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THE EMPLOYMENT EFFECTS OF MANUFACTURING INDUSTRY

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Contents

SUMMARY

This paper examines employment effects of manufacturing industry which go beyond direct employment within manufacturing itself. This includes secondary employment supported in services by industry's purchasing of services inputs, employment supported in services by the expenditures of industrial employees, and employment in services supported by the re-spending of taxes arising from industry and its employees.

It is found that, in all of these categories combined, there were approximately 172,000 non-manufacturing jobs which were supported by manufacturing industry to a significant degree in 1990. This meant that there were about 86 "secondary" non-manufacturing jobs per 100 direct manufacturing jobs. These figures are estimates which should not be regarded as highly precise, but they should indicate the order of magnitude involved. (These figures leave out the effects of spending of manufacturing profits or re-spending of taxation of manufacturing profits. If approximate estimates of those effects are included, there are about 89 or 90 secondary non-manufacturing jobs per 100 direct manufacturing jobs).

Looking at trends over time, it is found that the total secondary employment supported by manufacturing has tended to rise or fall at much the same time and at much the same rate as total direct employment within manufacturing itself, in the period 1983-91. Consequently, in that period, it would have made little difference to one's judgement of industry's overall employment performance whether one considered the secondary employment effects or not. For there was little change in the

relationship between direct manufacturing employment and total secondary employment, so that direct plus secondary employment combined changed at much the same rate as direct manufacturing employment alone.

This does not mean, however, that the relationship between secondary and direct manufacturing employment is inherently stable, or that there is no point in considering the secondary employment effects when assessing the employment effects of manufacturing. For there were, in fact, quite significant changes going on in the relationship between secondary and direct employment in different groups of industries. Thus the stability seen in the relationship between secondary and direct employment at the aggregate level of manufacturing as a whole in 1983-91 was the outcome of significant changes which tended to offset each other. Such an outcome was something of a freak occurence which would not necessarily be repeated in another period.

Looking at indigenous and overseas manufacturing separately, it is found that the direct employment record of indigenous industry was poorer than that of all industry, particularly in 1983-87 although its employment performance has improved since then. The record of secondary employment in services supported by indigenous industry was poorer than its direct employment. Thus the ratio of secondary employment to direct manufacturing employment declined appreciably for indigenous industry between 1983 and 1991, while it was relatively stable for all of manufacturing. There were about 86 secondary jobs in services per 100 direct indigenous manufacturing jobs in 1983, falling to about 77 per hundred in 1987 and 76 in 1990 and 1991.

In contrast, overseas industry had a stronger record of direct manufacturing employment than all industry, and the record of secondary employment in services supported by overseas industry was stronger still. The ratio of secondary employment in services to direct manufacturing employment for overseas industry increased from 93 secondary jobs in services per 100 direct manufacturing jobs in 1983 to 98 per 100 in 1990 and 1991.

Thus by 1990 and 1991, overseas industry supported 98 secondary jobs in services per 100 direct manufacturing jobs, compared with an appreciably lower ratio of 76 per 100 for indigenous industry. The difference between the two is explained mainly by the fact that overseas industry has substantially higher sales per employee than indigenous industry; at the same time, expenditure on Irish services as a percentage of sales is about the same in both overseas and indigenous industry, while pay as a percentage of sales is not much lower in overseas industry than in indigenous industry. Thus the relatively high level of sales per employee in overseas manufacturing, and the growth in its sales and its sales per employee, have been of some benefit for Irish employment through the secondary effects in services.

This paper also looks at employment supported by overseas manufacturing's purchases of materials which are made in Ireland. It is estimated that about 10,200 people were employed in Irish manufacturing in producing industrial products as inputs for overseas industry in 1983, rising to about 14,700 by 1991. When expressed in terms of numbers of indirect manufacturing jobs per 100 direct jobs in overseas manufacturing, the estimates are 12

in 1983 and 17 in 1991. Thus, as with the secondary employment supported in services by overseas industry, the secondary manufacturing employment was also increasing both in absolute terms and in relation to direct overseas employment.

1. INTRODUCTION

Irish industrial development agencies have been interested for some time past in trying to understand and measure the overall contribution to employment which is made by industry. This interest arises from an awareness that measures of the direct employment in industry alone do not capture its full contribution to employment, since it is believed to generate or sustain further employment indirectly in various ways.

There are a number of reasons why it is important to try to develop an understanding of the overall contribution which industry makes to employment. For industrial development policy to be given the appropriate weight and attention, it is necessary that there should be an appreciation of the general scale of the impact of industry on employment. For example, in addition to employing people directly in factories, industry supports many other jobs in services by its purchases of services. Thus industry is more significant for employment than it might appear to be from looking at its direct employment alone.

It is also necessary to take account of the overall impact of industry, direct and indirect, in order to be able to form judgements about progress (or the lack of it) in industrial development and job creation over time. For example, for much of the 1980s, from 1980 to 1987, Ireland had declining industrial employment together with relatively strong growth in industrial production. Such a combination of favourable and unfavourable trends creates problems in forming a judgement about whether this amounted to success or failure. Even if we are interested

primarily in employment trends, it is possible that the growth in industrial production could have meant growing purchases by industry from other sectors thereby sustaining growing employment in those other sectors. Thus the trend in the overall employment impact of industry could, in principle, have been different to the trend in direct employment within industry alone. Thus it is necessary to have a good understanding of the overall trends in order to judge how satisfactory or unsatisfactory is the performance of industry.

A particular issue which arises in this regard concerns the contribution to the economy and to employment which is made by overseas industry in Ireland, especially in the "modern" or "high technology" sectors which have grown very substantially since the early 1980s. There has been a growing awareness that these industries import many of their material inputs, withdraw very substantial profits from Ireland, and may also engage to some degree in transfer-pricing which would artificially inflate the recorded value of their production.

In these circumstances, it is pertinent to ask what is the real value for Ireland of rapid growth in the output of such industries. If industrial development policy is concerned with job creation, does encouragement of this type of industry make any significant contribution to employment? Or how is one to judge the contribution to Irish employment which is made by a relatively low-productivity indigenous industry in comparison with a high-productivity overseas industry which has low linkages with the local economy and withdraws substantial profits? The answers to questions such as these could have an important

bearing on the formulation of industrial development policy.

For these sorts of reasons, it can be seen that information on employment generated directly within industry alone can give a misleading or confusing impression of industry's overall contribution to employment, or at least it can leave some important questions unanswered. Hence it is of practical relevance to attempt to assess the overall impact of industry on employment, both directly within industry and indirectly in other sectors. This paper reports on research findings on this issue.

2. THE NATURE OF THE OVERALL EMPLOYMENT IMPACT OF INDUSTRY

The basic aim of this paper is to attempt to assess the overall contribution to employment which is made by manufacturing industry, and to examine how that contribution has changed over time. Such an undertaking is based on the premise that industry not only generates employment directly, i.e. within industry itself, but also generates or sustains other employment indirectly. Thus we need to consider the nature of these secondary employment effects.

There is a certain amount of existing literature which has a bearing on this issue, notably the literature on the economic effects of foreign multinational companies in developing or newly-industrialising countries, and the literature on project appraisal or cost-benefit analysis. In both of these areas of study, attempts have been made to take account of both the direct and indirect or secondary impacts of industrial activities on an economy. In some cases, the focus of study is an individual company or project, while in others it is a grouping of companies such as a sector. But either way, the conceptual issues which arise have some similarity to those which need to be considered in examining the total employment contribution of Irish manufacturing or of an individual Irish manufacturing sector.

It is relevant, therefore, to consider Table 2.1 which shows a listing of suggested indirect or secondary employment effects, from an ILO report on employment generation by multinational companies in developing countries. The items in this listing are partly self-explanatory, but it is worth noting that what are

Table 2.1: Employment Effects of a Subsidiary of a Multinational Enterprise (MNE).

Employment effects	*Definition or illustration*
Direct employment effects	*Total number of people employed within the MNE subsidiary*
Indirect employment effects	*All types of employment indirectly generated throughout the local economy by the MNE subsidiary*
1. Macro-economic effects	*Employment indirectly generated throughout the local economy as a result of spending by the MNE subsidiary's workers or share-holders*
2. Horizontal effects	*Employment indirectly generated among other local enterprises as a result of competition with the MNE subsidiary*
(a) Narrow horizontal effects	*Employment indirectly generated among local enterprises competing in the same industry as the MNE subsidiary*
(b) Broad horizontal effects	*Employment indirectly generated among local enterprises active in other industries than the MNE subsidiary*
3. Vertical effects	*Employment indirectly generated by the MNE subsidiary among its local suppliers and customers*
(a) Backward effects (or linkages)	*Employment indirectly generated by the MNE subsidiary among its local suppliers (of raw materials, parts, components, services, etc.)*
(b) Forward effects (or linkages)	*Employment indirectly generated by the MNE subsidiary among its local customers (e.g. distributors, service agents etc.)*

Note: The above employment effects, if they could be measured, should be calculated in net terms (i.e. gross employment directly or indirectly generated, minus total employment displacement).

Source: International Labour Office (1984).

called the "macro-economic effects" in Table 2.1, arising from the spending of incomes earned within a multinational subsidiary, are often called "induced" employment effects. The "narrow horizontal effects" mentioned in Table 2.1 refer partly to effects on local competitors making similar products; these effects, which could be negative, would be relevant when considering the impact of individual companies, but not when considering the impact of industry as a whole or complete sectors of industry. "Narrow horizontal effects" could also include effects on others competing for supplies of similar inputs or labour skills. The "broad horizontal effects" include effects on others (not competitors), for example through effects on general quality of management, labour skills, technology, government policy, etc. Under the heading "vertical effects" in Table 1, the "backward effects (or linkages)", arising from purchasing of supplies of inputs, are also sometimes termed "indirect" effects.

While Table 2.1 includes a wide range of secondary employment effects of an industrial activity, it is not necessarily exhaustive. For example, a further effect, which might be included under the heading "macro-economic effects", is the effect of tax revenues generated by an industry - which make it possible for the public sector to generate further employment. Henry (1991) is one example of a study of secondary economic and employment effects which includes the effect of re-spending of tax revenues; although that study refers to tourism rather than industry, the principle is much the same.

