INDUCED EMPLOYMENT IN THE MARKETED SERVICES SECTORS IN IRELAND 1975

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1 INTRODUCTION

In late 1983 the EEC published (Eurostat, 1983A) a set of consistent input output (I O) tables on the NACE/CLIO R44 system for the year 1975 The countries covered are the Federal Republic of Germany, France, Italy, the Netherlands, Belgium, the United Kingdom, Denmark and the Republic of Ireland As the name implies, the tables divide the economy into 44 sectors and in addition to agriculture, they include 26 industrial categories, 13 market services and 4 non market services This is clearly a publication of some importance, partly because it gives us a good deal of new information about the service sectors (which tended to be treated rather vaguely in the past) and partly because it enables us to make direct comparisons between the structure of eight economies including Ireland

In this paper I propose to use the I O tables to investigate the extent to which employ ment in the marketed services is due to the demand for agricultural and industrial goods The term industry as it is used in this paper includes the construction industry The matter is of some topical interest, because in recent years agricultural employment in Ireland has been falling, industrial employment has been roughly static and only employ ment in the service sectors has been rising (Conniffe and Kennedy, 1984, p 11) This pattern is by now well recognised and is common to most, if not all, countries which have attained a moderate degree of industrialisation [1] It has led to the coining of the term "deindustrialisation" and the widespread acceptance of the belief that increases in employment in the future are likely to take place in the service sector if they happen at all Yet service sector employment has received surprisingly little attention at either the practical or theoretical level (Conniffe and Kennedy, 1984, p 201) In particular, there has been little done to discover how much of the employment in the service sector is traceable to final demand, and how much to the demand for services as an imput to other sectors By attempting to tackle this problem one hopes to gain a better understanding of the way in which service sector employment is generated Three specific questions are posed in this paper, namely —

A   How much of the employment in the Irish marketed services in 1975 was traceable to the final demand for the output of the Goods Producing Sector (GPS)?

B   Is there any evidence that the pattern revealed in A above is changing over time?

C   Does a similar investigation for the other EEC countries shed any light on the situation in Ireland?

No great precision can be expected from work based on I O tables because a good deal of guesswork is involved in their construction To quote CSO (1983 p x) "An appreciable amount of estimation and intelligent allocation is involved in completing the multitude of inter sectoral flows, and many elements are estimated subject to margins of error which can be relatively large " The entries concerning the Marketed Service Sector (MSS) are probably subject to more error than those for the GPS because classification and measurement can be more difficult However, it is encouraging to note that the Census of Industrial Production (CIP) for 1975 (on which the I O tables are based) "provided extra input data on plant hire, rent of premises, insurance, bank charges and other non industrial costs" (CSO, 1983, p x) Probably the most balanced view is to regard the I O tables as being capable of giving information about the broad outlines of the economy but not about the finer details

Ideally, one would like to investigate a more recent year than 1975, but more recent tables are not available One would also like to include all the services and not merely those which are marketed, but the EEC tables do not give any details of the inputs from the public services into the other sectors The marketed services in the R44 categorisation (using the R44 numbers) are —

(550)   Recovery and Repair
(570)   Wholesale and Retail
(590)   Lodging and Catering
(610)   Inland Transport
(630)   Maritime and Air Transport
(650)   Auxiliary Transport
(670)   Communications
(690)   Credit and Insurance
(710)   Services to Enterprises
(790)   Other Market Services (including Renting of Immovable Goods, Marketed Education and Research, Marketed Health Services)

In Ireland in 1975 these services employed a total of 325,000 out of a total service employment of 498,000 and a total labour force of 1,146,000

For brevity, the service sectors will be referred to by their numbers only The following contraction are also used to avoid repetition of long titles —

MSS   Marketed service sectors (that is sectors (550) to (790))
MSSE   Marketed service sector employment

GPS   Goods producing sectors This includes agriculture, all industry and con
       struction In the R44 scheme it covers sectors (010) to (530)
GPSE   Goods producing sector employment

2 THE METHOD

In the following discussion I make the distinction, which is conventional at least in Ireland, between the agricultural, industrial and service sectors of the economy The procedures outlined below are well known, and the description is included mainly for the benefit of those who are not familiar with the I O model The purpose of the exercise is to determine how much of the employment in each service sector can be traced to final demand in the agricultural and industrial sectors, the construction industry being included in the latter category The method used is a fairly obvious one, it has been applied by Momigliano and Siniscalco (1982) to the Italian economy The basic assumption is that the distribution of employment within any sector is proportional to the distribution of output For example, if we find that (say) 5 per cent of the output of the inland transport sector is used to satisfy the final demand of the meat and meat products sector, it is assumed that this indicates that 5 per cent of the employment in the inland transport sector is traceable to the final demand of the meat and meat products sector

The I O tables show for a particular year (1975 in the present case) how the output of each of the 41 productive sectors of the economy was used The total output of each sector is shown as going partly to final demand (mainly personal consumption, exports, government use and capital formation) and partly to interindustry use which consists of all those amounts used as inputs or materials by other sectors for purposes of production Thus, the basic equation for each industry is —

Total output = Final demand + Interindustry use If we define X_1 and Y_1 as being respectively the total output and final demand in sector (i) and T_{ij} as being the amount of the output of sector (i) used as an input in sector (j), (all measured in value terms) we have —

$$X_1 = Y_1 + \sum_j T_{ij} \qquad (j = 1, 2 \quad 41) \tag{1}$$

A standard assumption of the I O model is that each unit of output in sector (j) requires a fixed input from sector (i), that is,

$$T_{ij} = a_{ij} X_j \qquad (a_{ij} = \text{constant}) \tag{2}$$

So the basic equation becomes

$$X_1 = Y_1 + \sum_j a_{ij} X_j,$$

which may be rewritten as

$$X_1 - \sum_j a_{1j} X_j = Y_1 \qquad (3)$$

The a_{1j} are called the direct input coefficients because they show the amount which is required directly by sector (j) from sector (1) per unit of output in (j) They are calculated simply from

$$a_{1j} = T_{1j} / X_j \qquad (4)$$

However, these coefficients do not tell the whole story because a unit of output in sector (j) requires inputs from other sectors, which in turn draw on sector (1) By inverting the matrix of coefficients on the left hand side of (3) above, we can calculate a new set of coefficients which give the full effect (both direct and indirect) of a unit increase in final demand for sector (j)'s output on the total output of sector (1) Knowing these coefficients and the final demand for each sector s output in the year in question, we can calculate how much of sector (1)'s output is traceable to (or induced by) the final demand for each of the 41 sectors Since employment is assumed to be proportional to output, we can similarly partition employment in sector (1) and, by suitable addition, find the amounts of employment in the MSS which are traceable to the final demand in the GPS

More formally, defining X and Y as the 41 element vectors of total output and final demand, we may write the set of equations in (3) above as

$$(I\ A)\ X = Y \qquad (5)$$

Hence,

$$X = (I\ A)^{-1} Y \qquad (6)$$

This enables us to express total output for each sector in terms of the appropriate row of $(I\ A)^{-1}$ and the vector Y

$$X_1 = (I\ A)_1^{-1} Y \qquad (7)$$

The element corresponding to sector (j) in this sum is

$$X_{1j} = (I\ A)_{1j}^{-1} Y_j \qquad (8)$$

This expresses the amount of the output of sector (1) which is traceable to the final demand in sector (j) in terms of an element of $(I\ A)^{-1}$ and the final demand for the output of sector (j)

We define N as the vector of numbers employed in the 41 industries, N_1 as the number employed in industry (1) and N_{1j} as the number employed in industry (1) as a result of the final demand in sector (j) Since it is assumed that the partitioning of employment is proportional to the partitioning of output, it follows that —

$$\frac{N_{ij}}{N_i} = \frac{X_{ij}}{X_i} = \frac{(I\ A)_{ij}^{-1} Y_j}{X_i}, \quad \text{giving} \tag{9}$$

$$\frac{N_{ij}}{} = \frac{(I\ A)_{ij}^{-1} Y_j N_i}{X_i} \tag{10}$$

As all the elements on the right hand side are, by assumption, known we can proceed to calculate the N_{ij} and, by suitable summation, find the employment totals which we require

