) row of column (2). This £246m. of interest payable by Agriculture for 1990 activity is quoted in CSO (1992c.).

To match the 1990 National Accounts' GDP aggregate shown in CSO (1993b), it is necessary to include entries right across each row through column (17). The Indirect Taxes include: (a) overhead taxes such as Rates, (b) taxes on products, such as Value-Added-Tax (VAT), taxes on alcohol and petrol. The row aggregates for the two kinds of Imports also match the required 1990 "Imports of Goods and Services " (£14,514m.).

These "Other Inputs" costs also fill out columns (14) to (17), to give "Total Input" aggregates as shown for 1990 in Table 5 of CSO (1993b). For example, the GDP Expenditure component "Personal Expenditure" is exactly matched by the £15,585.2m. Total Input of column (14) of Table 1, while column (17) Total Input £16,115.8m agrees with Table 5 "Exports of Goods and Services".

A brief comment on the Table 1 "Subsidies" row of negative entries is in order. Most of the £384m. shown in column (2) is "overhead" subsidies paid direct to farmers: we find a quoted £382.7m. for 1990 in CSO (1992c) report on Agriculture. Some of the "product" subsidy relates to C oras Iompair  ireann (CIE) transport. The large subsidies shown in columns (16) and (17) are for Intervention and Exports of agricultural products (mainly meat and milk) under EU price support.

Table 1 rows "Other Inputs Reworked"

Appendix 1 of Henry (1983a) provides details of how the Imports and GDP rows, and Final Demand columns, must be reworked and extended, to give Table 1 rows (14) to (17), with derived Gross National Product (GNP) row, and corresponding amended columns (14) to (17).

The reworked rows and columns provide a rudimentary Social Accounting Matrix (SAM) of four rows matched by four columns, at the level of Gross National Disposable Income, with GNP as a derivative.

The first row, Table 1 Household Income (14) row, gives the sectoral sources of 1990 disposable household income, each column of columns (1) to (17) being an actual or possible source of such income. Column (14) shows how this 1990 income was spent (£15,585.2m.) or saved (£1,646m.). The aggregate for row and column (14) is £17,231.2m.

The second row and column are for Government income and current outgoings. Row (15) shows an income of £9,762.2m. for Subsidies *paid* treated as *negative* income, but all transfers received from EU sources (including Subsidy coverage) treated as positive income. The same value of outgoings, in aggregate, includes a negative savings (i.e., borrowing) of £457.5m., meaning that actual 1990 current outgoings, in column (15), were £10,219.7m (given by £9,762.2m. plus £457.5m.) The £1,310m. in row (17) includes £1,009m. of interest on the National Debt paid to the rest of the world and £301m. of EU Taxes.

The third row and column match savings with capital formation. Row (16) shows aggregate Savings of £5,539.1m., matched by an equal expenditure in column (16), on capital formation.

The fourth row and column match imports and outflows with exports and inflows; both row and column (17) have £19,706.5m. as aggregate value. These aggregates conform to the

Balance of Payments details for 1990 in Table 30a of CSO (1993b). For the accounts set out in Table 1, the Savings (16) row entry of £182.4m. in column (17) indicates an "Import Surplus" of that amount, requiring external "credit" to balance the full estimated amount of imports and outflows of row (17). Readers may compare the sum of the "Merchandise" and "Invisible" import rows above, with entries in row (17), to see estimated outflows amounts of interest and dividends; some help on this aspect was provided to the writer by Mr Lucey of the CSO.

3. *DERIVED AVERAGE ANNUAL 1990 INPUT COST AND EMPLOYMENT COEFFICIENTS*

The central purpose of reworking "Other Inputs" rows of Table 1, as just described above, is to enable extended multiplier analysis to occur. The Household (14) and Government (15) rows and columns permit their treatment as "intermediate" sectors, to estimate induced effects of household and government spending of income received. It would be wrong on several counts to attempt this treatment of "Other Inputs" rows before reworking.

Table 2 shows the set of "direct input cost coefficients", derived from Table 1 by dividing the entries in each column by the value of "Total Input" for that column. For columns (1) to (13) only one Total Input value is shown. For column (14), the Total Input value used is £17,231.2m., to cover Household savings as well as expenditure. For column (15) the Total Input value used is £10,219.7m., matching the actual Government current outgoings in aggregate, for Savings set at zero.

Subject to rounding errors in the fourth decimal place, the Table 2 coefficients in each column add to unity, with due regard to proper selection. For columns (1) to (13), entries above the Total Input row aggregate to unity. For columns (14) and (15), the unit aggregate value is given by rows (1) to (13) and rows (14) to (17).

The meaning of the coefficients should be clear enough. For columns (1) to (13), each row entry in a column shows the average annual 1990 cost share, per £ million total receipts for output at basic prices. "Cost" covers returns to labour and gross profits, all part of the make-up of Total Input. For column (14), the entries show the average 1990 spending and saving pattern of Households, per £ million disposable income received, the savings taking 9.55 per cent, with various taxes on purchases taking 14.86 per cent "Government Income" per £ million received, on average. For column (15), with zero savings, the average pattern of 1990 Government current outgoings shows 37.31 per cent going to Non-Market Services (12) and 47.25 per cent by way of Household Income, in all forms of current transfers including interest on the National Debt paid at home.

Table 2 has also a row of employment coefficients, showing average numbers (or "manyears") per £ million received in each of sectors (1) to (12). These "direct" employment coefficients or intensities vary considerably in size. Agriculture (2) has the largest (41.54), followed closely by Non-Market Services (12) value (41.21). Two more relatively large values occur: 28.12 for Market Services (11), and 27.97 for Clothing (4).

All of the Table 2 average annual coefficients can be thought of as *direct* "Multipliers" per £ million output, wherever that output is sold. All such multipliers per £ million output can be denoted "Normal" multipliers; the Henry (1991) paper explains the use of the term "Normal", to avoid confusion with "Ratio" multipliers. The latter can be derived, as the ratios of entries in any of Tables 3 to 5 to corresponding entries in Table 2.

4. *DIRECT-PLUS-INDIRECT MULTIPLIERS FOR 1990 EMPLOYMENT, GNP AND IMPORTS*

All the inputs of Table 1 columns (1) to (13) are used up in producing the Domestic outputs in rows (1) to (13) of Final Demand columns (14) to (17), as is total employment as

well. Multipliers more complex than the "direct" kind of Table 2 are available, showing how the inputs and employment of Table 1 columns (1) to (13) are absorbed by these 1990 Final Demands. The "direct-plus-indirect" multipliers are now considered. In increasing complexity, they comprise Tables 3 to 5.