There would be considerable difficulties in actually

measuring, or even identifying, some of the effects mentioned in Table 2.1. One fairly common practice, which has been attempted in Ireland in the past and is practically feasible, is just to measure direct employment effects, "backward linkage" (or "indirect") effects, and activity generated by the spending of incomes arising in industry (termed "macro-economic effects" in Table 2.1 and also known as "induced" effects). However, there are some conceptual issues and measurement difficulties arising even with such a more simplified procedure.

Interpretation of Causation

Although it has been quite a common practice in various countries to measure at least some of the secondary employment effects of industry, such as the "backward linkage" and "induced" effects, there can be some problem in interpreting what such measures really mean. Are we to believe that industry actually causes all of this other employment to exist in, e.g., its suppliers, or in activities supplying the purchases of its employees? In the absence of demand from industry, would not some or all of those employed in supplying its requirements be employed anyway - whether in doing the same thing for other customers or doing something else?

The first point to be made here is that the presence of an industry in an economy is not in itself entirely sufficient to cause the secondary employment effects. It is also necessary that others should take the necessary steps to establish the activities which supply the requirements of that industry or which supply the requirements of its employees, etc. However, we can think of the presence of an industry in an economy as

creating opportunities which make possible the development of the secondary employment effects. Thus industry can support or facilitate the creation of the secondary employment effects, rather than automatically causing them to exist by its mere presence alone.

Having said that, the question as to whether the secondary employment effects amount to net additions to employment which are attributable to industry in a meaningful sense depends on several considerations concerning the broader economic context. First, a key question is whether one can assume that general equilibrium with full employment is the normal situation. If this can be assumed, then a particular industrial activity generates no net addition to employment because all would have been employed even in the absence of that activity. On the other hand, if there is normally chronic high unemployment, then it is possible that all of the employment associated with an industrial activity is a net contribution to total employment supported by that activity.

A second relevant consideration is whether or not there are shortages of certain skills in the economy. If there are, then employment generated by an industrial activity for people with those skills would not amount to a net contribution to total employment caused by that activity. For even if there is a high level of general unemployment, the people whose skills are in short supply would have been employed in any event. On the other hand, if there are no shortages of skills, then it is possible that all of the employment associated with an industrial activity is a net contribution to total employment supported by that

activity.

A third consideration which is relevant here concerns the supply of inputs for an industry. If the supply of inputs is constrained relative to demand, say by natural resource constraints, such inputs would have found an alternative market and the people who produce them would have been employed in any event. In this case, therefore, the purchasing industry concerned could not be regarded as having contributed substantially to the generation of their employment. On the other hand, if there are no constraints on the supply of inputs and the purchasing industry concerned offers an additional market, the additional employment generated in producing such inputs could be a net additional contribution to total employment supported by the purchasing industry.

A fourth relevant consideration is whether the physical location of an industry has any influence on the location of the secondary employment associated with it. For example, does the fact that an industry is in Ireland help other producers in Ireland to supply inputs to it, or is it just as easy for them to supply other customers elsewhere regardless of their location? If a local presence does nothing to facilitate the generation of local secondary employment, then an industry in Ireland does not really help to generate additional secondary employment in Ireland, any more than the existence of other purchasing industries elsewhere does. However, if the local presence of an industry is a factor of some significance in generating local secondary effects, then the secondary employment associated with that industry in the same economy could be regarded as being

sustained by it to a meaningful degree.

To sum up on the issue of interpreting causation of secondary employment effects, one can regard an industry as supporting or helping to generate further secondary employment in the economy - in addition to what would have existed in the absence of that industry - if the following conditions hold. (1) There is a background of unemployment. (2) The secondary employment concerned is not characterised by skills which are in short supply. (3) The secondary employment concerned does not involve a form of production which is supply-constrained. (4) The location of the industry concerned within the economy is a factor of some significance in determining that the location of its secondary effects are also within the economy.

In deciding whether these conditions actually hold in a particular situation, there is a need for some element of judgement. Consequently, our measurements of the secondary employment effects of industry in Ireland have to incorporate such an element of judgement concerning the degree to which industry is actually responsible for generating the secondary employment, and the degree to which that employment is additional to what would have existed in any event. In other words, underlying our measurements of the secondary effects, there is an element of judgement concerning the issue of interpreting causation which was discussed above. With reference back to that discussion, the approach adopted to this issue is as follows.

First, the data examined in this paper refer to Ireland in the period since 1983. Throughout that period there have been historically high levels of unemployment, often combined with

high levels of emigration. Thus there has been a chronic excess supply of labour and far from full employment. In these circumstances, it seems reasonable to regard employment generated by industry as being generally additional to what would have existed otherwise, since alternative employment opportunities were scarce.

Second, since the early 1980s, there has been little evidence of substantial shortages of skills in Ireland. While shortages of some skills may have been experienced at certain times in certain places this has not been a very widespread experience. Thus Sheehan (1992) shows that throughout the 1980s since before 1983, less than 5 per cent of firms were reporting skill shortages. (In contrast, the figures for the late 1970s were around 20 per cent, while the figures for the United Kingdom rose from less than 5 per cent in 1981 to over 20 per cent by the late 1980s). In these circumstances, it seems reasonable to conclude that the employment generated by industry since the early 1980s was not in a context of significant skill shortages. Therefore relatively few of those so employed would have been in a position to find alternative employment readily in a situation of persistent high unemployment. Consequently, the employment generated by industry may generally be regarded as being additional to what would have existed otherwise.

Third, most sectors of industry in Ireland are not purchasing inputs whose supply is constrained. To that extent, if industries help to sustain employment in the supplier activities, this is employment which is additional to what would have existed in any event.

However, the purchasing by some industrial sectors of material inputs from the primary producing sectors, such as agriculture, forestry and fishing, is something of a special case. While the presence of the purchasing industries would benefit the primary producers in terms of better prices and more secure markets than they would have otherwise, it would appear to be quite misleading to regard the industries concerned as being responsible for generating the primary production. In the absence of the processing industries, the raw materials - or at least some (perhaps different) mix of primary products - would probably be produced in any case. Indeed it might well be more true to say that the existence of the processing industries is made possible by, among other things, the local availability of the primary products.

The approach adopted in this paper is to consider it unlikely that industrial purchasing of Irish primary products can be credited with much responsibility for causing or generating the primary production concerned or for sustaining the employment of those engaged in such production. Thus we do not count backward linkages with primary sectors as part of the secondary effects which are attributable to industry in a meaningful sense. This may be a little crude since such purchasing by industry is no doubt of some benefit to the primary producers, but at least it seems to be more realistic than the alternative course of counting the primary production concerned as being caused by industry.

Fourth, there is the question whether the local presence of industry in an economy is a factor of some significance in

generating secondary effects in the same economy, or whether these secondary effects might just as easily occur elsewhere. On this question it seems reasonable to take the view that the local presence of industry does help to a significant degree to develop the secondary employment effects in the same economy.

Leaving aside purchases of primary products, industry and its employees purchase services and industrial products. Many services, in particular, must be provided on the spot to local customers, so that if industry and its employees generate a demand for such services this is a strong influence in causing them to be provided locally. This point can be supported by the observation that services constitute a far smaller proportion of international trade than of production, indicating that many services tend to have to be provided locally for local markets. And in the case of Irish manufacturing industry (to anticipate our results a little), some four-fifths of the services it purchases are sourced in Ireland. This could not be the case, in such a small and open economy, if it were just as easy to source such services from other locations, and it indicates that industry does tend to generate these secondary employment effects within the domestic economy to a significant degree.

In the case of purchasing of industrial products by industry or its employees, such purchasing would also usually help or facilitate the development of domestic supplier industries within the same economy to a significant degree. Although this effect is not as clear as in the case of services, since industrial products can generally be more readily exported and imported, there is evidence that it is nevertheless of some importance.

Thus even overseas or foreign-owned manufacturing in Ireland purchases 30 per cent of its materials and components from Irish sources (Census of Industrial Production 1989). This may seem a rather low figure from some points of view, but in fact it could not be anything like as high as it is if there were not a distinct tendency to source inputs locally rather than importing them, given that Ireland accounts for such a very small proportion of all the potential suppliers of inputs. Furthermore, Telesis (1982) reported that overseas firms in Ireland would like to purchase a higher proportion of their material inputs within the country, because it would be economically advantageous to do so, if products of the right quality and price were available. And An Bord Trachtala (1992) found that there is a similar preference among main contracting firms for sourcing from local subcontractors if prices and quality are competitive. Unpublished IDA studies also support this point. Thus there does seem to be a significant tendency to source material inputs locally in preference to importing them.

For these reasons, therefore, it seems reasonable to take the view that the local presence of industry in an economy does help to a significant degree to develop secondary employment effects in the same economy.

To conclude on the issue of interpreting causation, in the case of Ireland since the early 1980s, it seems reasonable to adopt the view that industry has, to a significant degree, supported or helped to generate various types of genuinely additional secondary employment. The one category of possible

secondary employment "effects" which it is not proposed to count, on grounds of not really being attributable to the effects of industry, is employment in supplying primary products as inputs to industry.

Problems of Measurement

Apart from the conceptual issue of interpreting causation, there are also practical difficulties involved in quantifying some of the suggested secondary employment effects of industry.

First, the "broad horizontal effects" which were mentioned in Table 2.1 would be very difficult to quantify, or at least to do so in a regular and systematic manner.

Second, the "narrow horizontal effects" could also be difficult to quantify precisely, although one could investigate whether they exist and are likely to be significant. It is worth noting, however, that the narrow horizontal effects on local competitors making <u>similar products</u> can be ignored in the case of examining the secondary effects of industry as a whole, and probably also in the case of most individual sectors of industry. This is because, in these cases, local competitors would not usually exist outside the boundary of the entity being examined; narrow horizontal effects on local competitors are more relevant to consider when examining the secondary effects of individual companies.

Third, in the case of "forward linkage effects", or employment generated in downstream processing or distribution of an industry's products, there are also difficulties. The sales of industrial output as inputs to other activities would usually only account for part of their inputs. So the problem is how to

attribute, as an effect of the supplier industry, a quantified measure of a share of the employment provided by the downstream activity.

