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# AN ANALYSIS OF SECONDARY EMPLOYMENT ASSOCIATED WITH MANUFACTURING INDUSTRY

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Eoin O'Malley



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## GENERAL SUMMARY

This paper presents estimates of secondary or indirect employment which is associated with manufacturing industry. This includes associated employment supported in services by industry's purchasing of services inputs, employment supported in services by the expenditures of industrial employees on services, and employment in services supported by the re-spending of taxes arising from industry and its employees.

### *Secondary Services Employment Associated with Total Manufacturing*

It is found that, in all of these categories combined, there were approximately 168,100 services jobs which were associated with manufacturing industry in 1991. This meant that there were about 84 associated services 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 87 or 88 associated services jobs per 100 direct manufacturing jobs.) It is worth noting here that, for reasons discussed in Chapter 2, we would not regard the entire number of jobs which are estimated as being associated with manufacturing as a "net" contribution to total employment which is all caused to exist by industry.

### *Trends Over Time in Secondary Services Employment Associated with Total Manufacturing*

Looking at trends over time, it is found that the total secondary services employment associated with manufacturing has tended to change at slightly different rates to total direct employment within manufacturing itself. The ratio of total secondary services employment to direct manufacturing employment drifted slowly downwards over the period 1983-90, from 89 to 83 jobs per 100 direct manufacturing jobs. This was followed by a small increase to 84 per 100 in 1991 and a larger increase to 91 per 100 according to the preliminary estimate for 1992. Thus by 1992, it is estimated that the ratio of total associated services jobs per 100 direct manufacturing jobs was just slightly higher than the ratio in 1983, after a decline in the intervening period.

In the period 1983-91, at least, it would have made rather little difference to one's judgement of industry's overall employment performance whether one considered the associated services employment or not. For there were only quite small and gradual changes in the relationship between direct manufacturing employment and total secondary services employment, so that direct manufacturing plus secondary services employment combined changed at only slightly different rates to direct manufacturing employment alone. In the period 1983-91 as a whole, direct manufacturing employment fell by -1.0 per cent per annum while direct plus secondary services employment combined fell by -1.3 per cent per annum. In the sub-period 1983-87, direct manufacturing employment declined by -2.9 per cent per annum while direct plus secondary services employment combined declined by -3.2 per cent per annum. And in the sub-period 1987-91, direct manufacturing employment recovered to grow by 0.9 per cent a year while direct plus secondary services employment combined grew by 0.6 per cent a year. The preliminary figures for 1992, however, indicate that direct plus secondary services employment combined grew at a substantially higher rate than direct manufacturing employment in 1991-92. This shows that the relationship between secondary services employment and direct manufacturing employment is capable of changing quite sharply, although in fact it changed only quite slowly throughout the period 1983-91.

#### *Secondary Services Employment Associated with Indigenous and Overseas Manufacturing*

Looking at indigenous and overseas manufacturing separately, 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 services employment associated with indigenous industry was poorer than that of its direct employment. Thus the ratio of secondary services employment to direct manufacturing employment declined for indigenous industry. There were about 86 secondary jobs in services per 100 direct indigenous manufacturing jobs in 1983, falling to about 74 per 100 in 1990. The figure then increased to 77 in 1991 and an estimated 80 in 1992, which was still below the figure of 86 in 1983.

Overseas industry had a stronger record of direct manufacturing employment than all industry, and the record of secondary services employment associated with overseas industry was somewhat stronger again. 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 94 per 100 in 1991 and an estimated 105 per 100 in 1992.

Thus by 1991, there were 94 associated jobs in services per 100 direct jobs in overseas manufacturing, while there was a lower ratio of 77 per 100 for indigenous industry. The preliminary estimates for 1992 indicate that the gap between these figures for overseas and indigenous industry widened in 1992. 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.

It may be concluded from this that 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 associated services. This is so despite the fact that a relatively high percentage of the value of the sales of overseas manufacturing is not spent in Ireland, but is rather spent on imported inputs or is taken out of the country in the form of profit outflows. The amount which is spent within the country, on wages and salaries and on Irish services, has been sufficient to have supported secondary services employment which is greater relative to direct manufacturing employment than in the case of indigenous manufacturing.

It should be noted, however, that this in itself cannot lead to a simple conclusion that overseas industry is "superior" to indigenous industry in supporting associated services employment, in any absolute sense. For the impression of "superiority" in this respect arises only when one expresses the secondary services employment in relation to direct manufacturing employment. If one were to look at the levels of either direct manufacturing employment or secondary services employment in relation to the value of *sales* - i.e., numbers of jobs per IR£million worth of sales - indigenous industry would look "superior" to overseas industry in supporting employment.

Thus one should be careful not to jump to inappropriate policy conclusions based only on the perspective of the relationship between associated services employment and direct manufacturing employment. In particular, we would *not* wish to conclude from this that overseas industry is better than indigenous industry at supporting employment, or that policy efforts should give priority to promoting overseas industry for that reason. Indeed, it seems clear that major efforts to develop indigenous industry are called for, most obviously because there is little sign that overseas

investment alone could be sufficient to make a satisfactory contribution to the country's employment needs. However, it does seem valid to conclude that overseas industry does make a significant contribution to supporting secondary services employment as well as direct manufacturing employment. Its employment impact should not be overlooked, despite the fact that much of the value of its turnover is not spent in Ireland.

*Employment Associated with Purchasing by Industry of Irish Manufactured Inputs*

This paper also looks at employment supported by overseas and indigenous industry's purchases of manufactured materials and components 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 14,000 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 16 in 1991. Thus the secondary manufacturing employment was increasing both in absolute terms and in relation to direct overseas employment.

It should be noted, however, that these estimates of secondary employment in Irish manufacturing in producing industrial products as inputs for overseas industry are rather different in character to the estimates of secondary services employment. This is because some of the secondary employment in the supplier industries concerned is in overseas industry itself, i.e., some overseas firms purchase some manufactured inputs from other overseas firms in Ireland. Thus, unlike the secondary services employment, the secondary manufacturing employment is not all *additional* to direct overseas manufacturing employment. To take account of this point, we also present rather rough or approximate estimates of the amount of secondary employment in producing industrial products for overseas industry which is in indigenous industry alone. These estimates are about 8,200 in 1983 rising to about 11,200 by 1991; this estimate for 1991 amounts to about 10 per cent of total indigenous manufacturing employment in that year.

In the case of indigenous manufacturing, it is estimated that the employment involved in producing Irish manufactured products as inputs for indigenous industry was about 24,200 in 1983, declining to about 18,900 in 1991. When expressed in terms of numbers of indirect manufacturing jobs per 100 direct jobs in indigenous manufacturing, the estimates are 19 in 1983 and a slight decline to 17 in 1991.

Again, it should be noted that these estimates of secondary employment in Irish manufacturing in producing industrial products as

inputs for indigenous industry are different in character to the estimates of secondary services employment, to the extent that much of the secondary employment in the supplier industries concerned is in indigenous industry itself. Thus, unlike the secondary services employment, the secondary manufacturing employment is not all *additional* to direct indigenous manufacturing employment. Nevertheless, the estimates of secondary manufacturing employment do have some meaning, in so far as they indicate that the amount of employment in producing Irish manufactured inputs for the average indigenous manufacturing firm is about 17 per cent of the average firm's own employment.