The "traceable" or "induced" employment referred to in A is the sum of direct and indirect effects A direct effect occurs when final demand for GPS (i) causes it to require part of the output of MSS (j) as an immediate input An indirect effect occurs when the final demand for the output of GPS (i) causes it to require part of the output of some other sector (k) as an input, which sector, in turn, has to draw on the output of MSS (j) Household income and expenditure are regarded as being outside the interindustry matrix, so further possible linkages, caused by the fact that the growth of an industry's output will cause household income to grow, which will cause increased demand for the output of industry and hence more employment, are ignored If one were to speak in terms of multipliers we consider "partial" rather than "complete" multipliers

Note that the discussion above has defined the X, Y and N vectors and the (I A) and $(I\ A)^{-1}$ matrices

3 THE DATA

The study uses the vectors X (total output), Y (final demand), N (employment), and the $(I\ A)^{-1}$ matrix for Ireland for the years 1975 and 1969 and for the following countries for the year 1975 — France, Germany, Italy, the United Kingdom, Belgium, the Netherlands and Denmark With a few exceptions (to be discussed below) the data for X, Y and $(I\ A)^{-1}$ refer to items of domestic origin only and are net of taxes All the vectors and matrices are based on the NACE/CLIO R44 categorisation

Sources —

1   Ireland (1975)
Y and $(I\ A)^{-1}$ are available directly from CSO (1983), Tables A1 and A3

A small difficulty arose in the case of the X vector because Table A1 gives Total Distributed Output rather than actual output which is required However, since the entries in Table A2 are found by dividing those of Table A1 by actual output (CSO (1983) p viii), it is a simple matter to infer the value of actual output

The part of the vector N which refers to the MSS is not available from published sources It was calculated by the author from the detailed employment figures of the 1975 Labour Force Survey kindly supplied by the Central Statistics Office Appendix 1 of CSO (1983) gives details of the sub categories included in each of the NACE sectors Most of these sub categories could be identified in the Labour Force Survey and so the NACE employ ment figures could be produced While some approximation was necessary, the author believes that the employment figures are quire reliable, apart from any inaccuracies involved in the Labour Force Survey

Ireland 1969
This was the area in which the greatest difficulties arose because a suitable transactions table was not available for 1969 To make comparisons between 1975 and 1969 it was necessary to use transactions tables which include both imports and taxes in the inter industry elements The problems which this causes and the efforts made to overcome them are discussed in the next section The X and Y vectors and the transactions tables distinguish only 39 sectors The sources for the 1969 tables and the comparable 1975 tables are — The X and Y vectors and transaction matrices were all obtained from Table B1 (1975) and Table $C1^2$ (1969) of CSO (1983) The A matrices are not given but they can be calculated from the transactions matrices which are given in the tables

$(I A)^{-1}$ matrices — These are not published but were very kindly calculated for me by Mr Aidan Punch of the CSO

The primary Irish tables (Tables A1–A3 of CSO 1983) have only 41 sectors Those which are missing are (750) marketed education and research and (770) marketed health services In these tables (750) and (770) are included in (790) other market services

The secondary Irish tables (Tables B1 and C1) cover 39 sectors This is due to the further amalgamation of (710) business services into (790) and the inclusion of (810) general public services and (850) non marketed education and research in (930) other non marketed services

Other Countries (1975)
The seven countries involved have already been listed All the X and Y vectors and the $(I A)^{-1}$ matrices (described as $(I Ad)^{-1}$) are given in Eurostat (1983A)

Employment figures on the R44 categorisation are available directly only for Italy (Momigliano and Siniscalco 1982, Table 5) Detailed figures for the other countries are available from 1983 to 1977 but not before that (Eurostat 1984) For 1975 the marketed services are divided into the three categories "trade, restaurants and hotels", 'transport and communications" and "finance and insurance" The more detailed figures for 1975 were calculated by taking the percentages of each of these three categories formed by the R44 sub sections in 1977 and applying them to the 1975 totals As the changes between 1975 and 1977 are all small, this would seem to give good approximations The information which is available does not enable one to form estimates for sector (790) "other market services" This sector is, accordingly, excluded from the cross country study

In this section an attempt is made to answer the three questions posed in the first section

A   How much of the MSSE in Ireland in 1975 is traceable to final demand in the GPS?

To answer this, the $(I-A)^{-1}$ table with the X, Y and N vectors are used to estimate the amount of employment in each of the MSS which can be traced to final demand for each of the 41 sectors In the final analysis, of course, all employment is traceable to the final demand for some commodity The results can then be summarised into three categories, namely, the amounts traceable to

(a)   Own final demand
(b)   Final demand for other services
(c)   Final demand in the GPS

The outcome of this exercise is given in Table 1 below

Table 1 *Ireland (1975) Marketed Services*
Sources of Employment ('000)

RACE CODE	RACE	OWN DEMAND	OTHER SERVICES	GPS	TOTAL EMPLOYMENT	AGRICULTURE %
550	R pair & P covery	5 6 (52 5)	2 1 (19 8)	3 0 (27 7)	10 7	(3 1)
570	Vholesale & Petail	92 0 (71 9)	4 0 (3 2)	31 9 (24 9)	127 9	(1 7)
590	Lod ing & Catering	31 5 (31 9)	3 8 (10 1)	1 9 (5 0)	37 2	(0 1)
610	Inl and Iiansport	8 ? (30 3)	8 2 (30 3)	10 6 (39 4)	27 0	(2 ?)
630	Maritime & Air Iransport	7 4 (76 4)	1 0 (10 2)	1 3 (13 4)	9 7	(0 3)
650	Auxiliary Iiansport	0 7 (9 1)	1 9 (25 3)	4 8 (65 6)	7 4	(1 2)
670	Communications	5 6 (21 8)	10 5 (41 2)	9 5 (37 0)	25 6	(1 1)
690	Credit & Insurance	7 8 (33 8)	6 2 (26 7)	9 1 (39 5)	23 1	(1 0)
710	Services to Interprise	0 9 (5 1)	8 7 (48 4)	8 4 (46 5)	18 0	(1 1)
790	Other Market Services	16 7 (43 2)	5 7 (14 6)	16 3 42 2)	38 7	(1 9)
	TOTAL	176 4 (54 25)	52 1 (16 00)	96 8 (29 75)	325 3	(1 4)

Figures in brackets are percentages of total employment
in the sector

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The main conclusion to be drawn from the table is fairly obvious In 1975 the GPS generated about 100,000 jobs in the MSS or about 30 per cent of the total This is quite certainly an underestimate of the number of service jobs generated by the GPS because it ignores the non marketed (or public) sectors Obviously, the GPS must require some inputs from these too, but at the moment we do not have the information to make an estimate of the number involved To do so, we would need entries in the I O tables for the inputs from the non marketed sectors into all the sectors of the economy

The services which owe the highest proportion of their employment to the GPS are (apart from (650) which employs only trivial numbers) (710), (790)[3], (690) and (610) All of these derived about 40 per cent of their employment from final demand in the GPS The services with low proportions so derived are (590), (630) and (570) It is, at first sight, surprising to find (570) near the bottom of the list The explanation lies in the fact that a high proportion of the employment in this sector (about 71% in 1975) is in the retail trade, and this, of course, is mainly an input into final demand

At this point it is natural to ask which are the industries in the GPS whose final demand creates the most employment in the MSS This involves a rearrangement of the information contained in Table 1 The results are presented in Table 2 The "traceable" employments referred to are all calculated in the manner described in the second section above