However, the forward linkage effects of Irish industries can in fact be regarded as probably not very significant. This is because the availability of supplies of Irish industrial output as inputs to other industries could not usually be regarded as being a very important factor in generating such downstream activities; there are generally other alternative sources of supply. And while Irish industrial output passes through the distribution sector, in which people are employed, the employment in distribution would probably be much the same whether the goods were made in Ireland or imported. Thus it is doubtful whether Irish industry generates much net additional downstream employment in distribution in excess of what would exist in the absence of industry. In fact, forward linkages are more usually regarded as effects which are attributable to primary production sectors, rather than to industry, since there can be logistical factors which make it particularly advantageous to perform the downstream basic processing of primary products in the same economy as the primary production itself.

Implications of the Causation and Measurement Issues

While there are difficulties in quantifying some of the secondary employment effects of industry, others can be estimated more readily. These include "backward linkage" effects, i.e. employment in supplying goods and services as inputs to industry; "induced" employment effects arising from the spending of incomes generated by industry; and the employment effects of the re-

spending of taxes generated by industry. Taken together, these are probably the major secondary effects, but it should be borne in mind that, because of the measurement difficulties, our measurements of secondary effects will be somewhat incomplete.

It also needs to be recognised that measures of the secondary employment effects attributable to industry inevitably incorporate some element of judgement concerning the interpretation of causation, as was discussed above.

For these reasons, in estimating measurements of the secondary employment effects of industry, what we can aim to provide are not complete and highly precise measurements of these effects. Rather it can be aimed to produce good indicators of the more important of these effects, estimated in a consistent manner over time. Thus trends in these indicators over time (as well as in the direct employment effects) should at least provide a distinctly better indication of trends in the total industry-related employment contribution than trends in direct industrial employment alone.

3. METHODOLOGY AND DATA FOR ESTIMATING SECONDARY EMPLOYMENT EFFECTS

In order to estimate the secondary employment effects of industry, we need data on the expenditures of industry within the Irish economy, as opposed to what it spends on imported inputs or what it withdraws from Ireland in the form of profits of foreign-owned firms. For this purpose, this paper relies a good deal on the Irish Economy Expenditures (IEE) survey, which has been undertaken by the IDA each year since 1983.

The Irish Economy Expenditures Survey

The IEE survey covers manufacturing companies which employ 30 people or more. It collects information on companies' sales and on how much they spend within the Irish economy – on wages and salaries and on Irish-produced materials, components and services inputs – as distinct from other expenditures on imported goods or services.

The IEE survey does not amount to a complete census since companies are not compelled to respond to it, but the response rates are generally quite good. Firms responding to the survey account for more than 70 per cent of employment in the target population of firms each year, and sometimes over 80 per cent (the target population being manufacturing firms employing 30 people or more). The response rates, again in terms of employment coverage, tend to be higher for overseas or majority foreign-owned companies, at over 80 per cent, and somewhat lower for indigenous or majority Irish-owned companies, at 60-70 per cent.

Since the target population for the survey excludes small firms employing less than 30 people, the response rate is lower if expressed in relation to all of manufacturing in the State. Responding firms account for 55-63 per cent of total manufacturing employment, with higher rates of 74-81 per cent for all of overseas manufacturing and lower rates of 40-49 per cent for all of indigenous manufacturing. These response rates for indigenous manufacturing are lower than average partly because of a somewhat lower than average response in relation to the target population. But the other reason why they are lower than average is because firms employing less than 30 people, which are not surveyed, account for a fairly significant minority of total indigenous employment, unlike in overseas manufacturing.

The IEE survey provides data on companies' sales and on their expenditures broken down by various categories; when all expenditures are subtracted from sales, profits emerge as a residual. The main point of the survey is that it distinguishes expenditures within the Irish economy from expenditures on imported inputs of materials and services. Thus it provides information which is essential for estimating the secondary effects of manufacturing which occur within the Irish economy.

Grossing Up the Survey Results

The data presented in this paper are not simply based on the raw IEE survey data for firms responding to the survey. Rather the survey data are first grossed up to give estimated national figures for all manufacturing firms' expenditure on wages and salaries, Irish-produced materials, Irish services, etc. Then, using these expenditure data, the various secondary employment

effects are estimated.

The method used to gross up the survey results to obtain estimated national figures is to multiply the survey data by the ratio of national employment (using IDA Employment Survey data) to employment in companies responding to the survey. This is done separately for each of 36 categories of manufacturing, namely, the indigenous and overseas components of each of 18 sectors. National totals - for all manufacturing, for indigenous manufacturing or for overseas manufacturing - are then derived by summing up the sectoral results, not by grossing up directly from survey totals to national totals. This should help to eliminate potential distortions which could arise from different survey response rates between sectors together with substantial differences in expenditure patterns between sectors. (Further details on this and other methodological matters are contained in the Appendix on "Methodological Procedures").

This grossing up procedure in effect assumes that sales or expenditures per employee are the same for companies which are left out of the survey as for those of the same nationality and from the same sector which are included in it. A likely flaw in this is that sales per employee or expenditures on inputs per employee could be systematically different (probably lower) for the small firms employing less than 30 people, which are all excluded from the survey, than for larger firms. In fact, however, examination of *Census of Industrial Production* (CIP) data on gross output by size class of establishments indicates that this flaw would have only very minor effects on our estimates.

Gross output per employee, and hence presumably expenditures per employee, are indeed lower for smaller firms according to the CIP, but this has only minor implications. If one used average CIP gross output per employee for firms employing over 20, together with employment for firms of all sizes, to estimate gross output for firms of all sizes, the error would be less than 1 per cent of actual gross output of firms of all sizes in the case of overseas industry. And it would be only about 2-3 per cent of actual gross output in the case of indigenous industry. This suggests that the error involved in our grossing up procedure - arising from systematically lower sales or expenditures per employee in the small firms which are excluded from the survey - would be of about this order of magnitude.

Checking the Accuracy of the IEE Data

While data on Irish economy expenditures from the IEE survey cannot be compared with the CIP (because the CIP does not include such data), it is possible to compare estimated sales data, obtained using the IEE survey and the above grossing up procedure, with data on gross output from the official CIP. Such comparisons are useful for checking the accuracy of the IEE survey data and the grossing up procedure. These comparisons indicate that the sales estimates obtained using the IEE survey data are generally reasonably accurate, since they match CIP gross output quite well.

To illustrate this point, Table 3.1 shows comparisons between total manufacturing gross output from the CIP and our estimates of total manufacturing sales from the grossed up IEE data. In column 4 of the table, the IEE sales estimates (from

Table 3.1: Comparisons of the IEE Survey Sales Estimates and CIP Gross Output.

Year	CIP Gross Output £million	Adjusted CIP Gross Output, £million	IEE Sales Estimate £million	IEE Sales as % of Unadjusted CIP	IEE Sales as % of Adjusted CIP
1983	11,798.7	12,223.5	12,322.8	104.4	100.8
1984	13,632.0	14,041.0	14,882.0	109.2	106.0
1985	14,435.9	14,984.5	15,279.3	105.8	102.0
1986	14,405.0	14,866.0	15,361.7	106.6	103.3
1987	15,443.4	15,752.3	15,956.0	103.3	101.3
1988	17,389.1	17,754.3	18,079.3	104.0	101.8
1989	19,740.7	20,194.7	19,667.8	99.6	97.4
1990	20,190*	20,412.1	20,642.5	102.2	101.1
1991	21,215*	21,384.7	20,138.5	94.9	94.2

Source: Derived from *Census of Industrial Production*, IEE survey and the IDA's Employment Survey. (Details can be found in the Appendix on "Methodological Procedures").

*** Note:** The gross output figures for 1990 and 1991 are estimates derived by increasing the CIP figure for 1989 in line with the Industrial Turnover Index for subsequent years.

The IEE sales estimate for 1991 is preliminary and is subject to revision when the next year's data become available.

column 3 of the table) are expressed as percentages of the CIP's gross output (from column 1). It can be seen that the IEE sales estimates are generally higher than CIP gross output, by about 3 to 9 per cent in most years. However, one would expect the IEE sales estimates to be somewhat higher given that they are obtained using the IDA's Employment Survey to gross up the IEE survey results; for the IDA's Employment Survey covers all of manufacturing whereas the CIP leaves out very small establishments with less than three employees. Thus the IEE sales estimates are for all of manufacturing, whereas the CIP's gross output is for all excluding these very small firms, so that the IEE sales estimates should in fact be a little higher.

Column 2 of Table 3.1 shows adjusted CIP gross output figures which are more closely comparable to the coverage of the IEE sales estimates. These adjusted CIP gross output figures are derived by estimating what the gross output would have been if CIP employment was as great as in the IDA's Employment Survey, and if the additional employment was all in very small firms with gross output per employee the same as in CIP establishments employing less than 10 people. Column 5 of Table 3.1 then shows the IEE sales estimates as percentages of these adjusted CIP gross output figures from column 2 of the table.

It can be seen that the IEE sales estimates are nearly all within 2 or 3 percentage points of the adjusted CIP gross output figures, which is quite satisfactory and gives some assurance on the reliability of the IEE survey data. The exceptions are the figures for 1984 and 1991, where the differences are 6 per cent. In the case of 1991, however, the IEE sales estimate is based on

preliminary data and it will be revised when the next year's data become available.

The General Approach to Estimating Secondary Employment Effects

The general approach adopted here in estimating the secondary employment effects of manufacturing is to start with the grossed up IEE data for estimates of expenditures by manufacturing within Ireland or for estimates of the pay bill for industry's employees. Then other sources are used to estimate how many people are employed in producing the inputs of goods and services which manufacturing purchases in Ireland. And, since further employment is generated in producing the inputs required for the inputs of manufacturing, input-output tables are used to estimate how many others are further employed in this way.

In the case of estimating the numbers employed in producing the products purchased by manufacturing employees, we start with the manufacturing pay bill from the grossed up IEE data. Employers' and employees' PRSI and income taxes are deducted from this to give employees' disposable income. Savings are further deducted from this to give employees' expenditure, and this amount is treated as being spent on Irish-produced goods and services and on imports in the same proportions as for total personal expenditure in the official input-output tables. We then calculate how many people are employed in producing these Irish-produced goods and services, and in producing the inputs required to produce them.