The figure of 17 indirect manufacturing jobs per 100 direct manufacturing jobs for indigenous industry is almost the same as the figure of 16 for overseas industry in 1991. But it should be noted that this would not necessarily support a clear and unambiguous conclusion that overseas industry is very nearly as good as indigenous industry at supporting employment in Irish supplier industries, in any absolute sense. Such a conclusion is suggested only when one expresses the indirect employment in relation to direct manufacturing employment. If one were to look at the levels of either direct or indirect manufacturing employment in relation to the value of *sales*, indigenous manufacturing would look rather better than overseas manufacturing at supporting employment.

Thus one should again be careful not to jump to inappropriate policy conclusions based only on the perspective of the relationship between secondary manufacturing employment and direct manufacturing employment. However, it does seem valid to conclude that overseas industry does make quite a significant contribution to supporting secondary manufacturing employment as well as direct manufacturing employment. Its employment impact should not be overlooked, despite the fact that much of the value of its turnover is not spent in Ireland and that much of its material inputs are imported.

## Chapter 1

### *INTRODUCTION*

This paper is concerned with trying to assess the significance of the employment which is associated with manufacturing industry. The interest in this matter arises from an awareness that measures of the direct employment within industry alone do not tell the full story about its influence on employment, since industry can help to generate or sustain further employment indirectly in various ways. For example, in addition to employing people directly in factories, industry helps to support other jobs in services by its purchases of services. Thus industry could be regarded as having influences on employment which are broader than its direct employment alone.

There are a number of different reasons why it might be thought desirable to attempt to quantify this further employment which is associated with industry. For example, one might want to have a comprehensive measurement of the overall scale of the “impact” of manufacturing on employment, simply in order to show that manufacturing is very important for employment in this country. However, this general objective could probably be achieved by qualitative comment and by reference to a few key statistics, without requiring very thorough and detailed quantitative research. Besides there are real problems in trying to measure, or even to identify, *all* aspects of the employment effects associated with manufacturing. For this reason, it would be difficult if not impossible to arrive at a fully comprehensive (and generally accepted) estimate of the overall scale of the employment associated with industry.

Nevertheless, there are reasons why it is important to try to measure at least the more significant and quantifiable elements of employment associated with manufacturing and – more particularly – to assess how these have been changing. This is necessary in order to be able to monitor and assess progress over time in job creation stemming from industrial development.

For example, for a long period in the 1980s, Ireland had declining industrial employment together with relatively strong growth in industrial output. At the same time, it appeared that quite a number of prominent manufacturing companies were tending to shed certain service functions

which were formerly done within the firm and to purchase these services from outside the firm. Such a combination of trends created problems in forming a judgement about whether this amounted to a positive or negative contribution by industry to creating employment.

For it was at least possible that the growth in industrial production, perhaps together with significant growth in subcontracting of services, could have meant strongly growing purchases by industry from other sectors thereby sustaining growing employment in those other sectors. Thus the trend in the overall employment associated with industry could, in principle, have been rather different to the trend in direct employment within industry alone. Thus it is necessary to have a good understanding of the broader trends in order to judge how satisfactory or unsatisfactory is the employment performance of industry.

A related issue which arises in this regard concerns the contribution to the economy and to employment which is made by overseas or foreign-owned industry in Ireland, especially in the "modern" or "high technology" sectors. These industries have been a major source of industrial growth for more than the past decade, but the growth in their output was much stronger than their employment growth since their productivity has been both high and rising rapidly. By 1990, total overseas or foreign-owned manufacturing accounted for 45 per cent of total manufacturing employment, but a more substantial 55 per cent of manufacturing gross output and as much as 68 per cent of manufacturing net output (*Census of Industrial Production 1990*).

Thus, overseas industry accounts for a considerably greater share of output than of employment in manufacturing. This raises the question whether overseas industry might be substantially more important for employment than its share of direct manufacturing employment suggests. This could be the case if its relatively high level of output leads to relatively high levels of purchasing from other sectors thereby sustaining large amounts of employment in those other sectors. On the other hand, however, there has been a growing awareness that overseas industry imports many of its material inputs, withdraws very substantial profits from Ireland, and may also engage to some degree in transfer-pricing which would artificially inflate the recorded value of its production. Thus, it could be that the relatively high share of overseas industry in recorded manufacturing output gives a quite misleading impression of its importance for the Irish economy or Irish employment. If so, this raises the possibility that overseas industry might contribute rather little more to Irish employment beyond its own direct manufacturing employment.

In view of these issues, it is a matter of some importance to attempt to

measure at least the more significant and quantifiable elements of the secondary employment associated with manufacturing. In attempting to do so in this paper, the primary objective is to address the question how has the employment associated with manufacturing changed over time – in a context of relatively rapid growth in the output of manufacturing industry and particularly at times when much of the growth has come from the overseas sector? In considering such questions, it is clear that information on employment generated directly within manufacturing industry alone could give a misleading or confusing impression of industry's overall contribution to employment change. Or at least it could leave some important questions unanswered. Hence it is of practical relevance to attempt to assess the trends in the broader area of employment associated with manufacturing industry.

This paper reports on research findings on these issues. Chapter 2 first discusses the conceptual issues, concerning what is meant by the secondary employment associated with manufacturing. Chapter 3 then describes the basic data source which is used in estimating this secondary associated employment, and briefly outlines how the data are used. Next, Chapter 4 presents estimates of non-manufacturing employment which is associated with all manufacturing industry and shows how this has changed over time since 1983. Chapter 5 then presents estimates of the non-manufacturing employment which is associated with Irish indigenous manufacturing and with overseas manufacturing and examines how and why this has changed over time. Chapter 6 presents and considers estimates of employment in manufacturing which is sustained by the purchasing of manufactured inputs from Irish industry by both overseas and indigenous industry. Finally Chapter 7 draws together the conclusions of this report.



## Chapter 2

### *THE NATURE OF SECONDARY EMPLOYMENT ASSOCIATED WITH INDUSTRY*

The basic aim of this paper is to attempt to estimate the principal elements of employment which are associated with manufacturing industry and – more particularly – to examine how has the employment associated with manufacturing changed over time. Such an undertaking is based on the premise that industry not only employs people directly, i.e., within industry itself, but that there is also other employment which is in some sense associated with or at least partly dependent on trends in manufacturing. Thus, we need to consider the nature of this secondary employment associated with industry.

There is a certain amount of existing literature which has a bearing on this issue, such as the literature on the economic effects of foreign multinational companies in developing or newly-industrialising countries, e.g., Lall (1979) and International Labour Office (1984). The literature on project appraisal or cost-benefit analysis is also relevant. 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 secondary employment associated with Irish manufacturing industry.