A macro-result matching Table 3 can first be presented, showing how Final Demand aggregates of Table 1 column (14) to (17) and rows (1) to (13) absorb Intermediate "Other Inputs" and employment. The following scheme shows how the absorption occurs through the Intermediate interactions:

	<i>Household</i>	<i>Government</i>	<i>Capital Formation</i>	<i>Exports</i>	<i>Total Final</i>
	<i>(14)</i>	<i>(15)</i>	<i>(16)</i>	<i>(17)</i>	<i>(14) to (17)</i>
Household Income (£m.)	3,006.36	2,119.09	1,311.71	4,199.09	10,636.25
Government Income (£m.)	1,836.00	1,084.75	818.11	2,552.74	6,291.60
Savings (£m.)	1,463.14	267.84	432.14	2,005.08	4,168.20
(GNP (£m.))	(6,305.50)	(3,471.68)	(2,561.96)	(8,756.91)	(21,096.05)
Imports + Outflows (£m.)	2,839.54	525.03	1,431.85	7,643.66	12,440.08
Aggregate of Rows (1) to (13)	9,145.04	3,996.71	3,993.81	16,400.57	33,536.13
Employment ('000)	348.530	193.205	148.237	436.028	1,126.000

Each of the four columns of Table 1 Final Demand is seen to be "filled-in" by the reworked "Other Inputs" to columns (1) to (13) of 1990 sectors. The employment is also fully absorbed by the four columns. Each entry in each column of the scheme above can be thought of as a "direct-plus-indirect" *Impact* obtained by applying Table 3 multipliers to the entries in a Final Demand column of Table 1. For example, the Household Income entry of £3,006.36m. in the Household column is the result of matching Table 3 Household Income (14) row against the entries in the Household (14) column of Table 1, multiplying each matched pair and aggregating the result.

The detailed background scheme of Table 3 needs to be explained. By analogy, the

schemes of Tables 4 and 5 should need less explanation.

Direct-plus-Indirect Multipliers (Table 3)

The Table 3 direct-plus-indirect multipliers are the least elaborate, because they take into account only columns (1) to (13) as interacting, thus accepting columns (14) to (17) of Table 1 as "Final Demand". Table 3 spells out in sectoral detail the background to the aggregate results just discussed above. Each entry in Table 3 gives the average annual 1990 "direct-plus-indirect" multiplier or response or impact per £1 million Final Demand for the 1990 Domestic output of the sector names at the head of the column. Thus all entries in Table 3 column (2) are multipliers of (impacts of) £1m. Final Demand (same as Final Output) of the 1990 Agriculture, Forestry, Fishing (2) sector.

Three parts of Table 3 need descriptive comment:

- (1) the 13 rows and columns of Domestic Output;
- (2) the 6 rows of "Other Inputs Reworked" (in lieu of "Other Inputs");
- (3) the employment row.

(1) *The 13 x 13 Array of Domestic Outputs*

This matrix of multipliers is frequently called the "Leontief Inverse", as first discovered by Professor Wassily Leontief. The direct-plus-indirect output required by £1m. of Final Demand for the domestic output of any sector appears in the column headed by the sector name. For example, £1m. of final demand for domestic output of Agriculture (2) implies the entries in column (2). We see 1.2590 in row (2), meaning an *indirect* demand for £0.2590m. of Agriculture (2) output, as well as the Final Output actual (direct) £1 m. of that sector. From the Market Services (11) sector the required (or implied) output is £0.2498m. per £1m. final demand for Agriculture (2) output.

Each other column of coefficients or multipliers can be interpreted in the same way. However, sector (13), the Artificial sector of business costs, has no Final Output, so its column of entries is of theoretical interest only.

(2) *The 6 Rows of Other Inputs, Reworked*

Again, within each column these multipliers or responses relate to the sector named at the head of the column. We see that the sum of rows (14) to (17) gives unit value within each column, subject to rounding errors in the fourth decimal place. This unit value (meaning £1m. response per £1m. final demand stimulus) is the detailed "filling-in" analogue of the scheme shown above for the four Final Demand columns. Worth notice is that GNP is the sum of entries in rows (14) to (17); thus GNP plus Imports and outflows (17) "fills in" any £1m. Final Demand for domestic output of a sector. So high GNP intensity implies low Imports etc. intensity, and vice versa.

The three largest GNP responses (per £1m. Final Demand unit stimulus) occur in: Non-Market Services (12) (value .8793); Agriculture (2) (value .7704); Market Services (11) (value .7255). The two smallest GNP responses or intensities are .4054 for the Metals (8) sector and .4345 for the Chemicals (6) sector.

(3) *The Employment Row*

The employment average annual 1990 responses per £1m. final demand stimulus show wide variation. The three largest are (in man-year units): 62.39 in Agriculture (2); 48.88 in Non-Market Services (12); 40.94 in Market Services (11). The three smallest average sectoral responses are: 12.33 in Chemicals (6); 16.07 in Metals (8); 17.48 in Energy (1).

We may notice consistency between high GNP and employment intensities involving the same three sectors. Low GNP and employment intensities occur in sectors (6) and (8).

Direct-plus-Indirect-plus-Induced Multipliers (Table 4)

A fairly brief commentary should suffice, in view of the detailed discussion of Table 3 in previous paragraphs. Table 4 uses 14 interacting sectors, by treating Household (14) row and column of Tables 1 and 2 as if it were an economic activity. Thus Final Demand is confined to Table 1 columns (15) to (17), with larger (more intense) responses expected, to absorb the same 1990 outputs of sectors (1) to (13) and the same employment as was accomplished by Table 3.

Table 4 details are available to readers. The Leontief Inverse has 14 rows and columns. The Household Income (14) row of column (14) has the value 1.2113, implying that £1m. of Household Income provided by, say, Government current transfers generates a *further* £0.2113m. of Household Income by the induced effects of average annual 1990 Household spending and saving. In the model, any £1m. of Household Income will have this same induced effect, with further details in column (14), through being spent and saved in the average Table 2 column (14) pattern.

The GNP row of multipliers has the largest response value of 1.2160 for Non-Market Services (12), followed by 1.1197 for a £1m. unit demand for output of Agriculture (2). A unit of Household Income as stimulus shows a GNP response of 0.6233 units of GNP, per column (14) entry.

The Employment multipliers again show great variability. The largest value, 76.12 manyears per £ million final demand, occurs in Agriculture (2), followed by 62.12 for Non-Market Services (12). A £1m. stimulus for Household (14) expenditure and saving implies 24.50 manyears on average throughout the economy, as shown in column (14).

Multipliers for Government Also Interacting (Table 5)

These 15-sector multipliers treat Government Income (15) row as if it were sales of output by a sector, and the corresponding column (15) of Government current outgoings like the average annual input cost column of an economic sector.

The 15-sector Leontief Inverse for domestic outputs occupies the top section of Table 5. The Government Income (15) row entry in column (15) has the value 1.4803, implying a *further* .4803 units of Government Income generated by the spending of 1 unit of income received by the Government through the Export (17) column. This Government Income of .4803 units applies on average to any £1m. unit of current 1990 outgoings by Government, spent in the average pattern of Table 2 column (15), according to the multiplier model assumptions.

Multipliers for the two remaining rows (16) and (17) and for GNP also appear, as do employment multipliers. There seems little point in quoting their values here, as some question about their validity will now be considered.

