An Alternative Measure of Employment Intensity

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Abstract: The input output tables in Eurostat (1983) are used to infer the total employment generated by final demand in 41 NACE Sectors in each of the 8 EEC countries in 1975. Average employment intensities (AEI) are then calculated by dividing total generated employment in each sector by final demand. The results show a good deal of consistency and it is possible to identify sectors which had uniformly high and low AEI's in the EEC countries. The AEIs of the service sectors are compared with those of industry. In general there is no evidence that the marketed services had substantially higher AEIs. While the evidence on the public services is somewhat scanty, it would seem that the public services were more employment intensive than industry. Ireland is an exception in that all its service sectors were, in general, more employment intensive than industry.

I INTRODUCTION

This paper is concerned with the question of employment-intensity in the various sectors of the economy, so it is necessary to ask at the outset what one means by employment intensity. It is, perhaps, natural to define it in terms of the relationship between total output and total direct employment in a sector. This definition is both reasonable and widely accepted, but it is not necessarily the most appropriate in all circumstances. Policies which are aimed at creating employment usually work by stimulating final demand rather than total output. The final demand for the output of a particular sector creates employment not only in that sector but throughout the economy, when the sector in question draws on others for inputs into its production process. In general, policy-makers would wish to favour those sectors where a given amount of demand creates a relatively large number of jobs irrespective of the sector in which they arise. Thus it is reasonable to give some attention to the ratio:-

(Number of jobs created throughout the economy by the final demand for the output of sector i)/(final demand for the output of sector i).

This is the definition of employment intensity adopted in this paper. It seems to provide a sensible criterion for comparing the job-creating potential of demand for the output of the various sectors of the economy.

Obviously, such an approach must rely on input-output (I-O) analysis as a starting point, because only such tables provide the detailed information which is needed. The I-O tables used are those published in Eurostat (1983) which are consistent across the 8 EEC countries and exclude imports and taxes. Conditions in all of the 8 countries are studied. The findings refer to the year 1975 which is as yet the only year for which consistent tables are available. Estimates of the employment intensity (as defined above) for 41 sectors are produced. In 31 cases all 8 countries are covered; in the remaining 10 there are some gaps in the information available. The study covers agriculture, 26 industries, 10 marketed services and 4 public services.

II   THE METHOD

The basic method is quite straightforward and has already been explained in detail in O'Riordan (1984), so it is merely summarised here. For each of the 8 EEC countries, a 44×44 I-O table is available whose entries are free of imports and taxes. The inverse of this table (represented hereafter by $(I-A)^{-1}$) is also available, as are the 44 element vectors of total output (X) final demand (Y) and employment (N). The basic I-O relationship is

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

In using this set of equations one is, of course, assuming a Leontief production function with its well-known highly restrictive assumptions. The function is homothetic, has constant returns to scale, equal average and marginal productivities and zero elasticity of substitution. In consequence, the input composition of a unit of output of any sector is identical at the margin to the average composition of output.

In view of all this, the main justifications for using I-O tables as a basis for any kind of analysis must be practical. They provide a wealth of detailed information which could not be obtained in any other way. They have been used in a very great number of applications with results that have been judged acceptable. Finally, the inaccuracies are likely to be minimised in the present case because of the way in which the I-O tables are used. Like any linear approximation, I-O analysis may be expected to provide a reasonable degree of accuracy in the neighbourhood of a central point and to fall off in accuracy as one moves away from that point. Any given I-O table is associated with a particular vector of final demands which we may call its own vector. We may expect it to give acceptably accurate results when it is used in combination with its "own" vector of final demands. There is, of course, some degree of imprecision because the

assumption of constant input coefficients is used in the second and subsequent rounds of the process that generates total output; the effect of this is, however, likely to be small. More substantial inaccuracies are likely to result when the I–O table is used with "alien" vectors of final demand, that is, vectors which are not its own. In the present case, all the results are obtained by using the "own" vectors of final demand.

Returning to the basic relationship

$$X = (I-A)^{-1}Y,$$

if one considers element i in this relationship one has: —

$$X_i = (I-A)_i^{-1}Y \qquad (2)$$

(where $(I-A)_i^{-1}$ is the ith row of $(I-A)^{-1}$).