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 called the “macroeconomic 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 more general effects on others (not just competitors), for example through effects on general quality of management, labour skills, technology, labour costs, government policy, etc. Under the heading "vertical effects" in Table 2.1, the "backward effects (or linkages)", arising from purchasing of supplies of inputs, are also sometimes termed "indirect" effects.

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

<i>Employment Effects</i>	<i>Definition or Illustration</i>
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. Macroeconomic effects	Employment indirectly generated throughout the local economy as a result of spending by the MNE subsidiary's workers or shareholders
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.)

Source: International Labour Office (1984).

While Table 2.1 includes a wide range of suggested secondary employment effects of an industrial activity, it is not necessarily exhaustive. For example, a further effect, which might be included under the heading "macroeconomic effects", is the effect of tax revenues generated by an industry – which make it possible for the public sector to generate further employment. Henry (1990/91) 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. A fairly common practice has been just to measure direct employment, "backward linkage" (or "indirect") employment, and activity stimulated by the spending of incomes arising in industry (termed "macroeconomic effects" in Table 2.1 and also known as "induced" effects). Some previous research in Ireland has aimed to measure such secondary or associated employment in certain years, with some variations in approach.

For example, Henry (1981) presented estimates of backward linkage employment of new grant-aided manufacturing and the rest of manufacturing in 1976. O'Riordan (1984/85) estimated backward linkage employment in "marketed services" attributable to purchasing of the "goods producing" sectors in 1975. Henry (1990/91) estimated backward linkage and "induced" employment attributable to tourism in 1989, together with employment effects of re-spending of taxes arising from tourism. Kennedy (1991) analysed backward linkage expenditures by overseas and indigenous manufacturing in 1983 and 1987, without estimating the employment implications of this. Thus these sorts of estimations are practically feasible, but there are some conceptual issues and measurement difficulties arising even with these types of procedures.

#### *Interpretation of Causation*

Although it has been quite a common practice in various countries to measure at least some of the secondary employment associated with industry, such as the "backward linkage" and "induced" employment, there can be some problem in interpreting what such measures actually mean.

At one level, of course, they can be understood simply as descriptive indicators of how employment in an economy is structured – with  $x$  number of people being employed in supplying the purchases of industry or its employees. But it is also of interest to ask does this mean that industrial activity actually *causes* all of this other employment to exist? In the absence of demand from industry, would not at least some 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 associated employment. It is also necessary that others should take the steps needed 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 industry in an economy as, at least, creating opportunities which make possible the development of the secondary associated employment. Thus, industry can facilitate or stimulate the creation of the associated employment, rather than automatically causing it to exist by its mere presence alone.

Having said that, it is necessary to consider whether the physical location of an industry has any real influence on the location of the secondary employment associated with it. For example, does the fact that an industry is in Ireland significantly help other producers in Ireland to supply inputs to it, or would it be just as easy for them to supply other customers elsewhere regardless of their location? On this question it seems reasonable to take the view that the local presence of industries generally does help to a significant degree to develop the associated employment in the same economy.

Leaving aside purchases of primary products (which we refer to separately below), 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 demand for such services this is a strong influence in causing services production 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. 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 stimulate this associated employment 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, 1990). 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. An Bord Trachtala (1992) found, too, 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 have a genuinely significant effect in stimulating the development of secondary associated employment, in services or industry, in the same economy.

However, the purchasing by some industrial sectors of material inputs from the primary producing sectors – principally from agriculture – 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 employment in primary production. In reality, primary production generally existed before significant processing industries were established. And even in the absence of the processing industries today, the raw materials – or at least some (perhaps different) mix of primary products – would probably be produced in any case, given that the natural resource of land exists. 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.

As Kennedy (1991) notes, it is only to the extent that a processing industry enhances the profitability of agricultural production and/or induces additional production that it can be said to involve development of backward linkages. Kennedy also mentions that the classic discussion of backward linkages by Hirschman (1958) noted that the highest value of apparent backward linkage was found in grain milling, but considered that

it would be quite unrealistic to think of the grain production as being induced by the grain mills; rather the grain mills constituted a forward linkage from the agricultural production.

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

Following from the discussion above, therefore, the view is taken in this paper that the presence of industry does have a genuinely significant effect in stimulating or helping the development of secondary associated employment in the same economy – in services or industry but much less so in primary production. Consequently, when quantitative estimates are presented of the secondary employment associated with industry, this will not include primary sector employment.

It is worth pointing out that such quantitative estimates of secondary employment associated with industry cannot really be interpreted as estimates of the “net” contribution to total employment which is caused to exist by industry. For if industry somehow ceased to exist, the economy would look very different indeed. There would probably be very different levels of wages, prices and other variables, quite likely involving – in particular – much lower wages, so that there could be consequent employment increases in other sectors. Thus the “net” contribution to the stock of total employment which is caused by the existence of industry could well be something less than the whole stock of employment which we can measure as being associated with industry.

Besides, if we were to make statements about the industrial sector “causing” or being responsible for the whole stock of the associated employment, this could be taken to imply that all of industry has an independent, autonomous existence, with the other activities depending on it. That would be a somewhat questionable proposition, particularly since some industries are themselves suppliers to other sectors or indeed to other industries. Furthermore, there is generally some degree of interdependence between associated economic activities such as purchasers and suppliers. However, it is not intended to embark here on a detailed

examination of the question of the autonomy or dependence of different economic sectors.

Rather, we will be content to think of estimates of the stock of employment associated with industry as being, first, descriptive indicators of how employment is structured in the economy – with so many being employed in supplying the purchases of industry or its employees, etc. We would also argue that the presence of industry does have a genuinely significant effect in stimulating or helping the development of the associated employment in the same economy. But in presenting numerical estimates of such associated employment, we do not mean to imply that these are precise figures for the “net” contribution to total employment which is “caused” to exist by industry.

In fact, the basic objective in estimating measurements of the secondary employment associated with industry is not so much to provide a comprehensive quantitative measurement of the whole *stock* of secondary employment generated or caused to exist by industry. Rather the aim is to produce good indicators of the more important types of secondary associated employment, estimated in a consistent manner over time. Then we are interested in observing the *changes* in these indicators over time, as well as the differences in these indicators for different types of industry. For the changes in such indicators (as well as in direct manufacturing employment) may be seen as providing information about trends in the total industry-related employment contribution which tell us more than trends in direct industrial employment alone.

This focus on the issue of changes over time raises the question whether changes in industry or its secondary associated employment can generally be regarded as “net” changes to total employment. A relevant consideration here is whether one can assume that general equilibrium with full employment is the normal situation. If this can be assumed, then an increase in industry or its associated employment generates no *net addition* to employment because all would have been employed even in the absence of that increase. On the other hand, if there is normally chronic high unemployment, then it is possible that all of an increase in employment associated with an addition to industrial activity is an additional net contribution to total employment.

In this regard, it should be noted that 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 that increases in employment associated with increased industrial activity could

generally be regarded as being net additions to what would have existed otherwise, since alternative employment opportunities were scarce. It is possible that there may have been some tendency for such employment increases in industry or its associated services to generate a general upward pressure on wages, with consequent tendencies to undermine and reduce employment to some extent in other non-associated services. But it seems likely that such tendencies would have been weak in an environment of a substantial excess supply of labour. (The available quantitative estimates of these types of effects – whereby employment increases can bid up wages and undermine employment in other sectors – would not generally refer to such effects in undermining *services* employment; thus they would not shed much light on the processes considered in this paper.)