At a trivial level we can see that the industries which induce large amounts of MSS employments are (010) agriculture (310) meat and meat products (330) milk and dairy products (350) other food products (410) textiles and clothing and (530) building and construction This is simply due to the fact that these are big industries The information given in column (VI) is more interesting It shows the ratio of GPS employment to MSS employment for the 1975 vector of final demands Those industries with high coefficients are those which rely relatively heavily on the MSS Those with coefficients above 0 3 are (070) petrol and gas, (130) metals and ores, (150) non metallic minerals, (170) chemical products, (210) machinery, (230) office machines, (390) tobacco products The data for (070) are probably too scanty to be reliable The other six industries do not seem to have much in common There does not seem to be any reason to believe that there is any particular type of industry which is particularly good at stimulating employment in the MSS

The industry which is most interesting in Table 2 is probably (530) building and construction In absolute terms it generates more MSS employment than any other Its coefficient in column (VI) is 0 290 which makes it the eighth highest in the list, so that it is the only industry which ranks well from both points of view There would appear to be a good deal of justice in the claim that building and construction is a key industry in the economy

The calculation of employment multipliers is somewhat outside the scope of this paper, but a brief word on the matter is, perhaps, in order If we concentrate on the manufactur ing industries (numbers 070 and 170 to 510 in the NACE codes) we find that in 1975 there were 139,000 jobs generated directly by the demand for the output of the

Table 2 *Ireland (1975) Goods Producing Sectors*
Employment in GPS & MSS Traceable to Final Demand in GPS

(I) NACE CODE	(II) Name	(III) Employment in GPS	(IV) Employment in MSS	(V) Total Employment	(VI) (IV/ (III)
010	Agric , Forestry, Fishing	50 8	4 6	55 4	0⁹1
030	Coal, etc	0 3	0 0	0 3	-
050	Coking	-	-	-	-
070	Petrol, Gas	0 3	0 2	0 5	667
090	Electricity, Gas, Water	7 2	0 8	8 0	111
110	Radio-active Materials	-	-	-	-
130	Metals & Ores	1 8	1 2	3 0	66/
150	Non-metallic Minerals	10 0	3 2	13 2	32C
170	Chemical Products	8 4	3 9	12 3	4o4
190	Metal Products (not Machinery)	7 6	1 5	9 1	197
210	Machinery	4 3	1 5	5 8	349
230	Office Machines	5 0	3 0	8 0	600
250	Electrical Goods	9 1	2 1	11 2	231
270	Motor Vehicles	5 4	1 0	6 4	185
290	Other Transport Equipment	5 2	0 8	6 0	151
310	Meat & Meat Products	130 3	15 2	145 5	117
330	Milk & Dairy Products	72 7	9 6	82 3	132
350	Other Food Products	38 8	7 4	46 2	191
370	Beverages	14 5	3 9	18 4	259
390	Tobacco Products	3 6	1 5	5 1	417
410	Textiles & Clothing	33 9	5 2	39 1	153
430	Leather & Footwear	7 2	1 1	8 3	153
450	Wood Products	4 8	0 9	5 7	188
470	Paper & Printing	8 0	1 3	9 3	16²
490	Rubber & Plastic	4 2	1 1	5 3	2b2
510	Other Manufacturing	1 5	0 3	1 8	200
530	Building & Construction	87 9	25 5	113 4	290
	TOTAL	522 8	96 8	619 6	165

manufacturing industries, a further 224,000 in the GPS were generated indirectly and 62,000 were generated in the MSS, giving a total of 425,000 The ratio of the total to the number generated directly is 3 06 In other words, in 1975 an increase in final demand sufficient to raise direct employment in manufacturing industry by 1,000 would lead to a further 2,000 jobs throughout the economy We may compare the multiplier of 3 06 here with the manufactured exports employment multiplier of 2 42 calculated by Henry (1983/84) and a similar multiplier of 3 04 calculated by the US Bureau of the Census (1982) Since Henry uses a different I O matrix and a different year, it would probably be a mistake to draw any inferences from the differences between the two Irish values

As has already been explained in the second section, the multipliers here are partial multipliers because they do not take account of the further increases in employment which would be generated by the stimulation of income in the household sector

B   Is there any evidence that the proportion of employment in the marketed services generated by the demand for industrial goods is changing over time?

The significance of this question is fairly clear If the proportion should increase, this would indicate a growing dependence of industry on the service sectors, and imply that the observed growth in employment in the latter was due in part of whole to industrial demand Unfortunately, there are substantial data difficulties which introduce some uncertainty into the results, but probably without rendering them useless Ideally one would need two identical transactions matrices for years separated by about a decade and based on transactions valued at "basic prices", that is, involving only domestic output and net of tax Only one matrix of this kind is published, namely that for 1975 What *is* available is a pair of matrices using 39 of the (R44) categories for the years 1969 and 1975 (CSO (1983) Tables B1, C1) These tables, which value transactions at "producers' prices" include taxes paid by the producers and purchasers of imports Thus the results of any work done with these tables are likely to be disturbed by changes in tax rates and by variations in the proportions of imports used as inputs In addition to this, the period (six years) is shorter than one would wish However, in spite of all this, the information contained in the tables may yield something of interest provided that the results are treated with due caution

To make the most use of the information available, I have approached the problem in two ways

Method 1   Use of direct input proportions based on Tables B1 and C1 of CSO (1975)

In doing this, I have assumed that the amount of employment in sector (i) generated by sector (j) is proportional to the fraction of (i)'s output which is used as a direct input in sector (j) In other words

$$N_{ij} = \frac{T_{ij}}{X_i} N_i$$

The advantage in this is that it relies only on two quantities (T_{ij} and X_i) which might be perturbed by imports and taxes These are both measures of the output of one of the MSS which, on the whole, are little affected by the two disturbing influences Evidence of this is given by the following table

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Table 3 *Ireland 1975 Interindustry Use of Marketed Services*
(Value £m)

SERVICE	BASIC PRICES	PRODUCERS' PRICES
(550) Recovery and Repair	26.3	31.7
(570) Wholesale & Retail	131.1	131.2
(590) Lodging & Catering	15.2	17.3
(610) Inland Transport	83.8	65.1
(630) Sea & Air Transport	22.1	30.5
(650) Auxiliary Transport	73.6	83.9
(670) Communication	74.1	64.4
(690) Credit & Insurance	147.2	149.4
(710) Other Market Services	274.1	272.7

(Source CSO (1983) Tables A1, B1).

The column at basic prices is from page 5 of Table AI It shows Irish output of the stated marketed service at economic cost of production, so it does not include similar imported marketed service, and taxes and subsidies are excluded By contrast, the column at producers' prices includes similar imported marketed service (which are in fact relatively small for these sectors), taxes and subsidies It will be seen that the differences are not great, and in the case of the three largest items (570), (690) and (710), there is virtually no difference

The main disadvantage of the present method is that we are inferring changes between 1969 and 1975 from the direct input from the MSS to the GPS rather than from the total (direct plus indirect) inputs

However, as a comparison of Tables A2 and A3 of CSO (1983) will show, the direct input (when it is of any non trivial size) normally forms more than 60 per cent of the total input, and the two quantities tend to be proportional As long as proportionality is maintained, the direction and size of changes can be inferred reasonably accurately The advantage of using the method is that the perturbations which can be caused by imports, taxes and subsidies in the GPS would affect all the elements of the inverse matrix and might make substantial changes in the elements which are relevant to the inputs from the MSS It must be stressed that the method is imprecise, but it is probably the least imprecise way of using the information available

The employment vector for 1975 has already been used The data for 1969 were based on Labour Force Survey data which once again were kindly supplied by the CSO There was no Survey in 1969, so the employment vectors for 1966 and 1971 were calculated and the figure for 1969 for each sector found by interpolation The changes between 1966 and 1971 are small in all cases

The results of this investigation are set out in Table 4 below

Table 4 *Ireland Employment in Market Service Sectors Traceable*
To Demand for Goods