This shows how the total output of sector i is ultimately related to the final demand for the output of each of the 44 sectors.

The jth component of the sum on the right-hand side: —

$$(I-A)_{ij}^{-1}Y_j \qquad (3)$$

represents the amount of the output of sector i which is generated by (or "traceable to") the final demand in sector j. If one makes the assumption that the partitioning of employment within any sector is proportional to the partitioning of output (so that if (say) 5 per cent of the output of sector i is traceable to final demand in sector j, then 5 per cent of the employment in sector i is also traceable to final demand in sector j), and using N_{ij} to represent the amount of employment in sector i which is generated by final demand in sector j, then

$$\frac{N_{ij}}{N_i} = \frac{(I-A)_{ij}^{-1}Y_j}{X_i} \qquad (4)$$

or

$$N_{ij} = \frac{(I-A)_{ij}^{-1}Y_jN_i}{X_i} \qquad (5)$$

The N_{ij} may be calculated from the quantities on the right-hand side which are all known. By adding over the j, one can then find the total amount of employment throughout the 44 sectors which is generated by the final demand in sector j. This total can then be divided by the final demand in the sector to give an estimate of the sector's average employment intensity.

In the rest of this paper, N_{it}^* will be used to indicate the total amount of employment generated throughout the economy of country t by the final demand for the output of sector i in that country. As is conventional, Y_{it} represents the final demand for the output of sector i in country t. N_{it} will be used

to indicate the number of people at work in sector i, that is, the "actual" employment of sector i in country t.

The N_{it}^* in themselves convey little information. They take on meaning only when they are related to other quantities. As a preliminary exercise, they may be compared with the N_{it} to show the degree to which actual and generated employment differ. In section 4 below this is done by forming N_{it}^*/N_{it} because the ratios are most easily discussed. The most interesting ratio is, however, that of total generated employment to final demand in each sector of each country. This is termed average employment intensity $(A_{it} = N_{it}^*/Y_{it})$. The N_{it}^* are measured in thousands of employees and the Y_{it} in millions of US dollars.[1] This latter unit is chosen mainly because it gives manageable results and not primarily to enable international comparisons to be made. The exchange value of a currency may not give a totally accurate indication of its internal purchasing power, so comparisons of sectors within each country are more likely to give accurate results than international comparisons based on employment per unit of final demand. For this reason international comparisons of the values of A_{it} are avoided as far as possible.

III   THE DATA

The basic source of data is Eurostat (1983). The importance of this publication is that it provides consistent I-O tables for 8 EEC countries for the same year (1975). The countries covered are: West Germany, France, The Netherlands, Belgium, Denmark, Italy, The United Kingdom and Ireland.

The tables use the 44-sector NACE categorisation. This gives data for agriculture, 26 industries, 13 marketed services and 4 non-marketed service sectors. The publication gives the $(I-A)^{-1}$ matrices, the total output vector X and the final demand vector Y. The data available in the case of three of the marketed services, namely:—

750   (Marketed Education and Research)
770   (Marketed Health Service)
790   (Other Marketed Services)

are scanty and unreliable so that they have been excluded from the study. Information on sector 110 (Radio-active Materials) is available only in the case of France. A few sectors are not reported in all the 8 countries. In particular, there are many gaps in the data on Sectors 850 (Public Education), 890 (Public Health) and 930 (Other Public Services). However, these have been included because of the importance of the public services.

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1. The exchange rates are taken from IMF (1978) and are:
for US$ 1975. Germany 3.070; France 5.774; Netherlands 3.147; Belgium 46.273; Denmark 7.232; Italy 800.201; UK 0.5784; Ireland 0.5784.

The $(I-A)^{-1}$ matrix for Ireland is not given in Eurostat (1983). Fortunately, a matrix of the same type, which is consistent with those of Eurostat (1983), is available in CSO (1983). The $(I-A)^{-1}$ matrix and the X and Y vectors are of order 41 instead of 44, but this is of little importance for the present purposes being mainly caused by the amalgamation of some of the smaller service sectors.