A further issue which is relevant here, however, is whether or not there are shortages of certain skills in the economy. If there are, and they cannot be quickly remedied, then employment generated by an increase in industrial activity for people with those skills would not amount to a net additional 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 increased employment associated with growth in industrial activity is a net additional contribution to total employment.

On this issue, it can be said that 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 changes in the level of employment stimulated by industry since the early 1980s did not occur in a context of significant skill shortages. Therefore, relatively few of those benefiting from such additional employment would have been in a position to find alternative employment readily in a situation of persistent high unemployment. Consequently, increases in the employment stimulated by industry may, for the most part, be regarded as being net additions to what would have existed otherwise.

To summarise and conclude on the general issue of interpreting causation, it seems reasonable, first, to take the view that the presence of industry does have a genuinely significant effect in stimulating or helping



the development of secondary associated employment in the same economy.

Secondly, we do not argue, however, that estimates of the stock of secondary employment associated with industry amount to precise estimates of the *net* contribution to total employment which is *caused* to exist by industry. Estimates of the stock of employment associated with industry can, at the least, be understood as descriptive indicators of how employment is structured in the economy – with so many being employed in supplying the purchases of industry or its employees, etc. We have argued, further, that industry does have a significant effect in stimulating the development of such associated employment. But in making quantitative estimates of the stock of associated employment, we do not mean to imply that these are precise figures for the “net” contribution to total employment which is “caused” to exist by industry.

Finally, in the case of Ireland since the early 1980s, it seems reasonable to adopt the view that *changes* in industrial employment or in employment associated with industry have been, for the most part, net changes to total employment.

#### *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 associated with 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 *similar products* 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 associated with 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 helps to generate 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 certain secondary effects of industry, some types of secondary employment associated with industry can be estimated more readily. These include "backward linkage" employment, i.e., employment in supplying goods and services as inputs to industry; "induced" employment 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 types of associated employment, but it should be borne in mind that, because of the measurement difficulties, our measurements of secondary associated employment will not be fully comprehensive.

It also needs to be recognised that the concept of secondary employment which is associated with industry can raise issues about the interpretation of causation, as was discussed above. On this, it should be said that we would not really regard the whole stock of secondary employment, which can be measured as associated with industry, as being a "net" contribution to total employment which is all *caused* to exist by industry, for the reasons discussed above. However, it seems reasonable to take the view that change in industrial activity can have meaningful effects in bringing about changes in the secondary associated employment. Measurable increases (or reductions) which have occurred in the secondary associated employment may be regarded as being quite largely

net additions (or reductions) to total employment.

In conclusion, in estimating measurements of the secondary employment associated with industry, what we are aiming to provide are not comprehensive and highly precise measurements of the complete stock of secondary employment generated or caused to exist by industry. Rather it is intended to produce indicators of the more significant categories of associated employment, estimated in a consistent manner over time. Then the *trends* in these indicators (as well as in direct manufacturing employment) may be seen as providing information about trends in employment related to industry which tell us more than trends in direct industrial employment alone.

## Chapter 3

### *METHODOLOGY AND DATA FOR ESTIMATING SECONDARY EMPLOYMENT*

In order to estimate the secondary employment which is associated with 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 (and now by Forfas) each year since 1983; the origins and scope of this survey are outlined in McMahon, McHugh and Bowe (1988).

#### *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 54-63 per cent of total manufacturing employment (except in 1984 when the figure was 49 per cent). There are higher response rates of 67-81 per cent for all of overseas manufacturing and lower rates of 40-49 per cent for all of indigenous manufacturing (except for a figure of 36 per cent in 1984). 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 types of secondary associated employment 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/Forfas 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. The error 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 much of the data on Irish economy expenditures from the IEE survey cannot be compared with the CIP, 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 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 usually higher than CIP gross output, by more than 5 per cent in some 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 one exception is the figure for 1984 where the difference is 6 per cent. This may reflect the relatively low response rate to the IEE survey in that year, which was noted above. However, this need not be a matter for concern here since results for 1984 will not be referred to in this paper.

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

<i>Year</i>	<i>CIP Gross Output £million</i>	<i>Adjusted CIP Gross Output, £million</i>	<i>IEE Sales Estimate £million</i>	<i>IEE Sales as % of Unadjusted CIP</i>	<i>IEE Sales as % of Adjusted CIP</i>
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	19,963.0	20,262.4	20,642.5	103.4	101.9
1991	20,977.0*	21,228.7	20,843.2	99.4	98.2
1992	22,562.0*	22,866.6	22,280.5	98.8	97.4

*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 1991 and 1992 are estimates derived by increasing the CIP figure for 1990 in line with the increase in the Industrial Turnover Index. The IEE sales estimate for 1992 is preliminary and is subject to revision when the next year's data become available.

It is also possible to check how the IEE survey data compare with the CIP in another respect. In recent years, the CIP has provided data showing what percentage of the materials used by industry are produced in Ireland. Thus, it is possible to check how these percentages compare with estimates derived from the IEE survey and our grossing up procedure, and such comparisons are again reasonably reassuring as regards the reliability of the IEE data. Thus, the CIP indicates that, in 1990, expenditure on Irish-produced materials as a percentage of expenditure on all material inputs was 52.9 per cent for all manufacturing, 70.1 per cent for indigenous and 30.2 per cent for overseas manufacturing. This compares with estimates derived from the IEE survey of 53.7 per cent for all manufacturing, 68.8 per cent for indigenous and 30.1 per cent for overseas manufacturing.

*The General Approach to Estimating Secondary Associated Employment*

The general approach adopted here in estimating the secondary employment associated with 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. 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 chapter should help to illustrate the structure of linkages and secondary associated employment which are being estimated.