(Direct Inputs only.   ('000))

		1969	1975
(550)	Repair & Recovery	2 4	2 6
(570)	Wholesale & Retail	25 5	33 7
(590)	Lodging & Catering	2 8	0 6
(610)	Inland Transport	7 5	8 1
(630)	Maritime & Air Transport	2 0	0 9
(650)	Auxiliary Transport	0 7	4 3
(670)	Communications	7.3	6 5
(690)	Credit & Insurance	3 8	3 4
(790 + 710) Other Market Services		10 7	19 7
		62 7	79 8
Total Market Service Employment		300 9	322 4
Traceable as % of Total		20 9	2ʌ 7ₐ

It is interesting to compare the results for 1975 here with those in Table 1 The present method includes (as part of T_{1j}) some input from each service which is not needed to satisfy its own final demand but rather to provide inputs to other sectors Similarly, it ignores the corresponding inputs in other sectors which ultimately find their way to the

final demand of the service in question The balance between the two results is a reduction in the estimated induced employment in each service sector Howevei, in all cases but one, the reduction is quite small, presumably because the direct input accounts for a high proportion of the total input

The exception is (690) where the amount shown in Table 1 is very much bigger The reason is probably associated with the treatment of the banking sector which is part of (690) Apart from bank charges, the output of the banking sector is regarded as being sold to itself, thereby giving a substantial diagonal element in the "direct" table and a bigger diagonal element in the inverse The element on the diagonal of the Irish inverse table is 2 188 which is nearly twice as large as the next biggest diagonal element This is, in fact, quite small by comparison with the other countries which range from 2 210 for Belgium to 4 212 for Denmark

The existence of a large element on the diagonal fo the inverse matrix would not in itself produce the difference we are considering The primary cause lies in the ratio between the elements of the inverse matrix and the "direct" matrix in the row corresponding to sector (690) In the case of many of the big GPS sectors this ratio is very much greater than that for the large MSS sectors For example, it is 15 0 for agriculture, 7 6 for meat and meat products and 3 8 for building and construction, while it is only 2 5 for wholesale and retail trade and 2 6 for other market services In the calculations for induced employment in which the inverse is used, this naturally increases the amount traceable to the GPS The connection between this and the large diagonal element is not obvious but it is probably connected with the interindustry linkages in the matrix

The question as to whether the calculations involving the inverse give a true result must be answered in terms of the correctness of the treatment of the banking sector Presumably, careful thought has been given to this in preparing the tables Fortunately (690) is a relatively small sector in terms of employment, and it cannot influence the overall result very much

It is clear from Table 4 that in the period 1969–75 there was an increase in the amount of service sector employment directly traceable to industrial output of slightly over 17,000 This was 79 5 per cent of the increase in employment in the marketed services in the same period It is perhaps more significant still that the percentage of service sector employment generated in this way went from 20 9 per cent in 1969 to 24 7 per cent in 1975 The indications are that the integration of the services sectors into the industrial system increased in the period It is perhaps of interest that the rate of increase calculated here (an average of 0 63 per cent per annum) is somewhat higher than the 0 43 per cent calculated by Momigliano and Siniscalco for the Italian economy in the period 1965 75

Method 2   Use of the $(I A)^{-1}$ matrices based on CSO (1983)
            Tables B1, C1

More for the sake of completeness than in the hope of attaining any greater degree of accuracy, I have attempted to estimate the change in MSSE generated by the GPS by carrying out a calculation similar to part A of this section but using $(I A)^{-1}$ matrices

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based on the data in CSO (1983) Tables B1 and C1 The problem with this procedure is that the elements in Tables B1 and C1 contain both taxes and imports, so changes between the two years may be due to changes in these items rather than in the inter industry structure Nevertheless, the results are of some interest They are presented in the table below The inverses needed were very kindly calculated by Mr Aidan Punch of the CSO

Table 5 *Ireland Employment in Market Service Sectors Traceable To*

Demand for Goods

(Based on Tables B1 and C1 of CSO (1983) ('000)

		1969	1975	(Table 1)
(550)	Repair and Recovery	2 7	3 2	(3 0)
(570)	Wholesale & Retail	26 3	35 1	(31 9)
(590)	Lodging & Catering	3 2	2 1	(1 9)
(610)	Inland Transport	8 9	10 5	(10 6)
(630)	Maritime & Air Transport	2 6	1 1	(1 3)
(650)	Auxiliary Transport	1 2	4 9	(4 8)
(670)	Communications	10 8	9 9	(9 5)
(690)	Credit & Insurance	8 7	8 3	(9 1
(790)	Other Market Services	13 1	24 3	(24 7)
		77 5	99 4	96 8
Total Employment Market Services		300 9	325 3	325 3
% of Total Industrially Generated		25 8%	30 6%	29 8%

(Corresponding figures from Table 1 are included for comparison)

It is interesting to see that the stimates for 1975 are quite close to those of Table 1 which is based on an acceptable $(I A)^{-1}$ matrix This, unfortunately, does not tell us anything about the reliability of the 1969 results One notes that the percentage of industrially generated service sector employment rises, on this calculation, by 5 0 per cent in the period

The sectors where induced employment falls in the period are (590), (630), (670) and (690) Presumably, in (670) and (690) this is due to the rapid advance in technology

which is displacing labour faster than the industrial demand is expanding It is hard to see any obvious explanation for the decline in (590) and (630) It may simply be caused by the lack of precision in the method

One might summarise this subsection by saying that, while the data needed to make a formally correct comparison between the years 1969 and 1975 are not available, there are strong indications that the proportion of industrially generated employment in the marketed services grew appreciably in the period This result is consistent with the outcome of a similar study of the Italian economy (Momigliano and Siniscalco 1982)

C   Does a similar investigation for the other EEC countries shed any light on the situation in Ireland?

There are at least two reasons for attempting to answer this question First, it will enable us to judge whether the Irish situation is normal, if, for example, we find that the proportion of induced employment in Ireland is low, we might expect that it would grow of its own account in the future or be made to grow relatively easily Secondly, by doing a cross section study, we can judge whether there is any relation between output per head and the proportion of induced service sector employment This has obvious implications for the changes observed in Methods 1 and 2 of Section B The work was carried out by applying the methods of the second section to the inverse matrices and demand vectors in Eurostat (1983) and the employment data of Eurostat (1984) The results are summarised in Tables 6 and 7

Table 6 shows the percentage of employment in the marketed services which was generated by the demand for goods in 1975 in the eight EEC countries The summary statistics $\bar{X}$ and Sx (standard deviation) have been calculated without including the Irish figures, so that Ireland can be compared with the other countries There is a reasonable amount of uniformity in the results It appears that (590) and (630) have a relatively low level of integration into the industrial system in all countries, in no case does the figure exceed 18 1 per cent On the other hand, (610) and (710) are in the high range with only one observation below 23 8 per cent and average values of 30 1 per cent and 32 5 per cent respectively Sectors (550), (570) and (670) seem to occupy the middle range around 20 per cent, while sectors (650) and (690) are too variable to make any generalisation Most significantly, (since the classification of service sub sectors may vary from one country to another) the total percentage seems to be much more stable than any of its constituent items This is shown by the fact that its standard error is smaller than that of any of the sectors It would seem that, in the EEC countries in 1975, the percentage of employment in the marketed services was not far distant from 21 per cent

In the light of this, the Irish figure of 28 per cent is very interesting, not only being well above the EEC average, but higher than any other country This would seem to indicate that in 1975 the marketed services in Ireland were already very well integrated into the industrial system Any further increase in the proportion of industrially generated service sector employment is likely to be more difficult to attain here than the rest of the EEC

Table 6   *EEC Countries (1975)   Percentage of Employment in*
Market Services Generated by Demand for Goods