The term "employment in sector i" as used here covers all the people at work in the sector and not merely the wage earners. The employment vector N was more difficult to obtain and some degree of approximation was necessary. The basic source of information was Eurostat 1984, amplified by the more detailed information in Eurostat 1976. Full details of the methods used are too tedious to publish here but are available from the author to anyone who is interested. Some data for Italy were obtained from Momigliano and Siniscalco (1982). All Irish data are from unpublished figures kindly supplied by the Central Statistics Office.

IV   THE RESULTS

In Table 1, two figures are given in each section. The first is the total amount of employment generated by the final demand in the sector and country in question (N_{it}^*). These are merely basic data and take on meaning only when they are compared with other quantities. The second figure in each case is the ratio of total generated employment to actual employment (N_{it}^*/N_{it}).

It is not surprising to find that there are many sectors in which the ratio N_{it}^*/N_{it} is substantially different from unity. These differences are largely caused by the ratio of final demand to net output in the sector in question. When the ratio is low, N_{it}^* is less than N_{it} because a large part of N_{it} is used in satisfying final demand in other sectors. When the ratio is high, N_{it}^* is in general greater than N_{it} because most of N_{it} and a substantial amount of the employment in other industries is used to satisfy the final demand in sector i.

N_{it}^* is less than N_{it} in all countries in Sectors 010 (Agriculture), 150 (Non-metallic minerals), 190 (Metal Products), 470 (Paper), 490 (Rubber and Plastic), 610 (Inland Transport), 650 (Ancillary Transport), 670 (Communications), 690 (Credit) and 710 (Services to Enterprise). N_{it}^* is greater than N_{it} in all countries in Sectors 210 (Machines)[2] 270 (Motor Vehicles)[3] 310 (Meat) 330 (Milk) 350 (Other Food) 370 (Beverages)[2] 390 (Tobacco) 41 (Textiles) 430 (Leather) 530 (Construction) 590 (Catering) 630 (Sea, Air Transport) 730 (Renting) 810 (General Public Service) 850 (Non-Market Education) 890 (Non Market Health). It is thus clear that Table 1 shows a good deal of consistency over the 8 countries in the ratio N_{it}^*/N_{it}. The most dramatic