Part of the employees' expenditure goes to the government as indirect tax receipts (VAT and excise). The proportion which does so is again calculated using the official input-output

tables, and this amount is added to the PRSI and income taxes deducted from industry's pay bill (as mentioned above) to give a combined figure for tax receipts. This amount is treated as being re-spent by government according to the same pattern as total public expenditure, with part of it leaking out of the economy in the form of foreign debt interest. The input-output tables are again used in estimating the employment effects of this re-spending of tax receipts arising from manufacturing.

More information on these estimation procedures is provided below as we deal with each component part, and further details are included in the Appendix on "Methodological Procedures". Figure 4.1 in the next section should help to illustrate the structure of linkages and secondary employment effects which are being estimated.

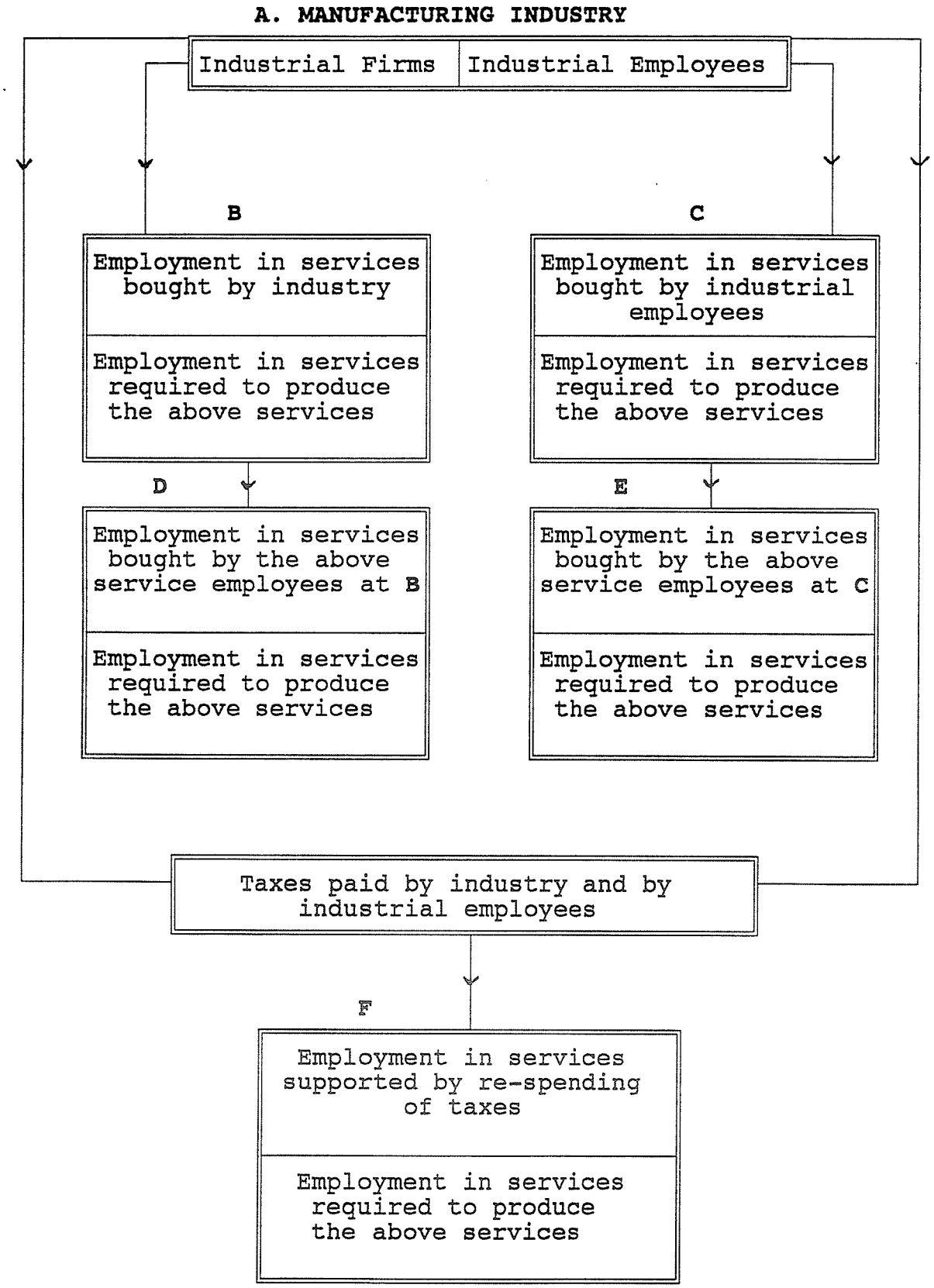
4. THE EMPLOYMENT EFFECTS OF ALL MANUFACTURING

This section deals with the employment effects of manufacturing as a whole. Apart from direct employment within manufacturing itself, it covers three types of secondary employment effects: (1) backward linkage effects, arising from the purchasing of inputs by manufacturing; (2) induced employment, arising in supplying the purchases of employees; (3) employment supported by the re-spending of tax revenues generated by manufacturing. Figure 4.1 illustrates the structure of relationships of these employment effects.

First, in block A in Figure 4.1, there is direct employment within manufacturing industry itself.

Second, manufacturing firms purchase inputs, thereby helping to sustain or generate employment for those producing the inputs. However, as was discussed in Section 2, we do not consider that manufacturing plays a major part in generating the employment of those who supply it with primary products; therefore we do not want to count that primary sector employment as a secondary effect of industry. And since all manufacturing employment is already counted in block A of Figure 4.1, we do not want to count secondary employment of those producing manufactured products as inputs for other industries, since this would be double-counting. Therefore, the secondary employment in supplying inputs to manufacturing which we do wish to count as a secondary effect of manufacturing is confined to employment in supplying services which are bought by manufacturing; this is included in block B in Figure 4.1. (Note that "services" here means everything

Figure 4.1: The Employment Effects of Manufacturing Industry.



The arrows show the direction of flows of payments.

except primary production and manufacturing, so it includes service industries such as production and distribution of electricity, gas, etc.).

The top part of block B in Figure 4.1 includes employment in those services which are purchased directly by manufacturing firms. However, in order to produce these services, the service companies concerned need to purchase other services as inputs, and then those other services, in turn, need to purchase further service inputs, and so on. Thus the lower part of block B includes employment in all these further rounds of service inputs which are supported by the purchasing of the services which are originally purchased directly by manufacturing. We can refer to the top part of block B as "first-round backward linkage" employment supported by industrial purchasing, while the whole of block B can be described as "total backward linkage" employment. If it makes sense to regard the first-round employment as being supported by manufacturing in a meaningful sense, the employment in each succeeding furher round of service inputs is similarly dependent on the purchasing of its services customers and hence on the original purchasing by manufacturing.

Next, manufacturing employees have incomes which are generated in industry and, after taxes and savings are deducted, they spend these incomes partly on Irish-produced goods and services and partly on imports. The "induced" employment in Ireland which is supported by the purchasing of manufacturing employees is included in block C in Figure 4.1. Again, we do not consider that primary production is caused by their purchasing to a significant extent, and in any case consumers buy very

little primary products; thus no primary sector employment is included in block C. And since all of manufacturing employment is already included in block A, block C does not include employment in producing manufactured products which are purchased by manufacturing employees, because we want to avoid double-counting. Thus, in the same way as block B, block C is confined to employment in services.

Also in the same way as block B, block C is divided into two parts. The top part includes employment in those services which are purchased directly by manufacturing employees. And the lower part includes employment in producing all the further rounds of services inputs which are required to produce the services purchased directly by manufacturing employees.

Further induced employment, arising from the spending of employees' incomes, is included in blocks D and E in Figure 4.1. Thus the service sector employees in block B, whose jobs are supported by the purchasing of manufacturing firms, in turn spend their incomes partly on Irish services. The employment thus supported in these services is included in block D, which again excludes primary sector employment for the reasons already mentioned and excludes any manufacturing employment because all manufacturing employment is already counted in block A. In the same way as blocks B and C, block D is divided into two parts. The top part includes employment in the services which are purchased directly by the service sector employees in block B, while the lower part includes employment in producing all the further rounds of services inputs which are required to produce the services in the top part of block D.

Block E in Figure 4.1 is analogous to block D, except that the services employment counted in block E originates from the spending of the service sector employees in block C, whose employment is supported by the spending of manufacturing employees.

Next, both manufacturing firms and manufacturing employees pay taxes, which help to fund public expenditure. Block F of Figure 4.1 includes employment which is supported by the re-spending of these taxes. For the reasons already mentioned, this is confined to services employment. And as with other blocks, it includes employment in services directly supported by the re-spending of taxes, as well as employment in producing the further rounds of services inputs which are required to produce those services.

Before proceeding to present estimates for these various employment effects, it is worth pointing out that double-counting is avoided in the structure outlined in Figure 4.1. All manufacturing employment is included in block A and therefore no manufacturing employment is included in the secondary employment effects, even though individual industries or industrial employees do, of course, purchase Irish manufactured products. Similarly, while the service sector firms and employees in blocks B to F also purchase manufactured products, these products are not counted among the rounds of inputs in blocks B to F because they are already included in block A.

It is worth making this point because some uses of input-output analysis can involve significant double-counting. Although we do need to use input-output tables in estimating the

secondary employment effects, our use of them does not involve double-counting.

Estimates of the Secondary Employment Effects for 1990

We now present estimates of the various employment effects of all manufacturing in 1990, with some explanation of how each is calculated; a more detailed account of the calculation of the estimates is contained in the Appendix on "Methodological Procedures". Subsequently we look at trends over time for the period 1983-1991 (although the 1991 figures, being based on preliminary IEE data, are subject to some revision).

Direct employment within manufcaturing industry amounted to 200,450 in 1990 according to the IDA's Employment Survey. From the IEE survey, we estimate that manufacturing industry's expenditure on Irish services was £2,528.2 million, which was equal to 12.2 per cent of the value of its sales. We estimate that, on average, gross output per head in Irish services was £34,516, so that about 73,200 people would be employed in Ireland in providing £2,528.2 million worth of services to manufacturing industry. Thus employment of 73,200 can be attributed to the top part of block B in Figure 4.1.