	GERMANY	FRANCE	ITALY	NETHERLANDS	BELGIUM	UNITED KINGDOM	DENMARK	IRELAND	$\bar{X}$	S_x
(550) Recovery & Repair	29 8	29 1	30 9	16 5	17 5		20 8	27 7	24 1	6 6
(570) Wholesale & Retail	21 6	11 1	14 0	14 5	12 9	21 1	16 7	24 9	10 0	4 0
(590) Lodging & Catering	18 1	4 0	6 4	10 1	1 9	4 6	6 1	5 0	7 3	5 4
(610) Inland Transport	35 5	32 1	34 7	13 1	28 1	35 3	28 6	39 4	30 1	9
(630) Maritime & Air Transport	16 4	6 4	6 6	9 6	4 2	8 4	2 9	13 4	7 8	4 4
(650) Auxiliary Transport	64 0	48 5	38 0	9 8	24 3	–	29 6	65 6	44 9	19 0
(670) Communications	27 4	28 5	31 1	22 5	19 5	16 4	19 8	37 0	23 6	5 5
(690) Credit & Insurance	21 0	28 7	45 9	20 9	15 9	13 7	13 3	39 5	22 6	11 5
(710) Services to Enterprise	35 0	43 0	32 6	23 8	24 3	27 2	41 2	46 5	32 5	7 8
TOTAL	26 6	22 3	22 0	16 4	17 0	21 5	18 8	28 0	20 7	3 5
Total Market Service Employment ('000)	6,387	4 665	5,206	1 228	851	6404	605	286		
Employment in Market Service Sectors traceable to the demand for goods ('000)	1702	1040	1165	202	145	1377	114	80*		

*Footnote   This total of 80 differs from that in Table 1 because sector (790) has been
excluded from all countries as explained above in Section 3   This makes
little difference to the percentages of the total which is traceable

Table 7 shows the amount of MSSE induced by the GPS as a percentage of total GPS
employment   Once again, the various categories show a reasonable amount of consistency
between the countries   Sectors (590) and (630) everywhere are in the "low" category
with no entry over 0 5 per cent   Sector (570) is "high" everywhere with no entry under
2 2 per cent   Sectors (610), (670), (690) and (710) may be classified as "medium",
having all their entries in the range 0 6 to 2 5   Finally, sectors (550) and (650) are rather

variable but tending to the "medium" range Once again, the total is more stable than the constituents, the percentages for the seven countries (excluding Ireland) all being quite close to the mean of 11 per cent

Ireland is clearly exceptional on this basis too, the figures of 14 0 per cent being well above the next highest country It is clear that the Irish GPS drew (in 1975 at least) to an unusual degree on the MSS

It is interesting to investigate the correlation between the productivity of the GPS and the ration of GPSE to MSSE generated by the GPS It is fairly plausible to hypothesise that the more productive a country's GPS, the more sophisticated they will be and the more

Table 7 *EEC Countries (1975) Induced Market Service Employment*

As a Percentage of Goods Producing Sector Employment

	W GERMANY	FRANCE	ITALY	NETHERLANDS	BELGIUM	UNITED KINGDOM	DENMARK	IRELAND	X	Sx
(550) Recovery & Repair	0 6	0 4	1 5	0 6	0 5	–	0 3	0 5	0 65	0 4
(570) Wholesale & Retail	4 7	2 2	3 1	4 1	2 6	5 7	5 2	5 6	3 94	1 2
(590) Lodging & Catering	0 5	0 1	0 3	0 3	0 1	0 2	0 3	0 3	0 26	0 1
(610) Inland Transport	1 9	1 8	2 2	0 9	2 0	2 4	1 5	1 9	1 81	0 4
(630) Maritime & Air Transport	0 1	0 0	0 0	0 0	0 0	0 1	0 1	0 2	0 04	0 0
(650) Auxiliary Transport	1 2	0 8	0 5	0 2	0 7	–	0 5	0 8	0 65	0 3
(670) Communications	0 9	1 2	0 6	0 8	0 9	0 7	0 9	1 7	0 86	0 1
(690) Credit & Insurance	1 3	1 4	1 1	1 3	1 0	0 8	0 9	1 6	0 95	0 2
(710) Services to Enterprise	1 7	2 5	1 3	2 5	1 2	3 0	2 2	1 4	2 06	0 6
TOTAL	12 9	10 4	10 6	10 7	9 0	12 9	11 9	14 0	11 20	1 4

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they will drawn on the MSS Table 8 below shows the appropriate correlation coefficient for each sector over the 8 countries The productivity data were calculated from Eurostat (1983 B)

Table 8 *Correlation between Output Per Head in GPS and Ratio of Induced MSSE to GPSE*

Sector	(550)	(570)	(590)	(610)	(630)	(650)	(670)	(690)	(710)	Total
R	+ 016	– 405	+ 070	– 694*	– 728*	– 478	– 562	– 120	+ 208	– 60

*Significant at the 95% level

The exclusion of the Irish figures makes no important difference to these results Obviously, the hypothesis is rejected If anything, it would seem that in 1975 the countries with the more productive GPS have a lower ratio of induced MSSE Similar results are obtained when we calculate the correlation between GPS productivity and the percentage of MSSE which is induced by GPS demand (Table 9)

Table 9 *Correlation between Output Per Head in GPS and Ratio of Induced MSSE to Total MSSE*

Sector	(550)	(570)	(590)	(610)	(630)	(650)	(670)	(690)	(710)	Total
R	– 562	– 608	+ 350	– 815*	– 167	– 759*	– 415	– 345	– 607	– 693*

*Significant at the 95' level

These negative correlation coefficients are, to the author at least, counter intuitive and hence interesting They may be caused by the fact that the more advanced countries have bigger and more sophisticated firms which satisfy their need for services internally rather than by buying them on the open market However, it does seem fairly clear that the growth in MSSE observed in Ireland and Italy is not caused by increasing productivity in the GPS It may be that the phenomenon is caused by a gradual change in the nature of industrial production which, at any level of productivity, is becoming more complex and so needs more services to support it However, it is unscientific to speculate on the causes of such a process without first of all establishing its existence in a reasonable number of countries To do this we would need another set of I O Tables covering all the EEC countries for 1980 or some later year This author, at least, awaits their appearance with some impatience

FOOTNOTES

1 References to this abound See, for example, Gershuny and Miles (1983) Table AG 1, Momigliano and Siniscalco (1982) Table 1 and Kenward (1983)

2 Table C1 of CSO (1983) is incorrectly labelled Imports are included in the entries and are not treated as primary inputs

3 Other Market Services As used here it includes items such as renting of immovable goods, marketed education and research, marketed sanitation and cleaning, pro fessional and employers' associations and photographic services

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DISCUSSION

E W Henry I have much pleasure in proposing a vote of thanks to Dr O'Riordan for his interesting and useful paper on analysis of 1975 induced employment of the marketed services in Ireland The scope of the analysis is impressive, covering as it does eight EEC countries and two different years in Ireland The consistency inherent in analysing tables of about 44 sectors should enhance the inter country comparisons of Tables 6 and 7 I find it of interest (Table 6) that the Irish 28 0 per cent of MSSE generated by final demand for GPS is not much greater than the corresponding West German 26 6 per cent Again (Table 7) the Irish 14 0 per cent MSS employment as a share of GPS employment is not much greater than the West German 12 9 per cent To my mind this gives added weight to the validity of the Irish results

As an input output practitioner I would like to compliment the author on a very clear exposition of the method of calculating the employment induced by (or traceable to) a unit of final demand in sector j This section of the paper should be of help to those who are not familiar with the I O model His research has given us clear and definite answers to his proposed questions A, B and C A good aspect of the answers is that further investigation is required to give better answers for C at least, and also perhaps for B

You will allow me to make a couple of suggestions as to why Irish results show increasing intensity of MSSE in GPS final demand between 1969 and 1975 Ireland entered the Common Market in 1973 and this event might possibly create a higher demand by GPS for marketed services, so as to increase trade with EEC partners, etc Between 1969 and 1975 there has been a considerable growth in IDA related new industry which is export oriented, and this too might incur a noticeable increase in demand for marketed services These hypotheses might be capable of research and testing