All Table 5 multipliers are larger than corresponding multipliers of Table 4, because Table 5 results are based on an assumed Table 1 Final Demand confined to columns (16) and (17), namely capital formation plus exports and inflows, and Table 5 multipliers or responses have to provide Table 1 sector outputs and employment through a smaller Final Demand stimulus than that of Table 4 (for which Government current outgoings are part of final demand).

The principle of Table 4 multipliers (for supposed "Keynesian" induced household spending effects) is generally accepted as plausible. But some question occurs, as to how plausible is the Table 5 assumption of Government interaction by means of fixed proportions in its current outgoings, in response to income available? The arguments for and against this

assumption will not be pursued here. One may however treat the Table 4 results as "lower limit" multipliers and those of Table 5 as actual or notional "upper limit" multipliers, with some compromise level taken between these two limits. A tentative 30 per cent of the range between these two limits has been used for some work on Tourism impacts, meaning the "lower limit" impact *plus* 30 per cent of the range in question. The Deane and Henry (1993) paper mentions this aspect.

5. APPLICATIONS OF MULTIPLIERS FOR IMPACT ANALYSIS

It is advisable to update the I-O model underlying a table such as Table 1, for improved estimation of economic impacts of some Final Demand stimulus several years later than the year covered by the I-O report. This aspect will be considered below. Then there follow brief descriptions of two impact studies by Henry (1987 and 1991), illustrating different methodologies of impact estimation.

Updating the Input-Output Tabulations and Matched Employment

Any worthwhile I-O tabulations must be derived from historical data (mainly of the kind published or held by the CSO). This means a time-lag of up to three years behind the year being tabulated, to allow for the data to become available in a fairly finalised condition.

An earlier I-O tabulation loses out on at least two counts:

- (a) preliminary industrial and National Account's data are subject to major revisions, this problem worsening with increased degree of detail;
- (b) there are large gaps in the data-set which usually materialises within three years after the year of analysis, and such gaps have to be filled by "estimation" which may border on the heroic.

So, the present (December 1993) I-O situation for 1990 is typical. Three years on, the 1990 I-O approximate structures are available, as covered by Tables 1 to 5 of this report, with a

detailed background. Next September, a similar estimation process could start, to give matching results for 1991 if time and resources were available, by the end of 1994.

But, in the meantime, and until a 1991 or later I-O structure becomes available, two feasible I-O applications or developments are possible:

- (1) To do various simulation experiments within the 1990 annual average hypothesis; this kind of simulation is illustrated by the Henry (1987) paper to be summarised below, on Agriculture 1982 impacts.
- (2) To consistently reprice the given 1990 structure (Table 1 or more detailed versions) to a price-system of some later year, and to amend 1990 sectoral employment for estimated growth in output-manyear between 1990 and the later year of analysis. The Henry (1991) paper on Tourism impacts of 1989 is a good example of this kind of application. The repricing process obtains implicit price deflators from the published National Accounts for Final Demand aggregates such as Personal Expenditure, Imports of Goods and Services, for, say, the period 1990-1993. These deflators (or inflators) are applied to the reworked "Other Input Costs" rows, such as Household Income, to give, say, 1990 values at 1993 prices. The I-O computerised model can consistently reprice the equivalent of Table 1 to give a full set of Transactions at, say, 1993 prices derived from the National Accounts in the way just mentioned.

To amend the 1990 employment sectoral direct intensities to, say, 1993 output/moneyear intensities, various CSO-based data are used. The basic principle is to "trend" Gross Domestic Product at constant prices/related employment, in the greatest sectoral detail permitted by the available data. Thus the "direct-plus-indirect" employment estimates for, say, some 1993 impact simulation are "average annual" 1993 estimates derived from an I-O structure at estimated 1993 price levels and productivities, to the extent that the data permit.

In all of these impact simulations, more sectors give increased precision of estimation, based on the fact that more sectors mean more information being used by the I-O modelling process. The 13-sector Table 1 structure of this report is too aggregate for many applications of the kind to be described in the following two summarised reports. If some sector is the centre of interest of some impact study, this sector should at least be separated out, and

perhaps further sub-sectored if expert advice is available on such further detail. Between 40 and 60 sectors is adequate for many impact experiments.

The 1982 Economic Impact of Irish Agriculture and Dependent Food Processing

This Henry (1987) impact study used a 23-sector I-O 1982 structure having Agriculture and Dependent Food Processing distinguished as two explicit sectors among the set of 23 (corresponding to the 13 sectors of Table 1 above). The approach was to suppose that all agriculture production was non-existent in Ireland during 1982, and that food processing industries which depended mainly on raw materials from agriculture had closed down. It was further supposed that a network of related activities, as estimated by the I-O model, had also ceased to exist, and that all employees in the related but non-existent jobs had emigrated with their families and dependents. The food distributive sector was assumed to remain, by distributing imported food at a slightly higher cost than the native produce.

The model solution gave a consistent economic structure complying with the conditions outlined above. By subtracting this structure from the "actual" given I-O 1982 structure, the full impact of the agriculture and dependent food processing 1982 activities was estimated. This full impact comprised 30 per cent of 1982 employment and 26 per cent of 1982 GNP, with a net positive contribution of £900 million to the 1982 balance of payments.

The analysis thus revealed the major importance of the agriculture and dependent food processing sectors in Irish 1982 economic activity. Numerical results are to be regarded as orders of magnitude, rather than precise estimates.

Employment and GNP Impacts of 1989 Tourist Expenditure

This Henry (1991) impact study used a 21-sector I-O 1982 structure repriced at 1989 prices, and having the sectoral employment amended to take account of growth of

output/manyear between 1982 and 1989, in the way explained above in a previous paragraph.

The 1989 expenditure had three main groupings: (1) "Out-of-State" tourists, (2) "Carrier Receipts", (3) expenditure by Irish tourist at home. The "Carrier Receipts" is payments by tourists to airlines and shipping for carrying them to points in Ireland and again carrying them home from points in Ireland. The other two groups of expenditure were treated separately, category (1) covering expenditure by tourist visitors from abroad, and category (3) covering expenditure in Ireland by Irish residents taking holidays within Ireland.

To complete this impact analysis two kinds of data have to be brought together and used. The first kind comprises the I-O sectoral multipliers, in this case those of the 1982 structure at 1989 prices and with estimated 1989 sectoral output/manyear. The second kind is an "I-O compatible" Final Demand version of the three tourist expenditure 1989 categories. As "Carrier Receipts" may be treated as "Sea and Air Transport", only the other two categories require elaborate breakdown and rearrangement of data, to give a column of expenditure *at basic prices* similar to the Household (14) column of Table 1 of this report. With help on data from Mr Brian Deane of Bord Fáilte, the rearrangement was made, to fit the I-O structure required. Then application of the sectoral GNP and employment 1989 multipliers to the rearranged expenditure was possible.

The estimated 1989 impacts were as follows. The £757m. Out-of-State tourist expenditure was worth £748m. of GNP and 39,400 manyears of "average annual" employment, by way of "direct + indirect + induced" effects. Carrier Receipts of £232m. generated £223m. GNP and 11,300 manyears, by way of "direct + indirect + induced". For home expenditure of £331m. by Irish tourists, the impact of £269m. GNP and 13,300 manyears was "direct + indirect", the induced effect not being valid for domestic tourism.