2. Belgium is an exception.
3. Ireland is an exception.

Table 1: *Employment Generated by Final Demand in Each Sector (1975) ('000)*

		GR	FR	NL	BLG	DK	ITL	UK	IRL
010	Agricultural Products	397 (0.22)	755 (0.36)	111 (0.42)	64 (0.47)	57 (0.25)	1367 (0.41)	488 (0.73)	56 (0.23)
030	Coal	86 (0.39)	30 (0.33)	0 (—)	11 (0.34)	0 (—)	0 (—)	119 (0.36)	0.3 (1.00)
050	Coke	46 (*)	5 (*)	0 (—)	1 (0.50)	0 (—)	0 (—)	29 (2.23)	0 (—)
070	Petroleum & Natural Gas	44 (0.94)	70 (1.49)	19 (1.36)	6 (0.86)	3 (1.00)	30 (0.80)	49 (1.44)	0.3 (1.00)
090	Electricity, Gas, Water	136 (0.56)	154 (0.84)	31 (0.67)	22 (0.63)	11 (1.00)	86 (0.54)	414 (1.13)	8 (0.53)
110	Radio Active Materials	0 (—)	7 (1.17)	0 (—)	0 (—)	0 (—)	0 (—)	0 (—)	0 (—)
130	Ferrous and Non-Ferrous Metals	368 (0.74)	184 (0.60)	37 (0.88)	147 (1.26)	6 (0.75)	91 (0.28)	216 (0.44)	3 (2.14)
150	Non-metallic Minerals	154 (0.33)	92 (0.28)	15 (0.32)	30 (0.38)	8 (0.25)	133 (0.30)	104 (0.31)	13 (0.59)
170	Chemical Products	534 (0.82)	356 (0.96)	125 (1.28)	106 (1.26)	24 (1.00)	330 (0.97)	469 (0.93)	12 (1.33)
190	Metal Products	447 (0.45)	473 (0.64)	64 (0.55)	65 (0.59)	24 (0.57)	305 (0.64)	380 (0.55)	9 (0.82)
210	Machines	1517 (1.33)	515 (1.22)	95 (1.06)	95 (1.27)	79 (0.99)	717 (1.63)	1125 (1.25)	6 (1.20)
230	Office Machines	274 (0.89)	186 (1.41)	28 (1.22)	9 (1.13)	7 (1.75)	118 (1.24)	316 (1.31)	8 (1.86)
250	Electrical Goods	1036 (1.00)	558 (1.02)	134 (1.06)	116 (1.10)	35 (0.80)	476 (1.10)	814 (1.02)	11 (1.22)
270	Motor Vehicles	986 (1.56)	656 (1.36)	29 (1.26)	65 (1.30)	0 (—)	467 (1.65)	796 (1.60)	6 (1.00)
290	Other Transport Equipment	210 (1.22)	308 (1.08)	87 (1.30)	29 (1.12)	43 (1.23)	196 (1.32)	394 (0.83)	6 (1.00)
310	Meat and Meat Products	709 (7.62)	731 (11.98)	155 (5.34)	97 (12.13)	149 (4.38)	837 (6.98)	267 (2.38)	146 (14.60)
330	Milk and Dairy Products	414 (4.93)	423 (4.45)	135 (4.66)	44 (3.14)	60 (15.00)	357 (9.92)	217 (3.19)	83 (8.30)
350	Other Food Products	680 (2.04)	600 (1.95)	129 (1.30)	75 (1.01)	71 (2.09)	854 (4.95)	690 (1.65)	46 (1.77)
370	Beverages	278 (1.17)	115 (1.72)	23 (1.53)	8 (1.00)	29 (1.07)	94 (1.40)	214 (1.65)	19 (2.38)
390	Tobacco	67 (1.60)	56 (5.09)	18 (1.38)	17 (1.21)	11 (1.83)	63 (1.80)	85 (2.18)	5 (2.08)
410	Textiles	853 (1.08)	768 (1.05)	104 (1.11)	207 (1.06)	44 (1.13)	1195 (1.11)	961 (1.07)	40 (1.21)
430	Leather and Footwear	128 (1.16)	156 (1.24)	13 (1.18)	12 (1.09)	7 (1.16)	333 (1.36)	153 (1.18)	10 (1.67)
450	Timber and Wooden Products	462 (0.97)	252 (1.00)	39 (0.74)	60 (1.07)	30 (1.03)	345 (0.87)	185 (0.69)	6 (0.75)

Table 1. *contd.*

	GR	FR	NL	BLG	DK	ITL	UK	IRL
470 Paper and Printing	295 (0.53)	159 (0.43)	59 (0.58)	33 (0.46)	25 (0.45)	133 (0.47)	231 (0.38)	9 (0.56)
490 Rubber and Plastic	161 (0.47)	116 (0.49)	20 (0.69)	22 (0.85)	9 (0.56)	108 (0.46)	108 (0.43)	5 (0.83)
510 Other Manufactures	72 (1.07)	125 (1.19)	60 (0.87)	19 (1.00)	11 (1.38)	118 (1.62)	88 (0.88)	2 (1.42)
530 Construction	3138 (1.69)	2643 (1.53)	448 (1.17)	383 (1.44)	248 (1.33)	2261 (1.30)	2174 (1.63)	114 (1.28)
550 Recovery and Repair	255 (0.89)	227 (1.42)	63 (0.78)	45 (0.76)	21 (1.11)	293 (0.57)	0 (—)	7 (0.64)
570 Wholesale and Retail	2740 (0.84)	2570 (0.99)	685 (1.08)	459 (0.91)	269 (0.94)	2315 (0.97)	3053 (0.93)	113 (0.88)
590 Lodging and Catering	543 (1.30)	768 (1.73)	79 (1.14)	109 (1.47)	54 (1.38)	968 (1.74)	1521 (1.69)	38 (1.03)
610 Inland Transport	519 (0.70)	354 (0.48)	84 (0.54)	111 (0.69)	31 (0.46)	446 (0.63)	456 (0.41)	10 (0.37)
630 Maritime and Air Transport	130 (1.23)	157 (1.73)	48 (1.41)	28 (1.33)	39 (1.39)	111 (1.73)	202 (1.74)	11 (1.10)
650 Ancillary Transport	42 (0.16)	58 (0.28)	33 (0.65)	50 (0.76)	12 (0.48)	49 (0.35)	0 (—)	1 (0.14)
670 Communication	230 (0.46)	148 (0.28)	35 (0.41)	40 (0.36)	23 (0.40)	101 (0.45)	261 (0.47)	7 (0.27)
690 Credit and Insurance	531 (0.59)	464 (0.73)	115 (0.81)	101 (0.63)	51 (0.53)	88 (0.33)	1141 (0.77)	10 (0.43)
710 Services to Enterprise	264 (0.37)	312 (0.37)	105 (0.43)	98 (0.76)	13 (0.18)	115 (0.26)	0 (—)	2 (0.11)
730 Renting Immovable Goods	243 (*)	112 (1.70)	34 (*)	32 (1.39)	54 (4.50)	185 (*)	136 (3.86)	5 (3.33)
810 General Public Service	3251 (1.26)	2576 (1.34)	616 (1.26)	464 (1.16)	705 (1.27)	1875 (1.24)	2945 (1.48)	115 (1.26)
850 Non-Market Education	1071 (1.23)	988 (1.15)	333 (1.18)	309 (1.09)	0 (—)	830 (1.08)	1158 (1.20)	0 (—)
890 Non-Market Health	221 (1.30)	0 (—)	0 (—)	0 (—)	0 (—)	810 (1.24)	1199 (1.51)	61 (1.17)
930 Other Non-Market Services	161 (1.30)	0 (—)	4 (1.00)	0 (—)	2 (1.00)	203 (1.16)	383 (1.71)	59 (1.04)