Regarding the relatively high intensity of MSSE in Irish GPS demand compared with that of other countries, I have a further suggestion This might be due to diseconomies of scale arising from relatively small Irish firms Something along those lines is suggested by the author (last paragraph) regarding "bigger and more sophisticated firms which satisfy their need for services internally rather than by buying them on the open market" But I am more concerned with purchased market services which are in the nature of overheads, e g , a slot in TV advertising, would be a larger proportion of costs for a small firm than for a large firm An analysis of purchased MSS by size of establishment would shed some further light on this question

The I O method of allocating primary inputs to final demand has had a long history That it is still being used for economic analyses is illustrated by the example quoted in the paper the US Bureau of the Census has made a detailed estimate of the employment traceable to US 1980 exports of manufactures, directly and indirectly Why we have seen so little of the kind of analysis described in tonight's paper for service industries I admit I do not know To estimate the employment required by any final demand from any sector would seem to be equally valid, i e , once one accepts the principle that final output absorbs (requires) interindustry output and related input resources, then each unit of

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final output (taken to equal final demand for stock changes regarded as positive or negative final demand) has an estimated share of each primary resource

So long as total final demand absorbs total primary resources, there is some room for manoeuvre, within this constraint The linear allocation method is the easiest, and has been generally used, as illustrated by tonight's results One obvious refinement would be to increase the number of sectors, thereby increasing the input of data to the solution of the problem A further direct refinement would be to break down the analysis of type of employee, e g , managerial, skilled A still greater refinement, probably impossible, would be to allocate each type of employment *directly* to each cell of the transactions matrix, in effect meaning each transaction carried an invoice detailing the labour content in manhours One could then do an analysis of final demand for each kind of labour, i e , replace the value transactions by manhour transactions, invert the (I A) for each kind of labour etc, etc Even after all this, there might be non linear methods of tracing the *indirect* demand for manhours There can be no question about direct allocations — these offer no choice of treatments

In his choice of the marketed services and their breakdown between different categories of final demand by the estimation process described in tonight's paper, I feel sure that Dr O'Riordan has made an original contribution to our knowledge of economic activity in Ireland I now ask you to join me in expressing our thanks and appreciation in the usual way

J O'Leary I am very pleased to be in a position to second the vote of thanks to Dr O'Riordan on the presentation of his paper here this evening I believe it to be an important, interesting and pioneering piece of work Unlike those two great pioneers of African exploration in the nineteenth century however, there is no Stanley of Irish services sector research to announce to Dr O'Riordan that he has arrived The speaker tonight has chosen a topic, the pitfalls in which have apparently deterred Irish researchers more effectively than the dangers of central Africa deterred British explorers in the last century

Many theories have been advanced since the publication of Colin Clark's "The Conditions of Economic Progress" to explain the changes in sectoral employment patterns which have occurred in the more advanced economies over the last thirty years or so — in particular the apparent shift out of the secondary and into the tertiary sectors A large number of such theories have been formulated at an excessive level of generality, owing more to casual impressions than to thorough empirical analysis Accordingly they have failed to provide a satisfactory explanation for the recorded growth of services sector employment Momigliano and Siniscalco, whose work is cited and used by Dr O'Riordan have this to say on the matter

> The reasons for dissatisfaction (with the various hypotheses put forward
> to explain service sector growth)   do not depend on the baselessness
> of the various hypotheses or relations put forward, but on the intrinsic
> non homogeneity of the service sector, the result of which is that the
> variations in tertiary employment cannot be explained by a unitary
> phenomenon

They go on to emphasise that the services sector, as conceived in the broad three sector classification of economic activity, is an artificial aggregation of activities which are extremely heterogeneous with reference to demand, technology, output, the characteristics of employees, the degree of competition in the relevant markets and their integration into the rest of the productive system Such heterogeneity and the nonsense it makes of highly aggregative analysis of services sector growth, make a great deal of sense of Dr O'Riordan's approach based as it is on (i) the distinction between interindustry use and final demand and (ii) the distinction between marketed and non marketed services The first distinction is of course broadly similar to that between consumer and producer services

The distinction between consumer and producer services has a point other than that which emanates from considerations of correct methodological procedure It opens the way to evaluate the extent to which recorded growth in services sector numbers may be due to "tertiarisation" of workers who in the past would have been classified as employed within manufacturing industry, or the secondary sector more generally The phenomenon whereby service type functions formerly carried out within industrial firms are now increasingly contracted out to firms or individuals in the service sector is one that has been frequently noted in the literature To the extent that this process has been responsible for the observed growth of the services sector then the analysis of recorded growth in services sector employment must be conducted with reference to structural and organisational changes within industry, rather than in terms of factors endogenous to the services sector itself Again to quote Momigliano and Siniscalco

> According to our hypotheses, the relative and absolute growth in
> service employment largely derives from a growing use of activities
> classified in the branches of the tertiary sector, but integrated into the
> productive system and into industry in particular The sectoral data,
> registered by branch, distinguish between the units which produce
> goods and those which produce services The growth in the importance
> of the latter component, however, does not imply that the part of the
> economic system producing goods is declining, relatively speaking, and
> even less does it imply the passage to a post industrial society

I would now like to turn to some of the more technical elements of Dr O'Riordan's paper A point on which he earns my gratitude, at least, is the very clear exposition of the technique involved In saying so I am speaking as someone whose familiarity with input output analysis extends to an imperfectly remembered undergraduate course in mathematical economics

Dr O'Riordan in his exposition of the methods takes care to reiterate the standard assumption of the I O model which is that each unit of output in sector j requires a fixed input from sector i The implications of this assumption as it pertains to I O analysis of interindustry transactions in tangibles, viz , components and raw materials, would appear to me to be relatively harmless It does not stretch one's resources of intuition to invoke a fixed proportions assumption in respect of material inputs for most productive processes

I am not at all convinced, however, that the same assumption can be as harmlessely invoked in respect of inputs of services Inputs of services such as legal and financial services, advertising, communications and even transport, are not likely to be as divisible, are likely to be purchased by industry in rather more discrete amounts and are accord ingly unlikely to exhibit a relationship of fixed proportionality to output in the goods producing sectors I would be interested in hearing from Dr O'Riordan the extent to which he thinks such considerations might do violence to the standard I O assumption and what implications, if any, this might have for his results

Matthews, in his remakrs earlier this year on a paper by Henry, drew attention to the important distinction which exists between marginal and average structures in I O analysis The point here is that input output coefficients represent average structures at a point in time but that notwithstanding this, when it comes to multiplier analysis, it is assumed that these average structures hold good in working through the effects of marginal changes in final demands Matthews pointed out that this is a strong assumption which may not be valid and gave an example of results which are valid on the basis of average structures but which do not hold when marginal structures are used If the remarks which I have made about the likely nature of services type inputs are valid then this cautionary note applies *a fortiori* to multiplier analysis which seeks to show the impact of changes in final demand on the demand for services

Another point worth mentioning concerns the homogeneity of the categories of services given in the NACE CLIO classification on which Dr O'Rirodan has based his paper This is a central issue since it is the search for greater homogeneity which spawned analysis of the type done originally by Momigliano and Siniscalco and now by O'Riordan Moreover the reasonableness of a crucial assumption employed in both papers, namely that the partitioning of employment within any sector is proportional to the partitioning of output, depends critically on the homogeneity of the sectors involved, in particularly their homogeneity with respect to average wage and salary levels