REFERENCES

- CENTRAL STATISTICS OFFICE, 1991. *Labour Force Survey 1990*, Dublin: Stationery Office.
- CENTRAL STATISTICS OFFICE, 1992a. *Input-Output Tables for 1985*, Dublin: Stationery Office.
- CENTRAL STATISTICS OFFICE, 1992b. *Trade Statistics of Ireland, December 1991*, Dublin: Stationery Office.
- CENTRAL STATISTICS OFFICE, 1992c. Estimated output, input and income in Agriculture 1987-1991, *Statistical Bulletin*, September issue, pp. 393-402.
- CENTRAL STATISTICS OFFICE, 1993a. *Census of Industrial Production 1990*, Dublin: Stationery Office.
- CENTRAL STATISTICS OFFICE, 1993b. *National Income and Expenditure 1992*, Dublin: Stationery Office.
- CÓRAS IOMPAIR ÉIREANN, 1991. *Córas Iompair Éireann Annual Report 1990*, Dublin: Córas Iompair Éireann.
- DEANE, B. and E. HENRY, 1983, "The Economic Impact of Tourism", *Irish Banking Review*, Winter issue, pp. 35-47.
- HENRY, E.W., 1983a. *Irish 1978 Input-Output Structures, with Derived Multipliers for Employment, GNP and Imports, and Some Comparisons with 1976, 1974, 1968*, Dublin: Economic and Social Research Institute, Memorandum Series No. 157.
- HENRY, E.W., 1983b. *Irish 1982 Preliminary Input-Output Structures, with Derived Multipliers for Employment, GNP and Imports, and Some Comparisons with 1978*, Dublin: Economic and Social Research Institute, Memorandum Series, No. 159.
- HENRY, E.W., 1987. "The Impact of the Agriculture and Dependent Food Processing Sectors on the Irish Economy During 1982", *Irish Journal of Agricultural Economy and Rural Sociology*, Volume 12, pp. 1-17.
- HENRY, E.W., 1991. "Estimated Employment and Gross National Product Impacts of 1989 Tourism in Ireland", *Journal of the Statistical and Social Inquiry Society of Ireland*, Volume XXVI, Part iii, 1990-'91 issue, pp. 339-385.
- REVENUE COMMISSIONERS, 1992. *Statistical Report of the Revenue Commissioners: Year Ended 31st December 1991*, Dublin: Stationery Office.

APPENDIX 1: *Matching of Ireland 1990 Input-Output 13-Sector Structure with that of CSO 1985 41-Sector*

<i>Sector Description of 1990 13-Sector</i>	<i>Approximate Match by CSO 1985 41-Sector</i>	<i>NACE-CLIO 3-Digit Groups</i>	<i>Brief Comments on 1985 Matching of 1990 Sectors</i>
Energy (1)	Coal (2) Petroleum Products (4) Peat fuel part of non-Met. Miner. (8) Elect., Gas, Water (5)	111 and 112 140, refined Peat fuel part of 239 134, 161, 162, 170	For both years (1985 and 1990), includes Natural Gas production, excludes "own-account" Construction moved to sector (9) below, includes Electricity "network losses".
Agriculture, Forestry, Fishing (2)	Agriculture, Forestry, Fishing (1)	011 to 019, 020, 303	For both years, excludes farmers' "Turf" moved to (1) above, includes crops consumed on farm.
Food, Beverages, Tobacco (3)	Meat and M. Prods. (16) Milk + Dairy Prods (17) Other Food Prods. (18) Beverages (19) Tobacco (20)	412 413 411, 414 to 423 424 to 428 429	Covers all animal slaughter. Includes pasteurising plants.
Clothing, Footwear, Textiles (4)	Textiles + Clothing (21) Leather + Footwear (22)	431 to 439 441 to 456	
Wood, Paper, Miscellaneous Manufacturers (5)	Wood Prods. + Furnit. (23) Paper + Print. Prods. (24) Other Manufl. Prods. (26)	461 to 467 471 to 474 491 to 495	
Chemicals, Rubber, Plastics (6)	Chemical Products (9) Rubb. + Plast. Prods. (25)	251 to 260 481 to 483	
Non-Metallic Minerals (7)	Non-Metal. Min. Prods. (8) excluding peat fuel	231 to 248 excl. Peat fuel part of 239	For 1990, Peat fuel has been moved to sector (1) above.
Metals, Engineering, Vehicles (8)	Metals + Ores (7) Metal Prods. (ex. Mach.) (10) Agric. + Indust. Mach. (11) Office Machines (12) Electrical Goods (13) Motor Vehicles (14) Other Trans. Equip. (15)	211 to 224 311 to 319 321 to 328 330 and 371 to 374 341 to 347 351 to 353 361 to 365	
Construction (9)	Building + Constr. (27)	505 to 509	Includes "own-account" new construction.
Transport + Communication (10)	Inland Transport (31) Marit. + Air Transpt. (32) Auxil. Transpt. (33) Communic. Serv. (34)	710 to 730 741 to 750 761 to 773 790	
Market Services (11)	Repair and Recov. Serv. (28) Wholesale + Retail Trade (29) Lodg. + Cater. Serv. (30) Credit + Insur. (35) Business Serv. (36) Rent. of Immov. (37) Other Market Serv. (38)	620, 671, 672 610 to 640 660 811 to 820 830, 840 850 92C to 97C, 981 to 984	
Non-Market Services (12)	Gen. Public Services (39) Non-Mkt. Health Services (40) Other Non-Mkt. Services (41)	91, 92A, 96A, 97A 95A, 95B 93A, 93B, 94A, 94B, 96B, 97B, 99	
Artificial Sectors (13)	Non-Existent separately, for 1985		The input cost groupings: (a) materials for repairs, (b) packaging, (c) residual business current expenditure, were dissolved into component costs for final 1985 tabular results.