Using the CSO's input-output tables, we can calculate that in order to produce £2,528.2 million worth of services for manufacturing, a further £939.2 million worth of services were required as all the rounds of inputs into the services for manufacturing. With the average output per head in services at £34,516, it required about 27,200 service sector employees to produce this £939.2 million worth of services. Thus employment of 27,200 can be attributed to the lower part of block B in

Figure 4.1.

Again from the IEE survey, it is estimated that manufacturing industry's pay bill was £3,069.7 million in 1990, which was equal to 14.9 per cent of the value of its sales. After deducting employers' and employees' PRSI and employees' income tax, at national avaerage rates, as well as savings at national average rates, manufacturing employees are estimated to have spent £1,994.1 million. The input-output tables indicate that, on average, just under 40 per cent of personal expenditure is spent on Irish services, which allows us to estimate that manufacturing employees spent £715.9 million on Irish services in 1990. Following the same procedure as for industry's spending on services, it is estimated that about 20,700 people were employed in providing £715.9 million worth of services for manufacturing employees, with a further 7,700 employed in providing all the service inputs required for those services. Thus employment of 20,700 can be attributed to the top part of block C in Figure 4.1, with 7,700 attributed to the lower part of block C.

Next, we now have an estimate of the number of service employees in block B in Figure 4.1, and we can estimate their pay bill using average remuneration per head for the services sector derived from the *National Income and Expenditure 1990*. The numbers employed in services purchased by these services employees can then be estimated in the same way that was used to estimate services employment arising from spending of industrial pay. In this way we estimate that in 1990 there was employment of about 8,600 in the top part of block D in Figure 4.1, with

about a further 3,200 in the lower part of block D.

In a similar way, it is estimated that in 1990 there was employment of about 2,400 in the top part of block E in Figure 4.1, with about a further 900 in the lower part of block E.

Finally, concerning the effects of re-spending of taxes arising from industry, we have an estimate of employers' and employees' PRSI and employees' income taxes, calculated at national average rates from industry's pay bill. (This amount was previously deducted from industry's pay bill before estimating industrial employees' purchasing of Irish services). We further calculate, from the input-output tables, that on average just under 17 per cent of personal expenditure goes to the government in the form of indirect taxes (VAT and excise), so that percentage of expenditure by manufacturing employees is added to the tax take arising from industry. The estimate of the above combined taxes arising from manufacturing industry is £1,135.8 million in 1990.

That amount is treated as being re-spent by the public sector according to the same pattern as total public expenditure. This means that, in 1990, 8.6 per cent of it left the Irish economy in the form of foreign debt interest payments and therefore made no contribution to Irish employment. However, 38 per cent of it was spent on providing current goods and services, 8.1 per cent was spent on capital investment, and the remaining 45.3 per cent was spent mainly on transfer payments as well as on subsidies and domestic debt interest.

In order to estimate the effects of this on Irish services employment, we again use the input-output tables to distribute

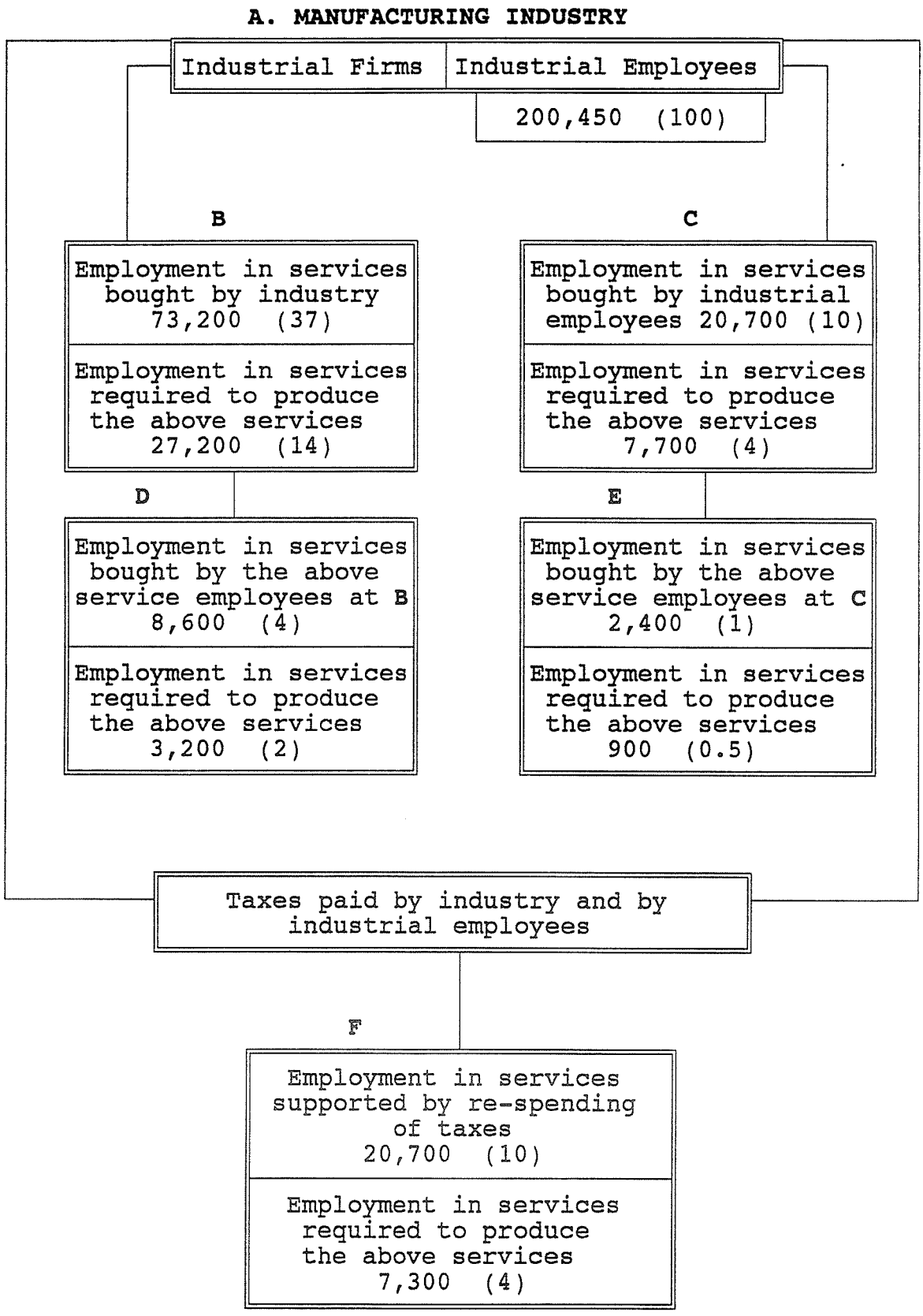
the appropriate proportions of these expenditures to Irish services, as opposed to other Irish products or imports. The current and capital expenditure is treated as being spent on Irish services in the same proportions as "Net Government" expenditure in the input-output tables. And the transfer payments, subsidies, etc., which mainly end up as incomes of individuals, are treated as being spent on Irish services in the same proportions as "Personal" expenditure in the input-output tables.

In this way it is estimated that the re-spending of taxes arising from manufacturing industry in 1990 directly supported 20,700 jobs in Irish services, and a further 7,300 jobs in the services required as inputs for those services. Thus 20,700 jobs are attributed to the top part of block F in Figure 4.1, with 7,300 in the lower part of block F.

Bringing these various estimates together, Figure 4.2 shows the employment supported by all manufacturing industry in 1990. The numbers in the boxes in Figure 4.2 are, first, the actual employment numbers and, second (in brackets), the employment numbers per 100 jobs directly within manufacturing itself. Adding up all the secondary employment in blocks B to F, there were 172,000 people in services jobs supported by manufacturing industry, or 86 people per 100 employed directly in manufacturing.

It can be seen that much the largest number was in block B, the employment supported by the purchasing of services inputs by industry itself. Blocks C and F, the induced employment by spending of industrial pay and the employment supported by re-

Figure 4.2: Estimated Employment Effects of Manufacturing, 1990.



Numbers in the boxes show employment numbers and (in brackets) employment numbers per 100 employed in manufacturing.

spending of taxes, are also substantial and of about equal importance. Blocks D and E, the induced employment supported by spending of services pay, are of lesser significance.

It is worth noting here that one element which is left out of consideration in Figures 4.1 and 4.2 is the effects of spending of industry's profits. This is because of a scarcity of information on how much of industrial profits are re-invested or distributed to shareholders. Despite the lack of accurate information on this, however, it is clear enough that the employment effects of spending of industry's profits would be of relatively minor significance compared to the effects which are counted in Figure 4.2. Manufacturing industry's profits are quite substantial, at £3,235 million in 1990, according to our estimate from the IEE survey. But only a small proportion of this is used in ways which would support secondary employment in Ireland.

A very large majority of industry's profits - £2,810 million or 87 per cent of the total - accrue to overseas or foreign-owned industry. And a substantial majority of this is withdrawn from the Irish economy and thus makes no employment contribution in Ireland. Part of it would be reinvested in Ireland, but much of this would be spent on investment goods which would be imports or else Irish industrial products. Either way, the purchasing of those types of investment goods generates no additional secondary employment effects in Ireland outside the manufacturing sector (and all of manufacturing employment is already counted in Figure 4.2).

However, part of the profits which are reinvested in Ireland

are spent on construction and this would support some secondary construction employment which is additional to manufacturing employment. In addition, part of the profits of overseas industry are taken in taxation, and the re-spending of this taxation would support some additional non-manufacturing employment in Ireland. According to IDA estimates, taxation took about 2 per cent of profits of overseas manufacturing in 1990 (rising to about 5 per cent in 1991 and probably about 9 per cent in 1992). The re-spending of this tax in 1990 would have added less than 1 services job to the secondary employment effects of manufacturing per 100 direct manufacturing jobs. In 1991, the effect would have been less than 2 additional jobs per 100 direct jobs in manufacturing, and in 1992 it would have been about 3 additional jobs per 100 direct jobs in manufacturing.