In this connection attention needs to be drawn to the composition of NACE sectors (710) and (790) especially The former, Services to Enterprises, includes such diverse functions as lawyers, accountants, publicity services and computing and data processing The latter, other market services, embraces refuse collection, sanitation and cleaning as well as employers' associations, markted education and research and the renting of immovable objects Together these two sectors accounted for almost one third of inter industry sales of services in 1975 It is not clear to me that the purchase of £1m worth of cleaning services will generate the same number of jobs as the purchase of £1m worth of research or that the purchase of £1m worth of legal services will generate the same number of jobs as the purchase of the same value of computing and data processing services My reckoning would be that this problem of heterogeneity is likely to impact somewhat on Dr O'Rirodan's results, particularly those presented in Table 2 of his paper

A danger involved in I O work, which also exists to an extent in econometric modelling, is that it become exclusively an exercise in mathematical technique in which the practitioners are at risk of jettisoning their economic theories or intuitions In I O work, I think, these dangers are compounded by the suppression of price variables For this

reason more than usual circumspection is warranted in interpreting the results of I O models Certainly extreme caution, almost I might suggest, to the point of abstinence, should be practised in attributing causation to the relationships captured by I O tables or in attempting to predict from them Thus although a certain frustration might be felt about the fact that 1975 is the latest year for which I O tables have been officially published, the temptation to infer relationships for 1983 or 1984 from the analysis of 1975 should be zealously resisted Many changes in relative prices have occurred through out the intervening 8–9 years, not least those associated with the increase in the price of oil, changes in the price of labour relative to capital, changes in the opportunity cost of leisure as well as changes in tax rates Moreover relative price changes which occurred in the period immediately preceding 1975 (oil prices again, and the price increases for agricultural produce consequent on our accession to EEC membership) would have only begun to impact on resource allocation decisions by 1975 Much of *their* impact would have been felt since 1975

Another point worth drawing attention to is the proportion of employment in certain marketed services sectors, which is accounted for by State sponsored commercial bodies in 1975 I am thinking especially of transport and communications and the employment provided by CIE, Aer Lingus, B+I and the then Department of Post and Telegraphs Such an observation prompts the question of what *economic* significance attaches to assertions such as £xm of final demand in the GPS generates £ym of interindustry demand for such services, in circumstances where large subsidies exist and/or inefficiencies which would not obtain if the disciplines of the market were observed A similar question might indeed be posed with regard to the demand for the services of professional groups which are insulated from market disciplines by restrictive practices

In conclusion I would like to compliment Dr O'Riordan once again on his paper I appreciate that some of my comments may betray an attitude of some agnosticism as far as certain aspects of the methodology are concerned It is of course a good deal easier to be critical than to be creative I hope that Dr O'Riordan's paper will mark the beginning of a concerted research endeavour into the services sector

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J FitzGerald Input output tables provide very important and detailed information on the structure of the economy However, like the National Accounts, of which they are an extension, they are a set of accounting relationships They do not purport to tell us how the economy works, what factors are crucial in driving the economy, and what variables will determine the pattern of future growth To turn such a set of accounting identities into a behavioural model requires a set of very strong assumptions This paper, in using the input output tables, does not spell out these assumptions while depending on them to reach its conclusions

The first assumption underlying the use of the input output table to derive job multi pliers is that the production function underlying each sector of the economy is of a Leontief, or fixed proportions, type There is ample evidence for the Irish economy, and other economies, that this is not a realistic assumption The proportion of the different inputs used in producing a given level of output is not fixed, being sensitive to, among other things, the relative prices of the inputs

The second strong assumption underlying the paper is that the rate of increase in the pro ductivity of labour is identical for all sectors of the economy This is clearly controverted by the experience of the Irish economy This assumption is crucial in deriving the multipliers described in Table 2 of the paper If, as is the case, the rate of productivity increase is much greater in some sectors than in others, then the effect of an increase in final demand on employment cannot be derived from the average productivity levels implied by the 1975 input output table

Because of the clearly unrealistic nature of these assumptions, the results shown in this paper cannot be applied to marginal changes in the economy nor, as a result, to the structure of the conomy in years other than 1975 What they do provide is an interesting picture of the structure of the economy at a point in time This restriction has frequently been ignored by those who wish to derive simple, and generally large multipliers, using input output tables However, it should be recognised that the results of such exercises are based on a set of very unrealistic assumptions

In deriving the amount of employment in the services sector "traceable" to final demand, no account is taken of the fact that the output of the industrial sector consumed domestically and the output of the retail/wholesale sectors are joint products In the input output table they are treated as separate inputs into final demand, in particular in to consumption However, it is clear that the vast bulk of such goods are sold to consumers indirectly involving an input from the distribution sector As much of the output of this sector is concerned with selling domestically produced output from the industrial sector much of the employment in that sector is related to the demand for such industrial goods Given the high level of employment in the distribution sector the results of the paper would be significantly altered by taking this factor into account To do so, involves allocating the distribution margin over the other goods and services entering final demand

Finally, the author uses the 1969 EEC input output table, including both imports and taxes, to compare the structure of the economy in 1969 and 1975 It would have been

preferable to have used the CSO's version of the 1969 input output table with these factors taken out The Department of Finance, with assistance from the CSO, also prepared a version of the 1969 EEC table excluding these factors Both these tables can be made available to the author on computer tape, if he is interested in pursuing the matter

J P Neary As a colleague of Bill O'Riordan's it goes without saying that I would like to be associated with the many positive comments which have been made on his paper this evening He has also been taken to task by a number of speakers and I would like to discuss some of the issues raised

The principal criticism which has been made of this paper, and indeed of input output analysis in general, relates to the difficulties in identifying average with marginal co efficients In my view, it is important to recognise that this criticism embodies two quite distinct points The first of these, to which Jim O'Leary and John FitzGerald have drawn attention, is the assumption of fixed coefficients in production Thus, when the paper shows that a given increase in final demand for the output of the goods producing sectors will indirectly generate additional employment in those sectors (mostly in fact in the meat and dairy products industries, as Bill O'Riordan pointed out), most of us do not believe the results because the output of those sectors could be easily increased with no additional employment

The assumption of fixed coefficients is therefore a serious drawback of input output analysis However, in my view it is not the most worrying After all, any serious analysis must make assumptions which depart from reality to some extent If the only price to be paid for taking account of the full richness of interindustry transactions was a mis specification of the production function (possibly a minor one in the short run) I feel many of us would be prepared to pay it My own view is that the answer to Eamon Henry's question "Why is input output analysis not used to a greater extent?") has more to do with the second sense in which the method fails to distinguish between average and marginal coefficients namely, its neglect of the opportunity cost of the additional resources which are used when final demand is increased In particular, standard input output models make no distinction between traded and non traded inputs, despite the fact that it is only changes in the latter which can be viewed as genuinely "induced" by a change in final demand Returning to the example of agriculture, the additional demand for agricultural products consequent on an increased demand for final goods, would in practice be met by a reduction in exports of agricultural goods rather than by any change in output This point calls into question many of the calculations which are normally made with input output analysis Of course, one reason why I am not embarrassed to make this point this evening is that marketed services are probably the one form of output which most of us would agree is exempt from this criticism Allowing as always for some simplifications of reality, such services for the most part are likely to be non traded, at least in the short run, and so tonight's paper is exempt from the second criticism I have raised In my view therefore the paper is absolutely fine as positive economics and makes a useful contribution to our understanding of the structure of the economy

I must, however, add some remarks about normative issues These hardly feature in the paper itself and were mentioned by Dr O'Riordan only in his aside that (because of the size of the sector's multipliers) he is "becoming very fond of the building industry" I would predict that, if Dr O'Riordan continues to make remarks along these lines, the building industry is going to become extremely fond of him! In other words, there are always interest groups and uninformed policy makers around who are all too eager to jump on isolated aspects of an exercise in positive economics and to draw quite unjustified conclusions from them I feel it cannot be too strongly emphasised that, even if the two difficulties I have mentioned already were overcome (i e , even if input output coefficients were in fact fixed and all inputs were non traded with zero opportunity costs), a high "multiplier" attaching to the final demand of a particular sector would still not constitute in itself an argument for intervention I would not wish this point to be interpreted reflecting a bias against intervention in general As debates between economists are increasingly popularised in the media, one sometimes gets the impression that economists are divided into two camps, one staunchly opposed to all intervention and the other favouring it in all circumstances This is silly over simplification and distracts attention from the need to measure the parameters which will determine whether intervention is justified in any particular case Among the most important of these are the opportunity cost of government funds and the shadow prices of the factors to be used in the project Input-output analysis is an essential prelude to the detailed cal culation of shadow prices, and tonight's paper is a step on the road towards operation alising normative economics in the Irish context However, (Dr O'Riordan's flirtation with the building industry apart) it has nothing directly to say about normative issues themselves