Figures in parentheses are N_{it}^*/N_{it}.

*Ratio not available for technical reasons. See Text.

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downward shift is in Sector 010 (Agriculture); the greatest upward shifts are in
Sectors 310 (Meat) and 330 (Milk). Clearly these shifts are closely related to each
other.

It is, perhaps, worth observing that if one takes the sum of N_{it}^* in Sectors 010
(Agriculture), 310 (Meat), 330 (Milk), 350 (Other Food) and 370 (Beverages) —
that is the total employment generated by the demand for food and drink — and
expresses this as a percentage of total private sector employment, one finds that
the percentage ranges from 10 per cent in the UK to 41 per cent in Ireland. Thus
there is, perhaps, some basis for the belief that Ireland is an "agricultural
country" or, at least, was one in 1975.

Table 2 shows the average employment intensity (A_{it}) of each sector in each
country. This has already been defined as N_{it}^*/Y_{it}, that is the average amount of
employment generated throughout the economy by one million US$ of final
demand in the sector in question. For reasons given above, it is best to avoid
international comparisons, so instead, each value is compared with the national
average employment intensity. This figure is found by dividing total generated
employment (N_{it}) by total final demand in millions of US$ (Y_{it}) in each country.
These averages are given at the foot of Table 2. This enables us to identify the
sectors in which a given amount of demand generated (on the average) relatively
high and low levels of employment. In making the comparisons, it is probably
best to exclude the following Sectors:— 110 (Radio-Active Materials) (only 1
observation), 050 (Coke) and 890 (Public Health) (only 4 observations) and 510
(Other Manufactures) (not a homogeneous industry). When the exercise is
carried out, two facts are immediately obvious. First, there is a great deal of con-
sistency in the results. Of the 37 sectors considered, one finds:—

Table 2: *Average Employment Intensity in each Sector (1975)*

	GR	FR	NL	BLG	DK	ITL	UK	IRL
Agricultural Products	127	118	60	65	94	224	142	196
Coal	70	109	—	113	—	—	135	211
Coke	54	43	—	54	—	—	112	—
Petroleum & Natural Gas	7	10	4	3	6	5	11	5
Electricity, Gas, Water	30	40	18	24	21	43	89	69
Radio Active Materials	—	12	—	—	—	—	—	—
Ferrous and Non-Ferrous Metals	53	52	30	45	58	63	116	37
Nonmetallic Minerals	61	72	50	66	61	104	119	92
Chemical Products	49	49	30	34	49	65	90	55
Metal Products	63	76	57	71	63	100	132	95
Machines	71	62	51	47	75	92	127	81