Table 1: Ireland 1990 Input-Output 13 Sector Transactions at Basic Prices (£ Million)

Row Description	Energy	Agriculture, Forestry, Fishing	Food, Beverages, Tobacco	Clothing, Footwear, Textiles	Wood, Paper, Misc. Manuf.	Chemicals, Rubber, Plastics	Non-Metall. Minerals	Metals, Engineering, Vehicles	Construction	Transport + Comm.	Market Services	Non-Market Services	As official	Row Description	Household Expenditure + Savings	Government Outgoings	Capital Formation	Exports + Inflows	Total Output	Total Inter	Total Final	Row Description	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)		(14)	(15)	(16)	(17)	(11)+(17)	(11)+(17)	(14)+(17)		
Domestic Output:																							
Energy	(1) 268.95	58.61	76.64	13.03	18.36	67.34	35.74	53.31	14.60	17.18	127.08	55.00	47.28	(1)	521.93			115.38	1,490.43	853.12	637.31	(1)	
Agric. For., Fishing	(2)	664.66	2,569.46		22.41					0.26	1.60	2.03		(2)	153.23	79.90		472.46	3,966.03	3,260.42	705.61	(2)	
Food, Bev., Tobacco	(3)	395.67	885.32	54.33	0.62	12.36				6.67	39.57	36.43		(3)	1,789.69	606.90		3,847.45	7,674.91	1,430.87	6,244.04	(3)	
Clothing, Footw. Text.	(4)	0.17			12.93	0.20	0.52	0.01	0.05	0.11	0.05	0.41	0.45	(4)	145.99	9.00		671.96	871.38	44.43	826.95	(4)	
Wood, Paper, Misc. Man.	(5)	3.99	0.11	1.61	28.78	1.90	0.25	13.94	89.87	19.58	164.35	88.70	97.51	(5)	327.56	25.00		459.18	1,322.33	510.59	811.74	(5)	
Chem., Rubber, Plast.	(6)	1.47	56.59	2.49	2.27	2.02	16.97	1.03	2.17	1.78	0.15	4.18	4.26	(6)	197.84	9.50		2,642.36	2,979.34	129.64	2,849.70	(6)	
Non-Metall. Mineral	(7)	0.91	7.81	3.02	0.10	2.14	0.85	90.83	11.34	386.39				(7)		12.90		388.22	960.05	558.93	401.12	(7)	
Metals, Engin. Vehic.	(8)	2.38	2.13	4.18	3.86	1.73	1.80	18.73	95.56	41.16	45.02	30.16	86.57	(8)	95.70	108.00		5,569.92	6,187.44	413.82	5,773.62	(8)	
Construction	(9)	0.74	51.57	14.01	1.61	3.54	3.32	3.36	8.68	205.49	417.98	70.32		(9)		144.44	2,482.44		3,411.50	784.62	2,626.88	(9)	
Transport + Communications	(10)	13.01	32.04	102.98	20.97	25.07	15.52	30.34	52.85	59.07	90.64	461.37	150.96	(10)	684.19	19.47		752.07	2,712.25	1,236.52	1,475.73	(10)	
Market Services	(11)	94.25	508.71	758.17	29.31	86.98	156.19	76.47	306.28	475.15	507.63	3,010.14	589.73	(11)	4,685.23	39.40	640.70	1,374.08	14,033.51	7,294.10	6,739.41	(11)	
Non-Market Services	(12)									5.44		234.38		(12)				107.49	5,119.96	655.94	4,464.02	(12)	
As official	(13)	37.91	0.96	921.44	57.96	87.49	187.32	112.43	588.65	407.50	194.76			(13)				2,596.42	2,596.42			(13)	
TOTAL DOMESTIC		419.62	1,782.91	5,337.82	197.98	279.34	467.99	369.19	1,132.83	1,481.07	892.70	4,685.98	1,102.15	DOM.	9,145.04	3,990.71	3,993.81	16,400.57	53,325.55	19,789.42	33,536.13	DOM.	
Other Input:																			T.O.	INTER	FINAL	Row Des.	
Merchandise Imports		280.14	381.87	464.85	350.15	412.67	798.74	153.95	2,241.53	623.92	84.54	489.22	344.94	Merch	3,306.40	1,599.12		336.67	12,286.10	7,043.91	5,242.19	Merch	
Investment Imports		45.00	5.96	332.10	7.19	24.28	215.89	32.97	432.03		271.31	211.92	4.31	Inv.	573.40	19.74			2,227.90	1,634.76	593.14	Inv.	
Indirect Taxes		34.70	128.48	53.65	6.91	10.56	15.00	11.76	30.59	17.96	131.03	272.37	66.85	Tax	2,770.03	83.99		276.17	148.44	4,445.90	1,167.27	3,278.63	Tax
Less Subsidies		-0.96	-383.75	-2.09	-1.47	-1.01	-0.89	-0.51	-7.54	-0.38	-35.12	-20.06	-3.13	Subs.	-209.67			-349.74	-769.88	-1,786.20	-456.91	-1,329.29	Subs.
Total Labour Costs		361.70	164.20	805.60	266.50	421.90	481.40	279.50	1,172.40	1,057.80	810.20	3,876.90	3,544.20	Lab.					13,242.30	13,242.30		Lab.	
Gross Profits		350.23	1,886.36	682.98	44.12	174.59	1,001.21	113.19	1,185.60	231.11	557.59	4,517.18	160.64	Prof.					10,904.80	10,904.80		Prof.	
TOTAL OTHER INPUT \$		1,070.81	2,183.12	2,337.09	673.40	1,042.99	2,511.35	990.86	5,054.61	1,930.43	1,819.55	9,347.53	4,017.81	OTHER	6,440.16	83.99	1,545.29	-284.77	41,320.80	33,536.13	7,784.67	OTHER	
TOTAL INPUT		1,490.43	3,966.03	7,674.91	871.38	1,322.33	2,979.34	960.05	6,187.44	3,411.50	2,712.25	14,033.51	5,119.96	T.I.	15,585.20	4,080.70	5,539.10	16,115.80	94,646.35	53,325.55	41,320.80	T.I.	
Other Input Re-worked:																			T.O.	INTER	FINAL	Row Des.	
Household Income	(14)	244.91	1,493.34	339.03	171.89	276.88	339.07	183.32	790.13	698.51	542.88	2,920.42	2,435.87	House		4,828.76		1,766.19	17,231.20	10,636.25	6,594.95	House	
Government Income	(15)	193.92	-64.45	419.55	106.44	180.85	309.24	122.95	580.99	411.86	419.77	2,051.04	1,172.05	Govem.	2,560.36	83.94		-73.57	899.87	9,762.20	6,291.60	3,470.60	Govem.
Savings	(16)	164.84	366.40	249.62	16.82	62.28	348.38	46.88	435.07	81.66	316.01	1,919.60	160.64	Savings	1,646.00	-457.50			5,539.10	4,168.20	1,370.90	Savings	
± Gross National Product	(GNP)	603.67	1,795.29	1,208.20	295.15	520.01	996.69	353.15	1,806.19	1,192.03	1,278.66	6,891.06	3,768.56	GNP	2,560.36	-924.83		-73.57	1,017.36	23,675.35	21,096.05	2,579.30	GNP
Imports and Outflows	(17)	467.14	387.83	1,128.89	378.25	522.98	1,514.66	237.71	3,248.42	738.40	540.89	2,456.47	249.25	Imp.	3,879.80	1,310.29	1,618.86	457.47	19,706.50	12,440.08	7,266.42	Imp.	
REVISED TOTAL INPUT (where required)														REV. T.I.	17,231.20	9,762.20		19,706.50				REV. T.I.	
Row Description	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)		(14)	(15)	(16)	(17)	T.O.	INTER	FINAL	Row Des.	
Employment (thousands)		16 001	164 744	42 825	24 375	24 650	23 025	13 550	67 280	78 800	45 100	394 650	211 000	Employ					1,126 000	1,126 000		Employ	

Note: \$ Column (1) to (13), GNP is the sum of rows (14) to (16); for the other columns it is not.