P Honohan No matter how you look at it, whether using Dr O Riordan's Input Output approach, Dr Bradley's econometric model approach, or simply the naive approach of looking at the direct inputs only, as in Table 4, it turns out that relatively little of services employment is associated with the goods producing sectors And I would doubt that the situation is improving in the sense of goods production becoming more effective in generating services employment My interpretation of Table 5 is not that increments to the demand for goods became more service employment intensive between 1969 and 1975, but rather that the gross output of goods in the economy grew much more rapidly than GNP or than personal consumption — which presumably is the other main source of demand for marketed services

Looking into the future, we have projections that office machines and chemicals will be the growth sectors in manufacturing In that regard I would mention a caution in connection with Table 2 While these two sectors are among the highest in the ratio of "associated" services employment to own employment (as shown in Column VI) they both tend to have extremely low employment content Thus output growth in these sectors would not necessarily be associated with above average induced services employ ment It would be interesting to have an additional column which shows for each sector the ratio of associated services employment to own output

There are two forms of induced service employment One is through the direct linkage type of effect discussed in Dr O'Riordan's paper The other relates to services demand

associated with higher consumer expenditure The distinction between these effects has been blurred in public debate What is confirmed by this paper is that the first form of linkage is likely to be very weak We can forget about getting 10 or 15 new service jobs for every new job in manufacturing At best we might expect 1 new service job for every 2 new manufacturing jobs But that does not mean that service employment growth will not greatly exceed manufacturing employment growth in the economy as a whole

K A Kennedy This paper is a pioneering effort in an important but little researched area The general impression it leaves, however, is not optimistic as far as future growth in marketed services is concerned Over the period 1969 75, the total growth in marketed services employment, from all sources, was about 3,500 a year on average Bearing in mind that this was a period of greater buoyancy in economic activity than can reasonably be expected in the next few years, a remarkable transformation would be required if employment in services were to carry the main burden of reducing unemployment at a time when employment in the public services is scheduled to fall

The amount of marketed services employment identified in the paper as being linked directly and indirectly to the goods producing sectors is only a small part of the total of marketed services employment in 1975, 97,000 out of a total of 325,000 Although the *share* was growing from 1969 to 1975, this must be seen in the context that there was no growth at all in the rest of marketed services employment, i e , the part that was not "industrially generated "

In regard to the employment multiplier of 3 06 for manufacturing, several speakers as well as the author have stressed that this is a purely descriptive average at one point in time, so that great care must be taken in drawing inferences about behaviour over time Professor Neary has rightly noted, for instance, that a rise in meat processing in manufacturing might not induce any increase in agricultural production but simply a diversion from exports in primary form I would add that even if agricultural *production* rose, there would probably be no increase in *employment* in agriculture This is important since agriculture makes up 1 41 of the 2 06 jobs outside final demand manufacturing (the own multiplier making up the other 1 00) Since agricultural employment is expected to go on falling more or less independent of growth in agricultural output, the marginal multiplier is therefore dramatically less than the figure of 3 06 that is given for 1975

It is puzzling to find in Table 7 that the ratio of induced market service employment to total goods producing sector employment is higher in Ireland than in any other EEC country Perhaps not too much should be made of the difference, since the figures are in all cases low Nevertheless it is surprising to find Ireland at the top, for two reasons First, Ireland has a relatively bigger agricultural sector, and agriculture tends to induce less services jobs than industry Second, Ireland is less developed industrially, and one would expect a greater externalisation of services procurement by firms in more advanced industrial systems The only explanation I can suggest is that Ireland, at the external level, has a peripheral location, and, at the internal level, a low population density Both factors would involve a relatively high use by the goods producing sectors of services such as transport and communications

Reply by W K O'Riordan I thank Professor Henry for his kind remarks His suggestions about the possible source of the high intensity of MSSE are valuable and may go a long way to explain the phenomenon I am sure that as we accumulate more information — and in particular a new set of I O tables for a later year — we may be able to investigate the problem in more detail I find his suggestions about decomposition of the labour force by type of employee particularly interesting and I hope to investigate this matter in the near future

As Mr O'Leary points out, the most significant finding of the paper is that the growth of the MSS is almost entirely due to increased interindustry demand However, even when this is allowed for, industry still seems to be becoming less labour intensive We simply do not have the information needed to form reliable conclusions about the effects of lack of homogeneity in the service categories Indeed, it is not clear that this lack of homogeneity in the services is any worse than in any other category Some products of the food industry, for example, are very labour intensive and some are not Input Output analysis is at best crude and only its larger results are worth considering

Mr O'Leary is quite right in pointing out that this is an exercise in average quantities rather than in marginals and that marginal conclusions should not be drawn The main questions in the paper were designed to be answered in average terms, and I believe that I have not used the term "marginal" at all The reference to multipliers was made as a passing comment There is considerable irony in the attention which these multipliers have received, they were merely intended as a casual aside, but they have attracted more attention than anything else

Finally, Mr O'Leary asks "what *economic* significance attaches to assertions that £xm of final demand in GPS generates £ym of interindustry demand for such services where large subsidies or inefficiencies exist?"

No doubt he is right The economic significance may be hard to untangle However, the practical significance is fairly obvious as long as the underlying structure persists

I share Professor Kennedy's pessimism about the future growth of employment in the MSS When I first undertook this research, I had hoped to find considerable scope for growth in the MSS in Ireland Professor Henry has made some suggestions as to the reasons for the high ratio and the additional suggestions made by Professor Kennedy are very interesting It is possible that the phenomenon is caused by the composition of our industrial sector and that even though the ratio is high it may be capable of further expansion I am at present engaged on a cross country study to investigate this

The large size of the employment multiplier is due in substantial measure to the rather peculiar structure of industries (310) — meat and meat products — and (330) — milk and dairy products If these are excluded, the employment multiplier for manufacturing industry falls to 1 66 I have already mentioned the fact that my reference to multipliers was a mere casual comment

Like Mr O'Leary, Mr FitzGerald quite rightly points out that this is an exercise in average quantities rather than in marginals I have already made several comments on this matter in replying to Mr O'Leary

On Mr FitzGerald's second point, it is difficult to decide how one may best treat the output of the distribution (that is, the wholesale and retail) sector Undoubtedly some part of the output of that sector is necessarily required for the consumption of goods The problem is to decide how much is to be so regarded A man buying a television set could, in principle, go to the factory and buy it, thus requiring no service from distribution Alternatively, by buying it from a shop, he decides to purchase the set and a service By regarding all distribution services which are paid for directly by the consumer as an input into consumption, I am deliberately choosing to underestimate rather than overestimate induced MSSE

I am very grateful for the offer of the 1969 matrix net of taxes and imports I had heard of its existence but had not been able to locate it I shall be very happy to receive it in due course

I would agree with Dr Honohan's interpretation of Table 5 As to his second point (the ratio of service employment to output in various sectors) it seems to me that the really important statistic is the ratio of total employment (GPS + MSS) to total output in each sector I am at present working in a cross country study of this for eight EEC countries On data from three countries, it would seem that of the two industries which he mentions, chemicals were below average in employment content in 1975 and office machines above average In general, as Dr Honohan rightly says, the main message of this paper is that we can forget the notion of 10 service jobs for each new 1 in manufacturing