Table 2. *contd.*

	GR	FR	NL	BLG	DK	ITL	UK	IRL
Office Machines	65	78	73	62	41	101	147	62
Electrical Goods	68	77	41	60	83	95	136	84
Motor Vehicles	66	69	42	26	—	92	136	60
Other Transport Equipment	77	86	52	58	55	97	146	92
Meat and Meat Products	87	95	62	49	90	144	144	178
Milk and Diary Products	109	92	58	63	88	162	176	173
Other Food Products	58	70	34	39	58	114	100	99
Beverages	63	55	27	21	49	98	71	94
Tobacco	18	31	23	31	23	35	24	25
Textiles	78	93	52	79	62	132	148	115
Leather and Footwear	79	81	64	69	80	114	136	139
Timber and Wooden Products	77	92	58	59	65	109	118	115
Paper and Printing	62	68	51	55	67	91	111	94
Rubber and Plastic	64	71	47	48	51	92	120	75
Other Manufactures	61	74	144	51	60	74	111	122
Construction	71	71	57	56	58	117	109	129
Recovery and Repair	47	55	57	50	49	127	—	147
Wholesale and Retail	81	78	73	74	60	109	147	199
Lodging and Catering	72	78	78	45	78	127	139	258
Inland Transport	77	101	70	92	65	132	161	165
Maritime and Air Transport	39	66	29	47	31	48	28	90
Ancillary Transport	107	56	60	45	86	88	—	70
Communication	70	125	62	140	115	98	114	185
Credit and Insurance	117	211	118	171	336	132	336	221
Services to Enterprise	34	55	91	36	71	87	—	95
Renting Immovable Goods	10	8	12	12	20	19	13	16
General Public Service	82	96	78	98	91	150	132	188
Public Education & Research	74	83	72	92	—	131	107	—
Public Health Service	79	—	—	—	—	151	135	173
Other Public Services	78	—	70	—	67	141	152	156
Average	64	73	52	54	60	102	115	127

8 above average in all cases (for which data are available):— 010, 030, 330, 430,
   610, 690, 810, 930.
5 above average in all but one case:— 310, 450, 570, 590, 850
2 above average in all but two cases:— 410, 670
7 below average in all cases:— 070, 090, 170, 370, 390, 630, 730
2 below average in all but one case:— 130, 350
3 below average in all but two cases:— 470, 490, 710

Of the 10 sectors which remain, the following may reasonably be described as
being 'about average' in their employment intensity in all, or in the great
majority of countries:— 150, 190, 210, 290, 530. In this regard, Sector 530 (Con-
struction) is particularly interesting because the values are remarkably close to
the national averages in all cases. In 1975, at least, there was little justification
for the widespread belief that this sector generates an usually great amount of
employment throughout the economy. The 5 sectors which remain unclassified
are 230, 250, 270, 550 and 650. All of these show fairly substantial deviations in
both directions from the national means. It thus appears that over 85 per cent of
the sectors for which adequate data are available show consistent results in their
average employment intensities. This consistency would seem to indicate that
the method provides a meaningful way of looking at employment intensity. The
second fact which is obvious from Table 1 is that there are some sectors which
deviate both consistently and *substantially* from the national means and thus may
be identified unambiguously as sectors of high and low average labour intensity.
One may, perhaps, define 'substantially above (or below) average' as meaning
at least 20 per cent above (or below) average in all but two or more cases. There
is, of course, an element of arbitrariness in choosing this criterion, but there
seems to be a natural break at about this level. If, for example, the standard were
lowered by 5 per cent only one extra sector would be added to the list.
   On this criterion, and excluding as before sectors 050, 110, 510 and 890, the
Sectors which deviate substantially from the national means are:—

Above: 010 (Agriculture), 030 (Coal), 310 (Meat Products), 330 (Milk & Dairy
          Products), 610 (Inland Transport), 690 (Credit & Insurance), 810
          (General Public Service), 930 (Other Public Services).

Below: 070 (Petroleum), 090 (Electricity, Gas, Water), 170 (Chemicals), 390
          (Tobacco), 630 (Sea, Air Transport), 730 (Renting Immovable
          Goods).