Table 2: Ireland 1990 Direct Input Coefficients Derived from Table 1 (£ Per £ Total Input)

Row Description	Energy	Agriculture, Forestry, Fishing	Food, Beverages, Tobacco	Clothing, Footwear, Textiles	Wood, Paper, Misc. Man.	Chemicals, Rubber, Plastics	Non- Metallic Minerals	Metals, Engineering, Vehicles	Construction	Transport + Comm	Market Services	Non- Market Services	Artificial	Row Des.	Household Expenditure + Savings	Govern + Current Out-goings
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)		(14)	(15)
Domestic Output:																
Energy	(1)	.1805	.0148	.0100	.0150	.0139	.0226	.0372	.0086	.0043	.0063	.0091	.0107	(1)	.0303	
Agric., For., Fishing	(2)		.1676	.3348		.0169				.0001	.0001	.0004		(2)	.0089	
Food, Bever., Tobacco	(3)		.0998	.1154	.0623	.0005	.0041			.0025	.0028	.0071		(3)	.1039	
Clothing, Footw., Text.	(4)			.0148	.0002	.0002						.0001	.0114	(4)	.0085	
Wood, Paper, Misc. Man.	(5)		.0010		.0018	.0218	.0006	.0003	.0023	.0072	.0117	.0173	.0376	(5)	.0190	
Chem. Rubb., Plast.	(6)	.0010	.0143	.0003	.0026	.0015	.0057	.0011	.0004	.0005	.0001	.0008	.0132	(6)	.0115	
Non-Metal. Min.	(7)	.0006	.0020	.0004	.0001	.0016	.0003	.0946	.0018	.1133			.0214	(7)		
Metals, Engin. Vehic.	(8)	.0016	.0005	.0005	.0044	.0013	.0006	.0195	.0154	.0121	.0166	.0021	.0169	(8)	.0056	
Construction	(9)	.0005	.0130	.0018	.0018	.0027	.0025	.0035	.0014	.0758	.0298	.0137		(9)		.0141
Transport + Comm.	(10)	.0087	.0081	.0134	.0241	.0190	.0052	.0316	.0085	.0173	.0334	.0329	.0295	(10)	.0397	
Market Services	(11)	.0632	.1283	.0988	.0336	.0658	.0524	.0797	.0495	.1393	.1872	.2145	.1152	(11)	.2719	.0039
Non-Market Services	(12)									.0016		.0167	.0035	(12)	.0316	.3731
Artificial	(13)	.0254	.0002	.1201	.0665	.0662	.0629	.1171	.0951	.1194		.0139		(13)		
Row Description	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)		(14)	(15)
Other Inputs:																
Merchandise Imports		.1880	.0963	.0606	.4018	.3121	.2681	.1604	.3623	.1829	.0312	.0349	.0478	Merch.	.1919	
Invisible Imports		.0302	.0015	.0433	.0083	.0184	.0725	.0343	.0698		.1000	.0151	.0008	Invis.	.0333	
Indirect Taxes		.0233	.0324	.0070	.0079	.0080	.0050	.0122	.0049	.0053	.0483	.0194	.0131	Taxes	.1608	.0082
Less Subsidies		-.0006	-.0968	-.0003	-.0017	-.0008	-.0003	-.0005	-.0012	-.0001	-.0129	-.0014	-.0006	Subsid.	-.0122	
Total Labour Costs		.2427	.0414	.1050	.3058	.3191	.1616	.2911	.1895	.3101	.2987	.2763	.6922	Lab.		
Gross Profits		.2350	.4756	.0890	.0506	.1320	.3361	.1179	.1916	.0677	.2056	.3219	.0314	Prof.		
TOTAL INPUT	1.-	1.-	1.-	1.-	1.-	1.-	1.-	1.-	1.-	1.-	1.-	1.-	1.-	T.I.		
Row Description	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)		(14)	(15)
Other Inputs Reworked:																
Household Income	(14)	.1643	.3765	.0702	.1973	.2094	.1138	.1909	.1277	.2048	.2002	.2081	.4758	House		.4725
Government Income	(15)	.1301	-.0163	.0547	.1222	.1368	.1038	.1281	.0939	.1207	.1548	.1462	.2289	Govern.	.1486	-.0082
Savings	(16)	.1106	.0924	.0325	.0193	.0471	.1169	.0488	.0703	.0239	.1165	.1368	.0314	Savings	.0955	
‡ Gross National Product (GNP)		.4050	.4527	.1574	.3387	.3933	.3345	.3678	.2919	.3494	.4714	.4910	.7361	GNP	.1486	-.0905
Imports + Outflows	(17)	.3134	.0978	.1471	.4341	.3955	.5084	.2476	.5250	.2164	.1994	.1750	.0487	Imp.	.2252	.1282
REVISED TOTAL INPUT														REV. T.I.	1.-	1.-
Row Description	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)		(14)	(15)
Employment per £ million		10.74	41.54	5.58	27.97	18.64	7.73	14.11	10.87	23.10	24.00	28.12	41.21	Employ		

Notes: ‡ For columns (1) to (13), GNP is the sum of rows (14) to (16); for the other columns it is not.

† Total input is taken to be £10,219.70m., the sum of all positive entries in col. (14), with Table 1 negative Savings £457.50m. set to zero value.

Table 3: Ireland 1990 Direct-Plus-Indirect 13-Sector Coefficients Derived from Table 2 (£ per £ Final Demand)