## Chapter 4

### *SECONDARY EMPLOYMENT ASSOCIATED WITH ALL MANUFACTURING*

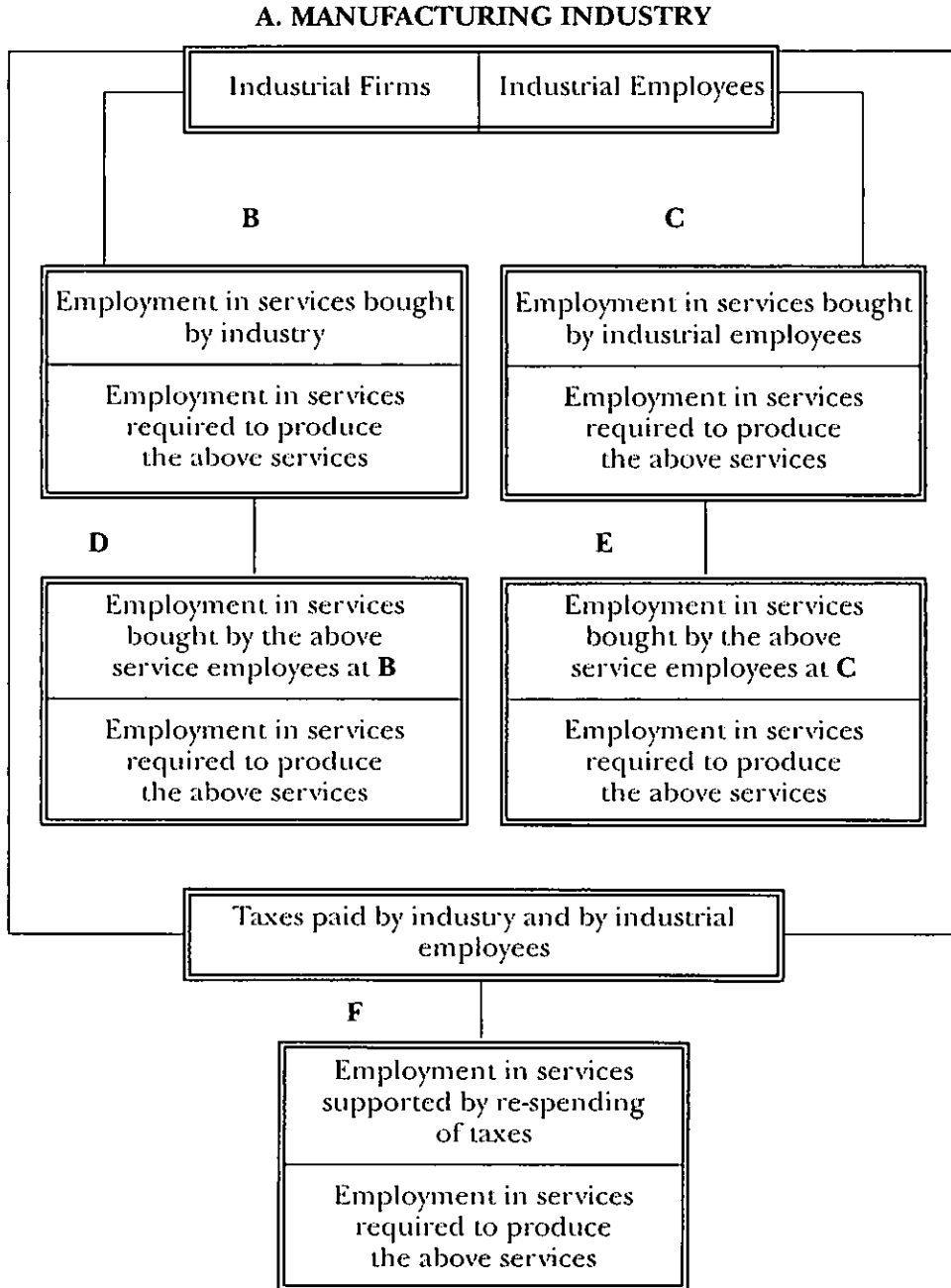
This chapter deals with the secondary employment associated with manufacturing as a whole. Apart from direct employment within manufacturing itself, it covers three types of associated employment: (1) backward linkage employment, arising from the purchasing of inputs by manufacturing; (2) induced employment, 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 categories of employment.

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

Second, manufacturing firms purchase inputs, thereby helping to support employment for those producing the inputs. However, as was discussed in Chapter 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 secondary employment associated with industry. 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 associated with 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 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

Figure 4.1: *Employment Associated with Manufacturing Industry*



purchased directly by manufacturing. We can refer to the top part of block B as "first-round backward linkage" employment in supplying the purchases of industry, while the whole of block B can be described as "total backward linkage" employment.

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 associated with 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. Also, 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. 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, manufacturing firms and their 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. 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 categories of employment associated with industry, 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 associated employment, 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 it is possible to use input-output analysis in a way which involves 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 Associated Employment for 1991*

We now present estimates of the various categories of secondary employment associated with all manufacturing in 1991, 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 1983-1992 (although the 1992 figures, being based on preliminary IEE data, are subject to some revision).

Direct employment within manufacturing industry amounted to 198,935 in 1991 according to the IDA's Employment Survey. From the IEE survey, we estimate that manufacturing industry's expenditure on Irish services was £2,699.9 million, which was equal to 13.0 per cent of the value of its sales. We estimate that, on average, gross output per head in Irish services was £37,465, so that about 72,100 people would be employed in Ireland in providing £2,699.9 million worth of services to manufacturing industry. Thus, employment of 72,100 can be attributed to the top part of block B in Figure 4.1. The calculation of this estimate involves an implicit assumption that average output per employee in all Irish services is much the same as average output per employee in the mix of services which are purchased by manufacturing. To the extent that this may not be so, there could be some margin of error here but, as is discussed in the Appendix, the estimation

procedure is constrained by the nature of the available data.

The top part of block B in Figure 4.1 includes employment in those services which are purchased directly by manufacturing firms. However, there is further indirect employment associated with this. In order to produce the services which are purchased by manufacturing firms, 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.

Using the CSO's input-output tables (Central Statistics Office, 1992), we can calculate that in order to produce the £2,699.9 million worth of services which were purchased directly by manufacturing, a further £1,003 million worth of services were required as all the rounds of further inputs into the services for manufacturing. With the average output per head in services at £37,465, it required about 26,800 service sector employees to produce this £1,003 million worth of services. Thus, employment of 26,800 can be attributed to the lower part of block B in Figure 4.1. The CSO's input-output tables which are used in calculating this estimate relate to the year 1985. Thus, there is an implicit assumption here that the input-output *relationships* or *ratios* change little over a period of some years, which seems a fairly reasonable assumption but would give rise to some minor margin of error. (But note that while our estimation procedure holds the *input-output relationships* constant, the absolute figures for expenditures on services and for services output per employee, which would change substantially over time, are allowed to change in our estimation procedure.)

Again from the IEE survey, it is estimated that manufacturing industry's pay bill was £3,183.5 million in 1991, which was equal to 15.3 per cent of the value of its sales. After deducting employers' and employees' PRSI and employees' income tax, at national average rates, as well as savings at national average rates, manufacturing employees are estimated to have spent £2,071.5 million. The input-output tables indicate that, on average, 35.9 per cent of personal expenditure is spent on Irish services, which allows us to estimate that manufacturing employees spent £743.7 million on Irish services in 1991. Following the same procedure as for industry's spending on services, it is estimated that about 19,900 people were employed in providing £743.7 million worth of services for manufacturing employees, with a further 7,400 employed in providing all the rounds of service inputs required for those services. Thus, employment of 19,900 can be attributed to the top part of block C in Figure 4.1, with 7,400 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 1992*. 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 1991 there was employment of about 8,400 in the top part of block D in Figure 4.1, with about a further 3,100 in the lower part of block D.

In a similar way, it is estimated that in 1991 there was employment of about 2,300 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 £1,187.4 million in 1991.