The profits of indigenous manufacturing, estimated to be £425 million in 1990, would be partly re-invested, partly distributed to shareholders, and would partly go to taxation. As with overseas industry, the re-investment would generate little additional non-manufacturing employment in Ireland through purchasing of investment goods, although re-investment in construction would support some additional employment in that sector. The re-spending of the taxation, at about 5 per cent of profits, would support much less than one services job per 100 direct manufacturing jobs. And while the amount of distributed profits are not known, they would not support very large amounts of secondary employment either. If distributed profits amounted to, say, half of indigenous industry's total profits, and if they were spent like average personal expenditure, they would support

less than two services jobs per 100 direct manufacturing jobs.

Thus, while we cannot give precise estimates of the secondary employment effects of industry's profits, it is reasonably clear that these effects are not very great. If they were included in Figure 4.2, they would not change the overall picture by much as they would probably add about 3 more servics jobs per 100 direct manufacturing jobs in 1990, plus a little more in construction. This figure would rise to perhaps 5 by 1992 as tax on profits of overseas industry increased.

Trends in the Period 1983-1991

This section looks at trends in direct manufacturing employment and in the secondary employment effects over time, since the IEE survey was initiated in 1983. First, direct manufacruring employment declined continuously from 216,257 in 1983 to 191,941 in 1987, according to the IDA's Employment Survey. It then increased continuously to 200,450 in 1990, with a slight decline to 198,935 in 1991. Thus we will examine the secondary employment effects in the years 1983, 1987, 1990 and 1991, which include the start and end of the whole period as well as the two turning points for direct manufacturing employment.

Table 4.1 shows manufacturing employment and the secondary employment effects in these years. It can be seen in the table that while direct manufacturing employment declined in 1983-87, increased in 1987-90 and declined again in 1990-91, total secondary employment followed similar trends of decline, increase and decline in the same periods. Most of the individual categories of secondary employment also followed similar trends, except that categories D, E and F had small declines rather than

increases in 1987-90.

However, while the secondary employment effects mostly increased or declined in the same periods as direct manufacturing employment, they did not necessarily change at exactly the same rates as direct manufacturing employment. Consequently there were some (rather minor) changes in the ratios of secondary employment to direct manufacturing employment. Table 4.2 shows these ratios, in the form of numbers of secondary jobs per 100 direct manufacturing jobs. It can be seen that while there were changes in these ratios, the changes were generally small. Overall, the ratio of total secondary employment to total direct manufacturing employment declined a little over the period 1983-91, from 89 to 86 jobs per 100 direct manufacturing jobs. And the ratios for each of the individual categories of secondary employment either showed no change over the period or else declined a little.

The main impression one gets from Table 4.2, however, is one of considerable stability, with no great changes in these ratios. Consequently, in the period 1983-91, it would have made little difference to one's judgement of industry's overall employment performance whether one considered the secondary employment effects or not. For there was little change in the relationship between direct manufacturing employment and total secondary employment, so that direct plus secondary employment combined changed at much the same rate as direct employment alone.

This does not mean, however, that the relationship between secondary and direct manufacturing employment is <u>inherently</u> stable, or that there is no point in considering the secondary

Table 4.1: Manufacturing Employment and Estimated Secondary Employment, 1983-1991.

Type of Employment	1983	1987	1990	1991
A. Direct Manufacturing	216,257	191,941	200,450	198,935
B. Total Backward Linkage	110,300	96,900	100,500	99,100
C. Induced, by Industrial Pay	32,000	28,200	28,400	28,300
D. Further Induced, by Services Pay	14,000	11,900	11,800	11,600
E. Further Induced, by Services Pay	4,100	3,500	3,300	3,300
F. Re-spending of Taxes	32,200	28,700	28,000	27,800
TOTAL SECONDARY (B-F)	192,500	169,200	172,000	170,100
DIRECT + SECONDARY (A-F)	408,800	361,200	372,500	369,100

Note: The categories of employment effects, labelled B to F, are the same as in Figures 4.1 and 4.2. In this table, each of these categories includes the total effects concerned, i.e., both the top and lower parts of the blocks in Figures 4.1 or 4.2.

Table 4.2: Number of Secondary Jobs Per 100 Direct Manufacturing Jobs, 1983-1991.

Type of Employment	1983	1987	1990	1991
A. Direct Manufacturing	100	100	100	100
B. Total Backward Linkage	51	50	50	50
C. Induced, by Industrial Pay	15	15	14	14
D. Further Induced, by Services Pay	6	6	6	6
E. Further Induced, by Services Pay	2	2	2	2
F. Re-spending of Taxes	15	15	14	14
TOTAL SECONDARY (B-F)	89	88	86	86
DIRECT + SECONDARY (A-F)	189	188	186	186

Note: The categories of employment effects, labelled B to F, are the same as in Figures 4.1 and 4.2. In this table, each of these categories includes the <u>total</u> effects concerned, i.e., both the top and lower parts of the blocks in Figures 4.1 or 4.2.

employment effects when assessing the employment performance of industry. For there were, in fact, quite significant changes going on in the relationship between secondary and direct employment in different groups of industries, while employment in various component parts of industry was also growing or declining at different rates; (some examples of this can be seen in the next section of this paper). Thus the relative stabilty seen in the relationship between secondary and direct employment at the aggregate level of manufacturing as a whole in 1983-91 was the outcome of a number of quite significant changes which tended to cancel each other out. Such an outcome would not necessarily be repeated in a different period, and it is certainly possible for the relationship between total secondary employment and total direct manufacturing employment to change appreciably.

5. EMPLOYMENT EFFECTS OF INDIGENOUS AND OVERSEAS INDUSTRY

This section examines and compares the employment effects of indigenous and overseas industry. First, Table 5.1 shows direct and estimated secondary services employment for indigenous manufacturing in 1983-91. It can be seen in the table that, like total manufacturing employment, direct indigenous manufacturing employment declined in 1983-87, increased in 1987-90 and declined a little in 1990-91. And the total secondary services employment supported by indigenous industry followed similar trends of decline, growth and decline in the same periods. The individual categories of secondary employment supported by indigenous industry also followed similar trends in these periods, except that categories C, E and F declined a little rather than increasing in 1987-90.

Compared with total direct manufacturing employment in all industry, however, the record of direct employment in indigenous indus2try was poorer. Whereas direct employment in all manufacturing declined by 8.0 per cent over the whole period 1983-91, direct employment in indigenous manufacturing declined by 13.4 per cent in the same period. The record of total secondary employment supported by indigenous industry was poorer still, with a decline of 23.5 per cent in 1983-91. Thus the ratio of secondary employment to direct manufacturing employment declined appreciably for indigenous industry, while it was relatively stable for all of manufacturing as was seen in Section 4.

Consequently, the performance of total employment supported

Table 5.1: Manufacturing Employment and Estimated Secondary Employment, Indigenous Industry, 1983-1991.

Type of Employment	1983	1987	1990	1991
A. Direct Manufacturing	128,902	110,731	113,210	111,679
B. Total Backward Linkage	62,800	46,900	49,500	48,600
C. Induced, by Industrial Pay	18,900	15,300	14,900	14,600
D. Further Induced, by Services Pay	8,000	5,800	5,800	5,700
E. Further Induced, by Services Pay	2,400	1,900	1,700	1,700
F. Re-spending of Taxes	19,000	15,600	14,600	14,400
TOTAL SECONDARY (B-F)	111,000	85,500	86,600	85,000
DIRECT + SECONDARY (A-F)	239,900	196,200	199,800	196,700

Note: The categories of employment effects, labelled B to F, are the same as in Figures 4.1 and 4.2. In this table, each of these categories includes the total effects concerned, i.e., both the top and lower parts of the blocks in Figures 4.1 or 4.2.

by indigenous industry - direct and secondary combined - was noticeably worse, with a drop of 18.0 per cent in 1983-91, than the performance of direct indigenous employment alone which declined by 13.4 per cent. However, nearly all of the employment decline occurred in the period up to 1987 and the record has been better since then.

Table 5.2 shows direct employment and estimated secondary employment for overseas industry in 1983-91. Like direct employment in all manufacturing, direct employment in overseas manufacturing declined in 1983-87 and rose again in 1987-90; however, direct overseas employment then held up in 1990-91, while total direct employment fell a little. Overall, in the period 1983-91, the direct employment record of overseas industry was stronger, with a fall of just 0.1 per cent, than in all manufacturing where the decline was 8.0 per cent. The record of secondary employment supported by overseas industry was stronger still.

Total secondary employment supported by overseas manufacturing actually increased in 1983-87, going against the trend in direct employment, and it increased again in 1987-90 with just a slight decline in 1990-91. By 1991, total secondary employment supported by overseas manufacturing was 4.5 per cent higher than in 1983 although direct overseas employment was slightly lower than in 1983. Most of the growth in this secondary employment occurred in category B, through the growth of purchases of Irish services by overseas industry, as well as in category C, through increases in the pay bill and the spending of its workforce.

Table 5.2: Manufacturing Employment and Estimated Secondary Employment, Overseas Industry, 1983-1991.

Type of Employment	1983	1987	1990	1991
A. Direct Manufacturing	87,355	81,210	87,240	87,256
B. Total Backward Linkage	47,500	50,000	50,900	50,400
C. Induced, by Industrial Pay	13,100	12,900	13,600	13,700
D. Further Induced, by Services Pay	6,000	6,100	6,000	5,900
E. Further Induced, by Services Pay	1,700	1,600	1,600	1,600
F. Re-spending of Taxes	13,200	13,100	13,400	13,500
TOTAL SECONDARY (B-F)	81,500	83,800	85,400	85,200
DIRECT + SECONDARY (A-F)	168,800	165,000	172,700	172,400

Note: The categories of employment effects, labelled B to F, are the same as in Figures 4.1 and 4.2. In this table, each of these categories includes the total effects concerned, i.e., both the top and lower parts of the blocks in Figures 4.1 or 4.2.

Since the secondary employment supported by overseas industry grew in 1983-91, while its direct employment did not grow, the ratio of secondary to direct employment increased in that period, in contrast to the experience of indigenous industry.