Row Description	Energy	Agriculture, Forestry, Fishing	Food, Beverages, Tobacco	Clothing, Footwear, Textiles	Wood, Paper, Misc. Man.	Chemicals, Rubber, Plastics	Non-Metallic Minerals	Metals, Engin. Vehicles	Construction	Transport + Comm.	Market Services	Non-Market Services	Artificial	Row Descrip.	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)		
<i>Domestic Output: (Leontief Inverse)</i>															
Energy	(1)	1.2228	.0292	.0316	.0240	.0218	.0311	.0570	.0191	.0133	.0168	.0167	.0335	(1)	
Agriculture, Forestry, Fishing	(2)	.0003	1.2590	.4772	.0306	.0225	.0023	.0007	.0014	.0021	.0025	.0047	.0028	(2)	
Food, Beverages, Tobacco	(3)	.0006	.1430	1.1857	.0756	.0038	.0055	.0012	.0015	.0041	.0048	.0093	.0042	(3)	
Clothing, Footwear, Textiles	(4)	.0004	.0004	.0018	1.0160	.0010	.0010	.0016	.0012	.0003	.0004	.0002	.0118	(4)	
Wood, Paper, Misc. Man.	(5)	.0032	.0064	.0115	.0071	1.0274	.0050	.0092	.0369	.0144	.0187	.0212	.0486	(5)	
Chemicals, Rubber, Plastics	(6)	.0017	.0186	.0095	.0043	.0030	1.0068	.0032	.0028	.0005	.0009	.0012	.0141	(6)	
Non-Metallic Minerals	(7)	.0024	.0068	.0079	.0033	.0048	.0028	1.1097	.1302	.0116	.0061	.0031	.0272	(7)	
Metals, Engineering, Vehicles	(8)	.0039	.0033	.0082	.0085	.0050	.0037	.0284	1.0200	.0215	.0204	.0191	.0387	(8)	
Construction	(9)	.0056	.0262	.0213	.0086	.0095	.0069	.0141	.0067	1.0123	.0880	.0433	.0230	(9)	
Transport + Communications	(10)	.0183	.0247	.0453	.0378	.0317	.0155	.0559	.0451	1.0485	.0492	.0388	.1046	(10)	
Market Services	(11)	.1176	.2498	.3036	.1021	.1291	.1016	.1872	.1106	.2638	.2789	1.3105	.1711	(11)	
Non-Market Services	(12)	.0073	.0085	.0287	.0143	.0135	.0122	.0246	.0174	.0284	.0078	.0262	1.0079	(12)	
Artificial	(13)	.0345	.0275	.1532	.0817	.0732	.0681	.1395	.1453	.0195	.0269	.0102	1.0216	(13)	
Row Description	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)		
<i>Other Inputs:</i>															
Merchandise Imports		.2462	.1650	.1826	.4505	.3533	.2995	.2433	.4036	.2715	.0797	.0747	.0800	.2823	Merch.
Invisible Imports		.0418	.0177	.0669	.0205	.0270	.0790	.0535	.0781	.0189	.1122	.0270	.0103	.0441	Invis.
Indirect Taxes		.0370	.0531	.0562	.0265	.0248	.0191	.0427	.0241	.0372	.0603	.0332	.0209	.1698	Taxes
Less Subsidies		-.0012	-.1226	-.0476	-.0054	-.0036	-.0009	-.0017	-.0018	-.0014	-.0142	-.0028	-.0019	-.0025	Subsid.
Total Labour Costs		.3444	.1723	.2854	.3833	.3949	.2176	.4362	.2531	.4795	.4387	.4220	.7802	.3123	Lab.
Gross Profits		.3318	.7145	.4565	.1244	.2035	.3857	.2260	.2428	.1943	.3234	.4459	.1104	.1940	Prof.
TOTAL OTHER INPUTS		1.-	1.-	1.-	1.-	1.-	1.-	1.-	1.-	1.-	1.-	1.-	1.-	1.-	T.I.
Row Description	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	Row Des.	
<i>Other Inputs Reworked:</i>															
Household Income	(14)	.2357	.5605	.3648	.2623	.2711	.1547	.2926	.1733	.3245	.3008	.3139	.5402	.2214	House.
Government Income	(15)	.1880	.0447	.1491	.1708	.1836	.1413	.2182	.1394	.2227	.2257	.2208	.2738	.2910	Govern.
Savings	(16)	.1546	.1652	.1370	.0482	.0760	.1385	.0967	.0927	.0787	.1672	.1908	.0653	.0871	Savings
‡ Gross National Product (GNP)	(GNP)	.5783	.7704	.6509	.4812	.5307	.4345	.6075	.4054	.6259	.6938	.7255	.8793	.5995	GNP
Imports and Outflows	(17)	.4217	.2296	.3491	.5188	.4693	.5655	.3925	.5946	.3741	.3062	.2745	.1207	.4005	Imp.
TOTAL OTHER INPUTS REWORKED		1.-	1.-	1.-	1.-	1.-	1.-	1.-	1.-	1.-	1.-	1.-	1.-	1.-	REV. T.I.
Row Description	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	Row Des.	
Employment per £m.		17.48	62.39	38.61	35.24	25.68	12.33	24.81	16.07	36.15	36.28	40.94	48.88	24.15	Employ

Note: ‡ For columns (1) to (13), GNP is the sum of rows (14) to (16); for the other columns it is not.

Table 4: Ireland 1990 Direct-Plus-Indirect 14-Sector Coefficients Derived from Table 2 (£ per £ Final Demand)

Row Description	Energy	Agriculture, Forestry, Fishing	Food, Beverages, Tobacco	Clothing, Footwear, Textiles	Wood, Paper, Miscellaneous Manufacturing	Chemicals, Rubber, Plastics	Non-Metallic Minerals	Metals, Engineering, Vehicles	Construction	Transport + Comm.	Market Services	Non-Market Services	Artificial	Row Des.	Household Expenditure + Savings
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)		(14)
<i>Domestic Output: (Leontief Inverse)</i>															
Energy	(1)	1.2363	.0613	.0525	.0390	.0373	.0400	.0738	.0250	.0376	.0305	.0348	.0476	(1)	.0573
Agric., Forestry, Fishing	(2)	.0181	1.3014	.5047	.0504	.0430	.0140	.0228	.0136	.0259	.0249	.0263	.0455	(2)	.0756
Food, Bev., Tobacco	(3)	.0368	.2293	1.2418	.1160	.0455	.0293	.0462	.0274	.0514	.0504	.0531	.0924	(3)	.1538
Clothing, Footw., Text.	(4)	.0030	.0065	.0058	1.0189	.0040	.0026	.0048	.0031	.0053	.0035	.0038	.0061	(4)	.0109
Wood, Paper, Misc Man.	(5)	.0110	.0250	.0236	.0158	1.0364	.0101	.0189	.0140	.0477	.0244	.0291	.0391	(5)	.0332
Chemicals, Rub., Plastics	(6)	.0055	.0276	.0153	.0085	.0073	1.0092	.0079	.0046	.0080	.0053	.0059	.0098	(6)	.0159
Non-Metallic Minerals	(7)	.0033	.0090	.0094	.0043	.0059	.0035	1.1109	.0060	.1315	.0128	.0074	.0053	(7)	.0041
Metals, Eng., Vehicles	(8)	.0067	.0099	.0125	.0117	.0082	.0055	.0319	1.0221	.0253	.0240	.0094	.0255	(8)	.0119
Construction	(9)	.0110	.0390	.0297	.0146	.0157	.0105	.0209	.0107	1.0197	.0949	.0505	.0345	(9)	.0229
Transport + Comm.	(10)	.0363	.0674	.0731	.0578	.0524	.0273	.0782	.0353	.0698	1.0714	.0731	.0800	(10)	.0762
Market Services	(11)	.2362	.5317	.4870	.2340	.2655	.1794	.3344	.1977	.4270	.4302	1.4684	.4428	(11)	.5030
Non-Market Services	(12)	.0196	.0377	.0478	.0280	.0276	.0203	.0399	.0265	.0454	.0235	.0426	1.0362	(12)	.0522
Artificial	(13)	.0428	.0473	.1661	.0909	.0828	.0735	.1498	.1073	.1567	.0301	.0380	.0292	(13)	.0352
Household Income	(14)	.2856	.6789	.4419	.3177	.3284	.1874	.3544	.2099	.3930	.3644	.3803	.6544	(14)	1.2113
<i>Row Description</i>	<i>(1)</i>	<i>(2)</i>	<i>(3)</i>	<i>(4)</i>	<i>(5)</i>	<i>(6)</i>	<i>(7)</i>	<i>(8)</i>	<i>(9)</i>	<i>(10)</i>	<i>(11)</i>	<i>(12)</i>	<i>(13)</i>		<i>(14)</i>
<i>Other Inputs Reworked</i>															
Government Income	(15)	.2608	.2179	.2618	.2518	.2674	.1892	.3086	.1929	.3230	.3187	.3178	.4407	Govt.	.3091
Savings	(16)	.2061	.2877	.2167	.1055	.1352	.1723	.1606	.1306	.1496	.2330	.2594	.1834	Savings	.2186
Gross National Product	(GNP)	.7253	1.1197	.8783	.6446	.6996	.5309	.7898	.5133	.8281	.8813	.9212	1.2160	GNP	.6233
Imports + Outflows	(17)	.5330	.4944	.5214	.6427	.5974	.6386	.5307	.6765	.5274	.4483	.4228	.3759	Imp.	.4724
Aggreg. of (15) to (17)		1.-	1.-	1.-	1.-	1.-	1.-	1.-	1.-	1.-	1.-	1.-	1.-	Agg.	1.-
<i>Row Description</i>	<i>(1)</i>	<i>(2)</i>	<i>(3)</i>	<i>(4)</i>	<i>(5)</i>	<i>(6)</i>	<i>(7)</i>	<i>(8)</i>	<i>(9)</i>	<i>(10)</i>	<i>(11)</i>	<i>(12)</i>	<i>(13)</i>		<i>(14)</i>
Employment per £ million		23.26	76.12	47.55	41.67	32.32	16.12	31.98	20.31	44.10	43.65	48.63	62.12	Employ.	24.50