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 1991, 8.2 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, 38.8 per cent of it was spent on providing current goods and services, 7.7 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 expenditure is treated as being spent on Irish services in similar proportions to "Net Government" expenditure in the input-output tables. The capital investment is treated as being spent on Irish services in similar proportions to "Gross Fixed Capital Formation" in the input-output tables. The transfer payments, subsidies, etc., which mainly end up as incomes of individuals, are treated as being spent on Irish services in similar proportions to "Personal" expenditure in the input-output tables.

In this way it is estimated that the re-spending of taxes arising from manufacturing industry in 1991 directly supported 20,100 jobs in Irish services, and a further 7,100 jobs in all the rounds of services inputs required to produce those services. Thus, 20,100 jobs are attributed to the top part of block F in Figure 4.1, with 7,100 in the lower part of block F.

It is perhaps worth noting that the amount of employment associated with the re-spending of taxes arising from industry depends in part on policy decisions about the scale and nature of public spending, and such policies can be changed. Thus, a given amount of tax revenue arising from industry could have different employment implications under different types of policies on public spending. This means that past experience of the employment implications of re-spending of taxes arising from industry would not necessarily be a very useful guide to possible future experience when relevant policies on public spending might change. Nevertheless, our estimates of employment arising from re-spending of taxes from industry in a particular past year should give a reasonable indication of the outcome for that year.

It should also be pointed out that, arguably, one could include as effects of re-spending of taxes, not just the re-spending of taxes arising from the manufacturing sector, but also the re-spending of taxes arising from the services which are associated with manufacturing. In other words, one could include not only the re-spending of taxes arising from industry and its employees in block A of Figure 4.1, but also the re-spending of taxes arising from the services in blocks B, C, D and E of Figure 4.1. There would be a certain logic in following the procedure through to this conclusion, but on the other hand it might be felt that do so would be to take account of effects which are rather too remote from the manufacturing sector.

To deal with this point, we can present here, for illustrative purposes, an estimate for 1991 of the amount of services employment arising from the re-spending of taxes raised from the services employees in blocks B to E of Figure 4.1. But it is not proposed in general to include this type of estimate elsewhere in this paper.

Thus, from the estimates mentioned above for services employment in blocks B to E, we have total estimated services employment in these blocks of 140,800. Using the same procedure referred to in estimating the numbers in block D, we can estimate the pay bill for these 140,800 to be £1,923.8 million. Using the same procedure referred to in calculating the numbers in block F, we can estimate the amount of taxes which this gave rise to, in the form of employers' and employees' PRSI, employees' income taxes and indirect taxes arising from employees' personal expenditure.



Again following the procedure referred to in calculating the numbers in block F, it is estimated that the re-spending of these taxes arising from the services employment in blocks B to E directly supported 12,200 jobs in Irish services in 1991, and a further 4,300 jobs in all the rounds of services inputs required to produce those services.

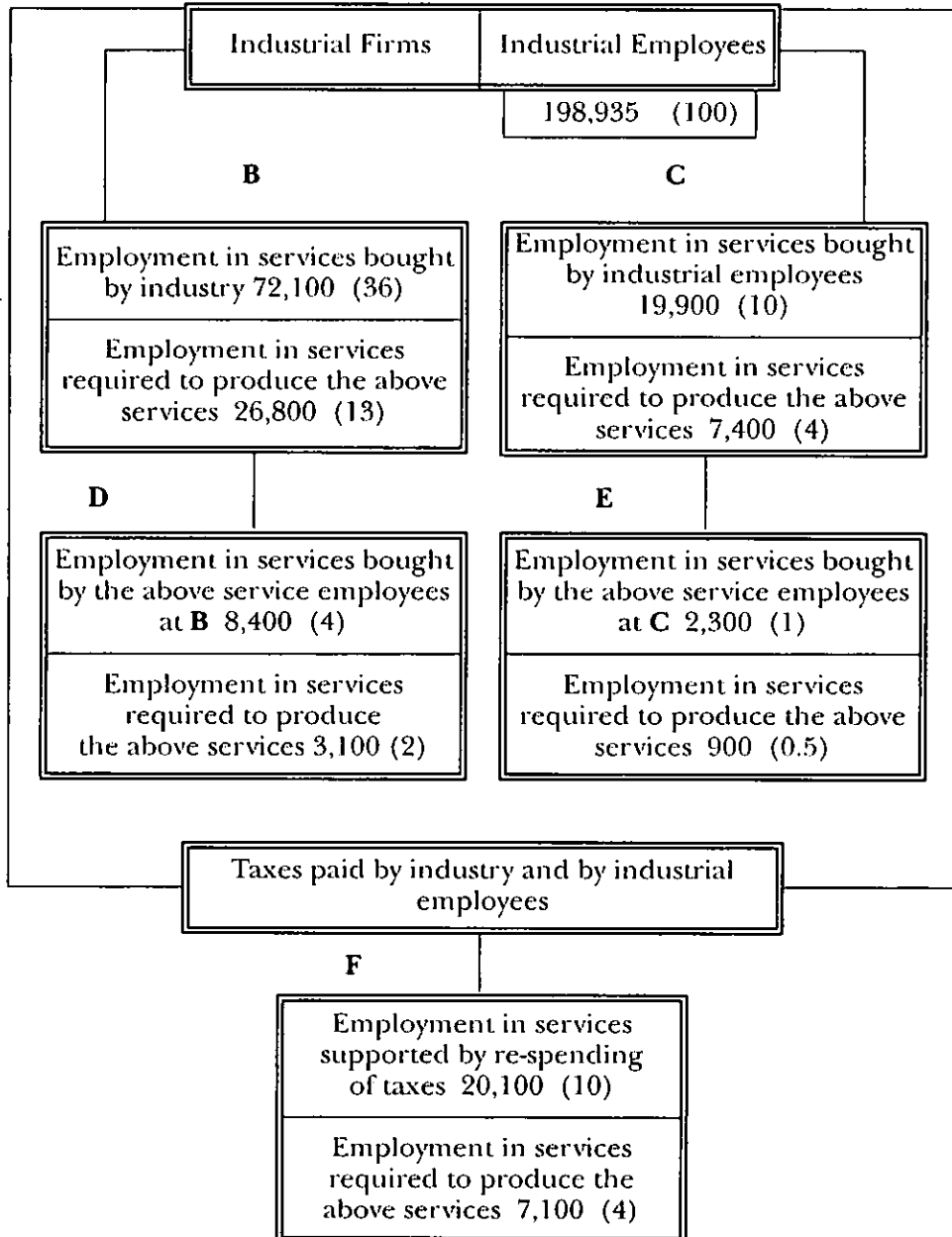
Bringing together the various estimates referred to above (except for the last-mentioned employment supported by the re-spending of taxes arising from the services employment in blocks B to E), Figure 4.2 shows the employment estimates for 1991 in each of the categories of services associated with manufacturing industry. The numbers in the boxes in Figure 4.2 are, first, the actual employment numbers and, second (in parentheses), the services employment numbers per 100 jobs directly within manufacturing itself. Adding up all the secondary employment in blocks B to F, there were 168,100 people in services jobs associated with manufacturing industry, or 84 people per 100 employed directly in manufacturing.