Table 5.3 shows the ratios of secondary employment to direct manufacturing employment for indigenous and overseas industry, in the form of numbers of secondary jobs per 100 direct manufacturing jobs. It can be seen in the table that, in 1983, the number of total secondary jobs per 100 direct manufacturing jobs was somewhat higher for overseas manufacturing, at 93, than for indigenous manufacturing, at 86. The difference between the two increased subsequently as the ratio for overseas manufacturing rose to 98 in 1990 and 1991 while the ratio for indigenous manufacturing fell to 76 by 1990 and 1991. Thus, by the end of the period, there was quite a significant difference between the two, and each individual category of the secondary employment effects contributed something to this overall difference.

It may seem rather surprising at first that overseas manufacturing has a higher ratio of secondary employment than indigenous manufacturing has. For it is well known that overseas industry imports many of its inputs and withdraws very substantial profits from Ireland. A common perception, therefore, is that much of the wealth generated by overseas industry is not retained within the country. There has consequently been much discussion about the need to increase the degree of integration of overseas industry with the domestic

economy.

In this context, therefore, it is worth pointing out that while it is true that much of the wealth generated by overseas industry leaves the Irish economy, it is also true that its expenditures in Ireland are still substantial. And while overseas manufacturing spends less in Ireland as a percentage of its sales than indigenous manufacturing does, Table 5.3 shows the ratios of secondary employment to direct employment, without reference to sales.

Specifically, the key factors which combine to give overseas manufacturing the higher secondary/direct employment ratios than indigenous manufacturing in Table 5.3 are as follows. First, and most important, overseas manufacturing has higher sales per employee than indigenous manufacturing - one-third higher in 1990. Second, the percentage of sales which is spent on Irish services is almost the same for both categories of industry, at 12.3 per cent for indigenous and 12.2 per cent for overseas in 1990. Thus overseas manufacturing spent about one-third more per employee than indigenous manufacturing on Irish services in 1990. Consequently, the ratios of secondary to direct employment are about one-third higher for overseas industry in 1990 in the categories B and D in Table 5.3, which depend on industry's expenditures on Irish services.

Next, pay is a lower percentage of sales in overseas manufacturing, at 14 per cent in 1990, than in indigenous manufacturing where the 1990 figure is 15.8 per cent. But, since overseas manufacturing has sales per employee which are one-third higher than in indigenous manufacturing, it still has

Table 5.3: Number of Secondary Jobs Per 100 Direct Manufacturing Jobs, Indigebous and Overseas Industry, 1983-1991.

Type of Employment		1983	1987	1990	1991
A. Direct Manufacturing	I	100	100	100	100
	OS	100	100	100	100
B. Total Backward Linkage	I	49	42	44	44
	OS	54	62	58	58
C. Induced, by Industrial Pay	I	15	14	13	13
	OS	15	16	16	16
D. Further Induced, by Services Pay	I	6	5	5	5
	OS	7	8	7	7
E. Further Induced, by Services Pay	I	2	2	2	2
	OS	2	2	2	2
F. Re-spending of Taxes	I	15	14	13	13
	OS	15	16	15	15
TOTAL SECONDARY (B-F)	I	86	77	76	76
	OS	93	103	98	98
DIRECT + SECONDARY (A-F)	I	186	177	176	176
	OS	193	203	198	198

Note: The categories of employment effects, labelled B to F, are the same as in Figures 4.1 and 4.2. In this table, each of these categories includes the <u>total</u> effects concerned, i.e., both the top and lower parts of the blocks in Figures 4.1 or 4.2.

I = Indigenous. OS = Overseas

significantly higher pay per employee than indigenous manufacturing. Hence overseas industry has significantly higher secondary employment per direct employee in the categories C, E and F, which depend on the level of industriy's pay.

As regards the factors behind the changes over time in the secondary/direct employment ratios in Table 5.3, it should be borne in mind that sales per employee are generally increasing in the services sector. Therefore, expenditures on services by manufacturing industry or by its employees would have to increase at the same rate as services' sales per employee in order to maintain a constant level of secondary services employment. And if the ratio of secondary services employment to direct manufacturing employment is to be maintained at a constant level, it is necessary that the expenditures on services supported by industry per direct industrial employee should increase at the same rate as sales per employee in services. If the expenditures on services per direct industrial employee increase faster than this, the ratio of secondary services employment to direct industrial employment tends to increase (other things being equal); and this ratio tends to fall if expenditures on services per direct industrial employee grow slower than sales per employee in services.

The expenditures on services supported by industry depend either on industry's own purchasing of services or on its pay bill (from which services are purchased and taxes are paid which support other purchases of services). Thus expenditures on services per direct manufacturing employee can increase (1) if manufacturing sales per employee increase, or (2) if industry's

purchasing of services increases as a percentage of its sales or (3) if industry's pay bill increases as a percentage of its sales.

With this in mind, the principal changes in the ratios in Table 5.3 can be explained as follows. First, the total secondary/direct employment ratio for indigenous industry declined quite substantially in 1983-87 due to a combination of unfavourable trends. Indigenous industry's sales per employee grew more slowly, at 8.5 per cent per annum (in current values), than sales per employee in services, at 9.1 per cent per annum (in current values). And at the same time, expenditures on services declined as a percentage of sales and pay also declined as a percentage of sales in indigenous industry. Any one of these trends would have tended to reduce the secondary/direct employment ratio, other things being equal, so that the combination of them reduced it quite substantially.

Subsequently, in 1987-91, the total secondary/direct employment ratio for indigenous industry stabilised. This was the result of continuing slower growth of sales per head in indigenous industry than in services being offset by an increase in expenditure on services as a percentage of sales, while pay as a percentage of sales was virtually unchanged in 1987-91.

In overseas industry, the total secondary/direct employment ratio increased quite substantially in 1983-87. This was primarily because overseas industry's sales per employee grew significantly faster, at 11.3 per cent per annum (in current values), than services' sales per employee, at 9.1 per cent per annum (in current values). In addition, expenditures on services

increased as a percentage of sales in overseas manufacturing. However, its pay declined a little as a percentage of sales which would have tended to reduce to some extent the rise in the secondary/direct employment ratio resulting from the other two factors.

Subsequently, in 1987-90, the total secondary/direct employment ratio for overseas industry declined, although it remained significantly higher than in 1983. This decline occurred even though sales per employee continued to grow faster in overseas manufacturing, at 8.1 per cent per annum, than in services, at 7.5 per cent per annum (in current values). For the difference between these two growth rates was small, and it was outweighed by the fact that there was a decline both in expenditures on services as a percentage of sales and in pay as a percentage of sales.

It may seem somewhat surprising at first sight that sales per employee do not generally grow a good deal faster in manufacturing than in services. (As we have seen, sales per employee grew faster in services than in indigenous industry in both 1983-87 and 1987-90, while sales per employee grew almost as fast in services as in overseas industry in 1987-90). This may seem somewhat surprising because we are used to thinking of manufacturing as having habitually higher rates of growth of productivity or output per head than services. However, when such comparisons of productivity growth rates are made, they are normally done in terms of <u>volume</u> of output per employee, or output per employee in <u>constant</u> prices. In contrast, our discussion above concerning trends in sales per employee refers

consistently to sales in current money values.

A recent report from the NESC (1992, Section 4) affirms that productivity growth in Ireland has generally been considerably lower in services than in manufacturing, when output is measured in terms of volume or constant prices. However, as the same report briefly notes, the picture is different when considered in terms of current values, because prices of services have risen faster than prices of manufacturing output. Thus despite the fact that the volume of output per employee, in constant prices, has risen more slowly in services than in manufacturing, it is still possible for sales per employee, in current money values, to have risen in services at rates which are almost as high or higher than in manufacturing.

In our analysis above, we have referred consistently to sales per employee in current money values because that is what matters for our purposes. If sales per employee in services rise by *x* per cent in current values, then industry can maintain the level of the secondary employment it supports in services only if its relevant expenditures on services increase by the same amount, in current terms. The fact that the volume of industry's production, in constant prices, may increase by a greater amount does not affect the position.

To conclude this Section, the relatively high level of sales per employee in overseas manufacturing, and the growth in its sales and its sales per employee, have been of some benefit for Irish employment through the secondary effects in services. This is so despite the fact that a relatively high percentage of the value of the sales of overseas industry is not spent in Ireland.

The amount which is spent within the country, on wages and salaries and on Irish services, has been sufficient to have supported secondary employment effects which are larger relative to direct employment than in the case of indigenous manufacturing. And these seondary employment effects have increased over time, even at times when direct overseas manufacturing employment was declining, while they have also increased relative to direct employment over the whole period 1983-91.

6. THE EMPLOYMENT EFFECTS OF MATERIALS PURCHASING LINKAGES OF OVERSEAS MANUFACTURING

In this paper up to now, we have not considered the secondary employment effects of industry's purchasing of Irish-produced materials and components. This was because, in the case of materials purchased from the Irish primary sector, it is not considered that industry is responsible for causing the generat2ion of employment in the primary sector in a meaningful sense, as was outlined in Section 2. In the case of purchasing of materials and components from Irish manufacturing, this was intentionally left out of consideration in Section 4, which dealt with the employment effects of all manufacturing, because all manufacturing employment was already counted in direct manufacturing employment, and we wanted to avoid double-counting.

However, when one is focusing on the employment effects of a part of manufacturing, then employment supported by its purchases of materials and components from other Irish industries may be counted as part of the secondary employment supported by it. As long as we do this for one part of industry at a time, and do not then sum up the results for the various parts of industry, the problem of double-counting is avoided. Thus if we want to know the full secondary employment effects of a particular sector of industry, we can include the effects of its purchases of inputs from other sectors of Irish industry. Similarly, the secondary employment effects of overseas industry can include the effects of its purchases from indigenous industry. Since industrial policy has been concerned with

developing the materials purchasing linkages of overseas industry in Ireland, it is of interest to consider the employment effects of such purchases by overseas industry.

However, there are some problems in attempting to estimate the employment effects of purchasing of materials and components by overseas industry, using the Irish Economy Expenditures survey. This is because the materials and components purchased by industries from Irish sources are not broken down by category in the IEE survey. The survey does provide data on materials and components purchased from Irish sources, as opposed to imported materials and components. But it does not make a distinction between manufactured materials and components as opposed to raw or unprocessed materials coming from the primary sector. Nor does it identify whether the manufactured materials and components purchased in Ireland come from indigenous or overseas industry.