A word of caution must be said about Sector 690 (Credit and Insurance). A
glance at any of the 1-0 tables in Eurostat (1983) will show that the entries for
this Sector are atypical. In particular the element on the main diagonal of the
$(I-A)^{-1}$ matrix which corresponds to it is very much bigger than that for any

other industry; values range from 2.2 to 4.2, while in the case of other industries they rarely exceed 1.3. This is caused by the way in which the output of the sector is treated. Apart from service charges, its output is regarded as being sold to itself, so that very little is supplied to final demand. There are, no doubt, sound technical reasons for doing this, but it must cast serious doubts on the reliability of any analysis (such as the present one) which uses the input to final demand for this Sector. The conclusions about Sector 690 will not be regarded as reliable in this paper. It is to be expected that its labour intensity will be considerably over-estimated.

One notes that the list of industries with average employment intensities which are substantially above average consists entirely of 'traditional' industries (011, 030, 310, 330) and Service Sector Industries (610, 690, 810, 930). One also notes that two of the high-technology industries (070 and 170) appear in the below-average list.

The results in Table 2 suggest that one should ask whether the service sectors are more employment intensive than the industrial sectors. Table 3 addresses this question. In each country, the mean and standard deviation for the observed values of the average employment intensities (N_{it}^*) in the industrial sectors have been calculated. The observed average employment intensities in the marketed services have then been expressed in standard deviations above the mean of the industrial sectors. The results are shown in Table 3. The dash indicates that the observed value is below the industrial mean.

The marketed services (550 to 730) and the public services (810 to 930) will be considered separately. Considering the marketed services first, it is clear that sectors 550 (Recovery and Repair), 630 (Sea and Air Transport), 650 (Ancillary Transport), 710 (Services to Enterprise) and 730 (Renting of Immovable Goods) are not more employment-intensive than the industrial sectors. Sectors 570 (Wholesale and Retail), 590 (Lodging and Catering) and 610 (Inland Transport) have intensities above the industrial average, but the difference in most countries is not dramatic and it would be easy to find industrial sectors which were as employment-intensive. Sectors 670 (Communication) and 690 (Credit and Insurance) show values which are, in general, well above those in the industrial sectors; however, as has been explained above, the results for 690 are suspect, so 670 emerges as the only sector where there is some evidence of consistently high employment intensities.

The data on the public sector are scanty and it is not wise to try to draw too many conclusions from them. One notes that only a single negative value appears and that this contrasts with the data for the marketed services. Sector 810 (General Public Services) (which is responsible for over half the public sector employment in each country) is the only one of these for which a full set of data is available. The values shown in Table 3 for this sector are all positive and in general, quite high, so it seems reasonable to conclude that in the EEC countries

Table 3: *Service Sector Average Employment Intensity: Standard Deviations above Industrial Mean*

	Country							
Sector	GR	FR	NL	BLG	DK	ITL	UK	IRL
550 Recovery and Repair	(—)	(—)	0.30	(—)	(—)	0.98	NA	1.00
570 Wholesale and Retail	0.89	0.42	0.91	1.03	0.12	0.46	0.88	2.14
590 Lodging and Catering	0.40	0.42	1.10	(—)	0.98	0.98	0.66	3.37
610 Inland Transport	0.70	1.45	0.79	1.85	0.36	1.12	1.26	1.44
630 Sea and Air Transport	(—)	(—)	(—)	(—)	(—)	(—)	(—)	(—)
650 Ancillary Transport	2.14	(—)	0.42	(—)	1.36	(—)	(—)	(—)
670 Communications	0.36	2.52	0.49	4.04	2.74	0.14	NA	1.85
690 Credit and Insurance	2.62	6.38	2.60	5.45	13.23	1.12	6.02	2.60
710 Services to Enterprise	(—)	(—)	1.58	(—)	0.65	(—)	NA	(—)
730 Renting Immovables	(—)	(—)	(—)	(—)	(—)	(—)	(—)	(—)
810 General Public Service	0.94	1.22	1.10	2.13	1.60	1.64	0.47	1.92
850 Public Education and Research	0.55	0.64	0.87	1.85	NA	1.09	(—)	NA
890 Public Health Service	0.80	NA	NA	NA	NA	1.67	0.56	1.60
930 Other Public Services	0.75	NA	0.79	NA	0.46	1.38	1.02	1.25
Industrial Average (standard deviation in parentheses)	62.4 (20.9)	68.7 (22.3)	48.9 (26.6)	51.3 (21.9)	57.4 (21.1)	93.0 (34.7)	114.6 (36.8)	95.8 (48.1)

The dash (—) indicates that the value is below the industrial mean.

in 1975 Sector 810 had an average labour intensity which was rather high by comparison with the industrial sectors.