It can be seen that much the largest number was in block B. In fact, the 72,100 jobs in the *top* part of block B alone – which is the employment involved in supplying the services inputs purchased *directly* by manufacturing industry itself – accounts for 43 per cent of the total of 168,100.

Blocks C and F, the induced services employment by spending of industrial pay and the employment supported by re-spending of taxes, are also substantial and of about equal importance. Blocks D and E, the induced services 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 arising from spending of industry's profits would be of relatively limited significance compared to the employment which is 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 minority of this is used in ways which would support associated 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. 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

Figure: 4.2: *Estimates of Associated Employment, 1991***A. MANUFACTURING INDUSTRY**

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

goods which would be imports or else Irish industrial products. Either way, the purchasing of those types of investment goods has no additional implications for secondary associated employment 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 associated 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 an IDA survey, taxation took about 5 per cent of profits of overseas manufacturing in 1991 (up from about 2 per cent in 1990 and rising further to about 9 per cent in 1992). The re-spending of this tax in 1991 would have added less than 2 services jobs to the secondary employment associated with manufacturing per 100 direct manufacturing jobs. In 1992, the effect 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 support 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 1 services job per 100 direct manufacturing jobs in 1991. 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 2 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 probably add about 3 or 4 secondary services jobs per 100 direct manufacturing jobs in 1991, plus a little more in construction. This figure would rise to perhaps 4 or 5 by 1992 as tax on profits of overseas industry increased.

#### *Trends in the Period 1983-1992*

This section looks at trends in direct manufacturing employment and in the secondary associated employment over time, since the IEE survey

was initiated in 1983. First, direct manufacturing 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, and after that it changed only marginally over the next two years. Thus, we will examine the secondary associated employment in the years 1983, 1987, 1990, 1991 and 1992. The year 1983 represents the start of our data series, 1987 and 1990 represent the two turning points for the trends in direct manufacturing employment, and 1991 and 1992 are our most recent observations. Since the data for 1992 are based on preliminary IEE survey data which will be subject to revision, we will pay more attention to 1991 as the most recent reliable data set.

Table 4.1 shows the trends in manufacturing employment and the associated services employment. It can be seen in the table that while direct manufacturing employment declined in 1983-87, total secondary services employment also declined in that period. However, when direct

Table 4.1: *Manufacturing Employment and Estimated Associated Services Employment, 1983-1991*

<i>Type of Employment</i>	<i>1983</i>	<i>1987</i>	<i>1990</i>	<i>1991</i>
A. Direct Manufacturing	216,257	191,941	200,450	198,935
B. Total Backward Linkage	110,300	94,500	96,200	98,800
<i>"First Round" Only</i>	<i>80,400</i>	<i>68,900</i>	<i>70,100</i>	<i>72,100</i>
C. Induced, by Industrial Pay	32,000	28,600	28,100	27,200
D. Further Induced, by Services Pay	14,000	11,600	11,300	11,500
E. Further Induced, by Services Pay	4,100	3,500	3,300	3,200
F. Re-spending of Taxes	32,200	28,600	27,300	27,300
TOTAL SECONDARY (B-F)	192,500	166,900	166,100	168,100
DIRECT + SECONDARY (A-F)	408,800	358,800	366,600	367,000

*Note:* The categories of associated employment, 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* employment concerned, i.e., the sum of the top and lower parts of the blocks in Figures 4.1 or 4.2. However, in the case of category B, the table also shows the "first round" backward linkages (i.e., the top part of block B) separately, since this seems to be a significant piece of information in itself.

manufacturing employment subsequently increased in 1987-90 and then declined slightly in 1990-91, total secondary services employment followed a somewhat different trend, with a slight decline in 1987-90 followed by an increase in 1990-91.

All of the individual categories of associated services employment contributed something to the decline in the total in 1983-87. However, in the following periods some of the categories of associated services employment changed in different directions to other categories. In 1987-90, for example, category B, which arises from the purchasing of industry itself, increased while other categories declined. In 1990-91, two categories increased while two others declined and one remained unchanged. Thus, the different types of secondary services employment do not necessarily change in the same way at the same time, and total secondary services employment can follow a different trend to direct manufacturing employment.

Since these different employment categories have followed somewhat different trends at certain times, there were some changes in the ratios of secondary services employment to direct manufacturing employment. Table 4.2 shows these ratios, in the form of numbers of associated services jobs per 100 direct manufacturing jobs. It can be seen that while there were changes in these ratios, the changes were, for the most part, not very dramatic. Overall, the ratio of total secondary services employment to direct manufacturing employment drifted downwards over the period 1983-90, from 89 to 83 jobs per 100 direct manufacturing jobs. This was followed by a small increase to 84 per 100 in 1991 and a larger increase to 91 per 100 according to the preliminary figure for 1992.

Thus, by 1992 it appears that the ratio of total secondary services jobs per 100 direct manufacturing jobs was slightly higher than the ratio in 1983, after a decline in the intervening period. It should be remembered too that the effects of recycling of industrial profits are not included in Table 4.2, and that taxation of profits of overseas manufacturing was increasing after 1990. The secondary services employment arising from re-spending of taxes on profits of overseas manufacturing would have been less than 1 per 100 manufacturing jobs in 1990, rising to about 3 per 100 in 1992, so that the rise in the ratio of secondary services employment after 1990 would have been a little greater than that shown in Table 4.2.

The ratios for each of the individual categories of secondary services employment in Table 4.2 either showed no change or else they shared in the general decline in 1983-90 and the general increase in 1990-92. In this regard, it is worth noting that the trend in the ratio for the category of "first round" backward linkage services employment was similar to the

trend in the overall total in showing rather little change over the whole period, with just a small decline in 1983-90 and a slightly larger increase in 1990-92. This category refers to employment in those services which are purchased directly as inputs by manufacturing firms. In the Introduction to this paper, it was mentioned that there had appeared to be a trend of increasing subcontracting or out-sourcing of service functions by at least some prominent manufacturing firms during the 1980s. If so, this might have been expected to lead to a tendency for the ratio of "first round" backward linkage services employment to increase relative to direct manufacturing employment. However, the figures in Table 4.2 indicate that there was no such *general* tendency – at least not up to 1990.

Table 4.2: *Number of Associated Services Jobs Per 100 Direct Manufacturing Jobs, 1983-1992*

<i>Type of Employment</i>	<i>1983</i>	<i>1987</i>	<i>1990</i>	<i>1991</i>	<i>1992*</i>
A. Direct Manufacturing	100	100	100	100	100
B. Total Backward Linkage	51	49	48	50	54
<i>"First Round" Only</i>	37	36	35	36	39
C. Induced, by Industrial Pay	15	15	14	14	14
D. Further Induced, by Services Pay	6	6	6	6	7
E. Further Induced, by Services Pay	2	2	2	2	2
F. Re-spending of Taxes	15	15	14	14	14
TOTAL SECONDARY (B-F)	89	87	83	84	91
DIRECT + SECONDARY (A-F)	189	187	183	184	191

*Note* : See note to Table 4.1.

\* Data for 1992 are based on preliminary IEE survey data which are subject to revision.