Table 5: Ireland 1990 Direct-Plus-Indirect 15-Sector Coefficients Derived from Table 2 (£ per £ Final Demand)

Row Description	Energy	Agric., Forestry Fishing	Food, Beverages Tobacco	Clothing, Footw., Textiles	Wood, Paper, Misc. Man.	Chemicals, Rubber, Plastics	Non- Met. Minerals	Metals, Eng., Vehicles	Con- struction	Transport + Comm.	Market Services	Non- Market Services	Artificial	Row Des.	Household Expenditure + Savings	Govern. Current Out-goings	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)		(14)	(15)	
<i>Domestic Output: (Leontief Inverse)</i>																	
Energy	(1)	1.2538	.0760	.0701	.0559	.0553	.0527	.0945	.0380	.0594	.0520	.0562	.0773	.0704	(1)	.0781	.0673
Agriculture, Forestry, Fishing	(2)	.0387	1.3185	.5254	.0702	.0640	.0289	.0471	.0288	.0514	.0499	.0513	.0802	.0478	(2)	.0999	.0787
Food, Beverages, Tobacco	(3)	.0786	.2641	1.2837	.1563	.0883	.0595	.0956	.0582	.1031	.1014	.1040	.1630	.0958	(3)	.2033	.1600
Clothing, Footwear, Textiles	(4)	.0059	.0089	.0087	1.0217	.0069	.0047	.0082	.0052	.0088	.0071	.0073	.0110	.0182	(4)	.0143	.0111
Wood, Paper, Misc. Man.	(5)	.0230	.0350	.0356	.0274	1.0487	.0188	.0331	.0228	.0625	.0390	.0438	.0594	.0725	(5)	.0474	.0460
Chemicals, Rubber, Plastics	(6)	.0099	.0312	.0197	.0127	.0118	1.0124	.0131	.0078	.0134	.0107	.0112	.0172	.0236	(6)	.0211	.0168
Non-Metallic Minerals	(7)	.0055	.0109	.0116	.0065	.0082	.0051	1.1135	.0077	.1343	.0155	.0101	.0091	.0312	(7)	.0067	.0086
Metals, Engineering, Vehicles	(8)	.0127	.0149	.0185	.0174	.0144	.0099	.0390	1.0265	.0328	.0313	.0167	.0356	.0496	(8)	.0190	.0230
Construction	(9)	.0258	.0514	.0446	.0289	.0309	.0212	.0384	.0216	1.0380	.1130	.0685	.0595	.0484	(9)	.0405	.0567
Transport + Comm.	(10)	.0622	.0891	.0991	.0828	.0789	.0461	.1089	.0545	.1019	1.1031	.1047	.1238	.1572	(10)	.1069	.0994
Market Services	(11)	.3963	.6654	.6477	.3886	.4296	.2955	.5238	.3161	.6252	.6258	1.6634	.7133	.7476	(11)	.6926	.6137
Non-Market Services	(12)	.1787	.1707	.2075	.1816	.1907	.1357	.2282	.1442	.2424	.2180	.2365	1.3050	.3951	(12)	.2408	.6100
Artificial	(13)	.0543	.0569	.1776	.1020	.0946	.0819	.1634	.1158	.1710	.0442	.0521	.0487	1.0453	(13)	.0489	.0443
Household Income	(14)	.6035	.9446	.7611	.6247	.6544	.4179	.7307	.4451	.7868	.7530	.7677	1.1917	.7064	(14)	1.5881	1.2191
Government Income	(15)	.3861	.3226	.3876	.3728	.3959	.2800	.4569	.2856	.4781	.4718	.4705	.6524	.5320	(15)	.4575	1.4803
<i>Row Description</i>	<i>(1)</i>	<i>(2)</i>	<i>(3)</i>	<i>(4)</i>	<i>(5)</i>	<i>(6)</i>	<i>(7)</i>	<i>(8)</i>	<i>(9)</i>	<i>(10)</i>	<i>(11)</i>	<i>(12)</i>	<i>(13)</i>		<i>(14)</i>	<i>(15)</i>	
<i>Other Inputs Reworked:</i>																	
Savings	(16)	.2736	.3441	.2845	.1707	.2044	.2212	.2405	.1805	.2332	.3154	.3416	.2974	.2285	Savings	.2985	.2588
Gross National Product	(GNP)	.9851	1.3368	1.1391	.8955	.9660	.7193	1.0973	.7055	1.1498	1.1988	1.2378	1.6551	1.0955	GNP	.9311	.9962
Imports + Outflows	(17)	.7264	.6559	.7155	.8293	.7956	.7787	.7595	.8195	.7668	.6846	.6584	.7026	.7715	Imp.	.7015	.7412
Aggregation of (16) and (17)		1.-	1.-	1.-	1.-	1.-	1.-	1.-	1.-	1.-	1.-	1.-	1.-	1.-	Aggreg.	1.-	1.-
<i>Row Description</i>	<i>(1)</i>	<i>(2)</i>	<i>(3)</i>	<i>(4)</i>	<i>(5)</i>	<i>(6)</i>	<i>(7)</i>	<i>(8)</i>	<i>(9)</i>	<i>(10)</i>	<i>(11)</i>	<i>(12)</i>	<i>(13)</i>		<i>(14)</i>	<i>(15)</i>	
Employment per £ million		36.99	87.59	61.34	54.92	46.40	26.08	48.23	30.47	61.11	60.43	65.36	85.32	48.50	Employ.	40.77	52.64