Looking down the columns of Table 3, and recalling that the dash (—) indicates a value below the industrial mean, it is clear that Ireland is exceptional in that it has a greater density of high positive values than any other country. One can say that the Irish service sectors (both marketed and public) are, in general, more employment-intensive than the industrial sectors. Table 2 shows how unusual Ireland is in this respect. Most Irish industries have employment intensities which are reasonably close to those in the UK and Italy. But in 10 of the 13

service sectors for which data are available, the Irish figure is the highest. There are positive and negative aspects to this phenomenon because it means that there is much employment generated by the demand for the output of the service sectors, but it may lead to expensive services. However, it certainly seems to be a distinctive feature of the Irish economy. Since Ireland is the least-developed economy of the eight, it is possible that the phenomenon is one that will disappear as the economy develops. It is also important to bear in mind that these conclusions are based on the structures that existed in 1975. Significant changes in relative factor prices may have led to profound changes in economic structures since then.

V: SUMMARY AND CONCLUSIONS

The results apply to the 8 EEC countries in 1975. The NACE 44 sector classification is used. The average employment intensity is defined as the ratio of the total employment generated throughout the economy by the final demand for the output of a sector to the amount of final demand in the sector. The consistency of the results set out in Table 2 seems to indicate that this is a useful and meaningful way of classifying the sectors of an economy.

The sectors which emerge as being consistently and substantially above the mean in their average employment intensity are:—

010 (Agriculture)
030 (Coal)
310 (Meat and Meat Products)
330 (Milk and Diary Products)
610 (Inland Transport)
690 (Credit and Insurance)
810 (General Public Service)
930 (Other Public Services)

Those which are consistently and substantially below the average are:—

070 (Petroleum)
090 (Electricity, Gas and Water)
170 (Chemicals)
390 (Tobacco)
630 (Sea and Air Transport)
730 (Renting Immovable Goods)

Sector 530 (Construction) is remarkably close to the national mean in its employment intensity in the 8 countries.

The employment intensities in the service sectors are compared with those in the industrial sectors. In general, there is no evidence to suggest that the employ-

ment intensities in the marketed services are substantially greater than in the industrial sectors. Sector 670 (Communications) may be an exception to this. Data on the public service sectors are rather scanty, but in general the employment intensities are above the mean for the industrial sectors, and one can say with confidence that the largest of them — 810 (General Public Service) — has a much higher average employment intensity than the industrial sectors. Ireland is exceptional in that its service sectors (both marketed and public) are, on the whole, very much more employment intensive than the industrial sectors. It is possible that this is due to the low level of development of the Irish economy in 1975.

The value of the approach taken here would be greatly enhanced if a second, more recent, set of I–O tables became available. The year studied is over a decade ago and some sectors such as 230 (Office Machines), have probably changed considerably since then, though one can only speculate about the way in which their employment intensities might have altered. The intensities measured are average and not marginal. The latter are, of course, the more interesting, but with only a single observation in each case marginal values cannot be estimated without using cross-section methods. When and if a new set of I–O tables appear it will be interesting to see how the marginals compare with the averages.

It is difficult to compare the present work with previous studies, partly because it compares the experience of complete industries in different countries (which is unusual), but mainly because it relates final demand to total generated employment, an exercise which appears not to have been attempted before. Normal production studies relate net output to employment within the industry. Reasons have been given in Section 1 for thinking that the present approach is not without value. The conventional approach to production and employment intensity may give unreliable results because no attempt is made to allow for the employment intensity of the inputs. Some of the inputs, may, for example, be merely labour hired from other sectors. It is possible that more reliable production functions could be obtained by applying the method used here to both labour and capital.

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