This creates difficulties in estimating the secondary employment effects of materials purchasing by overseas industry. For, in order to do so, we would wish to count only the effects of purchases of Irish-made industrial products, leaving out purchases of Irish primary products, for the reasons already outlined in Section 2. And we would wish to count only the effects of purchases by overseas industry of industrial products from indigenous industry, leaving out the effects of products purchased from overseas industry itself. This is because we cannot count such secondary employment in overseas industry itself as being additional to direct employment in overseas industry, without becoming involved in double-counting.

We can get around the first of these difficulties, concerning the distinction between primary and manufactured inputs, by using input-output tables to estimate what proportion of all Irish material inputs come from the manufacturing sector as opposed to the primary sector. But we have no satisfactory way of estimating what proportion of Irish-sourced manufactured inputs come from indigenous industry as opposed to overseas industry itself. Thus we can only estimate the secondary effects of overseas industry's purchasing of all Irish-sourced manufactured products, whether the source is indigenous industry or overseas industry itself. This means that these estimated secondary employment effects cannot really all be counted as additional to direct overseas employment because of the element of double-counting. To this extent, the secondary employment effects estimated in this section are somewhat different in character to those in Sections 4 and 5, where there was no double-counting and all the secondary employment was additional to the direct employment concerned.

To estimate the secondary employment in Irish industry which is supported by overseas industry's purchasing of Irish-made materials and components, we start with estimates, derived from the IEE survey, of overseas manufacturing's expenditures on Irish-sourced materials and components.

Then we use the official input-output tables to estimate how much of this is spent on Irish manufactured products as opposed to Irish primary products. The input-output tables show which sectors the Irish materials inputs purchased by individual sectors come from. In the case of most manufacturing sectors,

more than 98 per cent of spending on Irish materials and components goes to non-Food manufacturing sectors. Thus for these sectors, we take it that all their expenditures on Irish materials and components are spent on non-Food manufactured products. The employment supported by these expenditures is then estimated by dividing the expenditures by sales per employee for indigenous non-Food manufacturing industry in the year concerned, on the grounds that most of the inputs purchased would come from indigenous industry.

In the case of a minority of manufacturing sectors, however, the input-output tables show that a significant percentage of their expenditures on Irish materials and components goes to the primary sector or to the Food sector. In these cases, we use the IEE survey data to derive the amounts of their expenditures on all Irish materials, and we use the input-output tables to determine what proportions of those expenditures go to the primary sector, the Food sector and non-Food manufacturing sectors. The expenditure going to the primary sector is then left out of consideration. And the employment supported by expenditures going to the Food and non-Food manufacturing sectors is estimated by dividing the expenditures concerned by sales per employee for, respectively, indigenous Food and non-Food manufacturing industries. (Further details on this are in the Appendix on "Methodological Procedures").

In this way, it is estimated that the manufacturing employment supported indirectly by overseas manufacturing's purchases of Irish industrial products was about 10,200 in 1983, rising to about 13,500 in 1990 and further to about 14,700 in

1991. When expressed in terms of numbers of indirect manufacturing jobs per 100 direct jobs in overseas manufacturing, the estimates are 12 in 1983, 15 in 1990 and 17 in 1991. Thus, as with the secondary employment supported in services by overseas industry, the secondary manufacturing employment was also increasing both in absolute terms and in relation to direct overseas employment.

The figures above for Irish manufacturing employment supported by the materials purchasing of overseas manufacturing should only be regarded as estimates, which are subject to some error due to the estimation procedures. But they should give a reasonable indication of the orders of magnitude involved. And it is very likely that they are at least correct in indicating that the secondary employment concerned has been increasing both in absolute terms and in relation to direct overseas manufacturing employment.

If it were the case that all of the above secondary manufacturing employment supported by overseas manufacturing was in indigenous industry, then it would have accounted for 7.9 per cent of indigenous manufacturing employment in 1983, rising to 11.9 per cent in 1990 and further to 13.1 per cent in 1991. This can be broken down into 9.7 per cent of indigenous non-Food manufacturing employment in 1983 rising to 14.8 per cent in 1990 and 16.5 per cent in 1991, and 3.6 per cent of indigenous Food sector employment in 1983 rising only marginally to 3.8 per cent in 1990 and 4 per cent in 1991.

However, the above figures must overstate the impact on indigenous industry to some degree. For some part of the

secondary employment concerned would occur in overseas industry - to the extent that some of the Irish-sourced manufactured products purchased by overseas industry come from overseas industry itself.

Nevertheless, it is reasonable to regard the bulk of the secondary employment impact from purchasing of Irish industrial products by overseas manufacturing as occurring in indigenous industry. This is because overseas manufacturing is very highly export-oriented and sells relatively little of its output in Ireland, while indigenous manufacturing sells most of its output in Ireland. Consequently, indigenous industry is the source of a large majority (some 80 per cent) of the manufactured products which are both made and sold in Ireland. Thus expenditures by overseas manufacturing in Ireland on industrial products made in Ireland would probably have to go very largely to indigenous industry.

So while it would be overstating the case to say that 12 or 13 per cent of indigenous manufacturing employment or sales is supported by the purchasing of overseas manufacturing, the true figure is probably not a great deal lower. Thus overseas industry in Ireland constitutes a fairly important and a growing market for indigenous industry. For comparison, the market of the United Kingdom accounts for 15 per cent of the sales of indigenous industry, while the rest of the EC accounts for 8 per cent of its sales (*Census of Industrial Production 1989*).

As was noted above, it cannot be said that <u>all</u> of the secondary industrial employment supported by the Irish materials purchasing of overseas manufacturing is additional to direct

overseas manufacturing employment. Consequently, we cannot add all of this secondary manufacturing employment to the secondary services employment supported by overseas industry, which was estimated in Section 5, to arrive at total additional secondary employment supported by overseas manufacturing. However, most of the 17 secondary manufacturing jobs per 100 direct overseas manufacturing jobs would be additional to direct overseas manufacturing employment. Thus with 98 secondary services jobs per 100 direct overseas manufacturing jobs in 1991, plus most of 17 secondary manufacturing jobs per 100 direct overseas jobs, overseas manufacturing would be supporting something in the region of about 110 additional secondary jobs per 100 direct manufacturing jobs.

7. CONCLUSIONS

This paper has examined employment effects of manufacturing industry which go beyond direct employment within manufacturing itself. This included secondary employment supported in services by industry's purchasing of services inputs, employment supported in services by the expenditures of industrial employees, and employment in services supported by the re-spending of taxes arising from industry and its employees.

It was found that, in all of these categories combined, there were approximately 172,000 non-manufacturing jobs which were supported by manufacturing industry to a significant degree in 1990. This meant that there were about 86 secondary non-manufacturing jobs per 100 direct manufacturing jobs. These figures are estimates which should not be regarded as highly precise, but they should indicate the order of magnitude involved. (These figures leave out the effects of spending of profits of manufacturing or re-spending of taxation of manufacturing profits. If approximate estimates of those effects are included, there were about 89 or 90 secondary non-manufacturing jobs per 100 direct manufacturing jobs).

Looking at trends over time, it was found that the total secondary employment supported by manufacturing has tended to rise or fall at much the same time and at much the same rate as total direct employment within manufacturing itself, in the period 1983-91. Consequently, in that period, it would have made little difference to one's judgement of industry's overall employment performance whether one considered the secondary

employment effects or not. For there was little change in the relationship between direct manufacturing employment and total secondary employment, so that direct plus secondary employment combined changed at much the same rate as direct manufacturing employment alone.

This does not mean, however, that the relationship between secondary and direct manufacturing employment is inherently stable, or that there is no point in considering the secondary employment effects when assessing the employment effects of manufacturing. For there were, in fact, quite significant changes going on in the relationship between secondary and direct employment in different groups of industries. Thus the stability seen in the relationship between secondary and direct employment at the aggregate level of manufacturing as a whole in 1983-91 was the outcome of significant changes which tended to offset each other. Such an outcome was something of a freak occurence which would not necessarily be repeated in another period.

Looking at indigenous and overseas manufacturing separately, it was found that the direct employment record of indigenous industry was poorer than that of all industry, particularly in 1983-87 although its employment performance has improved since then. The record of secondary employment supported by indigenous industry was poorer than its direct employment. Thus the ratio of secondary employment to direct manufacturing employment declined appreciably for indigenous industry while it was relatively stable for all of manufacturing. There were about 86 secondary jobs in services per 100 direct indigenous manufacturing jobs in 1983, falling to about 77 per hundred in

1987 and 76 in 1990 and 1991.

In contrast, overseas industry had a stronger record of direct manufacturing employment than all industry, and the record of secondary employment supported by overseas industry was stronger still. The ratio of secondary employment in services to direct manufacturing employment for overseas industry increased from 93 secondary jobs in services per 100 direct manufacturing jobs in 1983 to 98 per 100 in 1990 and 1991.

Thus by 1990 and 1991, overseas industry supported 98 secondary jobs in services per 100 direct manufacturing jobs, compared with an appreciably lower ratio of 76 per 100 for indigenous industry. The difference between the two is explained mainly by the fact that overseas industry has substantially higher sales per employee than indigenous industry; at the same time, expenditure on Irish services as a percentage of sales is about the same in both overseas and indigenous industry, while pay as a percentage of sales is not much lower in overseas industry than in indigenous industry. Thus the relatively high level of sales per employee in overseas manufacturing, and the growth in its sales and its sales per employee, have been of some benefit for Irish employment through the secondary effects in services.

We also looked at employment supported by overseas manufacturing's purchases of materials which are made in Ireland. It was estimated that about 10,200 people were employed in Irish manufacturing in producing industrial products as inputs for overseas industry in 1983, rising to about 14,700 by 1991. When expressed in terms of numbers of indirect manufacturing jobs per

100 direct jobs in overseas manufacturing, the estimates are 12 in 1983 and 17 in 1991. Thus, as with the secondary employment supported in services by overseas industry, the secondary manufacturing employment was also increasing both in absolute terms and in relation to direct overseas employment.

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APPENDIX. METHODOLOGICAL PROCEDURES

This Appendix, which is referred to in the text, is not included in the present volume.