Looking into this a little further, one might ask was there, in fact, a general trend of increasing subcontracting or out-sourcing of service functions which were formerly done within manufacturing companies. If there was, it should be possible to observe an increase over time in expenditures by all manufacturing on Irish services as a percentage of the

sales of all manufacturing. But, in fact, there is no clear indication that there was such an increase. The Irish Economy Expenditures Survey data show that expenditures by manufacturing on Irish services amounted to 12.8 per cent of the value of sales of manufacturing in 1983 and 1984, falling marginally to 12.5 per cent in 1989 and 12.2 per cent in 1990 and rising a little to 13.0 per cent in 1991 and 13.3 per cent in 1992. Thus, over the whole period there was not much change in this.

There is no doubt that there were a number of prominent examples of manufacturing companies during the 1980s which began to shed some service functions which were formerly done within the firm and to purchase these services from outside the firm. But the figures referred to above show that this practice was not sufficiently widespread to result in a significant general increase in spending by all manufacturing on Irish services as a percentage of the sales of all manufacturing. Thus, the tendency by some industrial firms to increasingly subcontract or out-source various service functions must have been offset by other trends, such as the establishment of new industrial firms which have lower expenditures on Irish services in relation to their sales.

To conclude on this chapter, it would have to be said that, in the period 1983-91 at least, it would have made rather little difference to one's judgement of industry's overall employment performance whether one considered the associated services employment or not. For there were not very major changes in the relationship between direct manufacturing employment and total secondary services employment, so that direct plus secondary services employment combined changed at quite similar rates to direct manufacturing employment alone. In the period 1983-91 as a whole, direct manufacturing employment fell by -1.0 per cent per annum while direct plus secondary services employment combined declined by -1.3 per cent per annum. In the sub-period 1983-87, direct manufacturing employment fell by -2.9 per cent per annum while direct plus secondary services employment combined declined by -3.2 per cent per annum. In the sub-period 1987-91, direct manufacturing employment recovered to grow by 0.9 per cent a year while direct plus secondary services employment combined grew by 0.6 per cent a year. The preliminary figures for 1992, however, indicate that direct plus secondary services employment combined grew at a substantially higher rate than direct manufacturing employment in 1991-92.

This result for 1991-92 shows that the relationship between secondary and direct manufacturing employment is not inherently stable and it can change quite significantly, although it may have looked fairly stable in 1983-91. Thus, it can be of some importance to consider the associated

services employment when assessing the employment performance of industry. Furthermore, 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 chapter of this paper). Thus, it is certainly possible for the relationship between total associated services employment and total direct manufacturing employment to change rather more substantially than was seen in 1983-91.



## Chapter 5

### *SERVICES EMPLOYMENT ASSOCIATED WITH INDIGENOUS AND OVERSEAS INDUSTRY*

The last chapter presented estimates of the secondary employment in services which is associated with manufacturing industry as a whole. This chapter examines and compares the employment in services which is associated with indigenous and overseas industry, and considers the trends in this over time. 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. While direct indigenous manufacturing employment declined in 1983-87, the total secondary services employment associated with indigenous industry also declined at the same time. However, when direct indigenous manufacturing employment subsequently increased in 1987-90 and then declined a little in 1990-91, total secondary services employment followed different trends with a slight decline in 1987-90 and an increase in 1990-91.

The individual categories of secondary services employment associated with indigenous industry all contributed something to the decline in the total in 1983-87. However, some of these individual categories diverged somewhat from the overall trend in total secondary services employment associated with indigenous industry in 1987-90 and 1990-91, as also happened in the case of all manufacturing.

Compared with total direct manufacturing employment in all industry, the record of direct employment in indigenous industry 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 services employment associated with indigenous industry was poorer still, with a decline of 22.6 per cent in 1983-91. Thus, the ratio of secondary services employment to direct manufacturing employment declined appreciably for indigenous industry, by more, in fact, than in the case of total manufacturing.

Table 5.1: *Manufacturing Employment and Estimated Associated Services Employment, Indigenous Industry, 1983-1991*

<i>Type of Employment</i>	<i>1983</i>	<i>1987</i>	<i>1990</i>	<i>1991</i>
A. Direct Manufacturing	128,902	110,731	113,210	111,679
B. Total Backward Linkage "First Round" Only	62,800 45,800	45,800 33,400	47,400 34,600	50,300 36,600
C. Induced, by Industrial Pay	18,900	15,500	14,700	14,100
D. Further Induced, by Services Pay	8,000	5,600	5,600	5,900
E. Further Induced, by Services Pay	2,400	1,900	1,700	1,600
F. Re-spending of Taxes	19,000	15,500	14,300	14,100
TOTAL SECONDARY (B-F)	111,000	84,300	83,700	85,900
DIRECT + SECONDARY (A-F)	239,900	195,100	196,900	197,600

*Note:* The categories of associated employment, 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* employment concerned, i.e., the sum of the top and lower parts of the blocks in Figures 4.1 or 4.2. However, in the case of category B, the table also shows the "first round" backward linkages (i.e., the top part of block B) separately, since this seems to be a significant piece of information in itself.

Consequently, the record of total employment supported by indigenous industry – direct and secondary services combined – was noticeably worse, with a drop of 17.6 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 services 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 services employment associated with overseas industry was slightly stronger again than the record of its direct manufacturing employment.

Table 5.2: *Manufacturing Employment and Estimated Associated Services Employment, Overseas Industry, 1983-1991*

<i>Type of Employment</i>	<i>1983</i>	<i>1987</i>	<i>1990</i>	<i>1991</i>
A. Direct Manufacturing	87,355	81,210	87,240	87,256
B. Total Backward Linkage	47,500	48,800	48,700	48,600
<i>"First Round" Only</i>	<i>34,600</i>	<i>35,600</i>	<i>35,500</i>	<i>35,400</i>
C. Induced, by Industrial Pay	13,100	13,100	13,400	13,200
D. Further Induced, by Services Pay	6,000	6,000	5,700	5,700
E. Further Induced, by Services Pay	1,700	1,600	1,600	1,500
F. Re-spending of Taxes	13,200	13,100	13,000	13,200
TOTAL SECONDARY (B-F)	81,500	82,500	82,500	82,200
DIRECT + SECONDARY (A-F)	168,800	163,700	169,700	169,400

*Note:* See note to Table 5.1.

Total secondary services employment associated with overseas manufacturing actually increased a little in 1983-87, going against the trend in direct employment, and it then held steady in 1987-90 with just a slight decline in 1990-91. By 1991, total secondary services employment associated with overseas manufacturing was 0.8 per cent higher than in 1983, although direct overseas employment was slightly lower than in 1983. Since the secondary services employment associated with overseas industry increased in 1983-91, while its direct employment did not grow, the ratio of secondary services to direct manufacturing employment increased a little in that period, in contrast to the experience of indigenous industry.

Table 5.3 shows the ratios of secondary services employment to direct manufacturing employment for indigenous and overseas industry, in the form of numbers of secondary services jobs per 100 direct manufacturing jobs. It can be seen in the table that, in 1983, the number of total secondary services 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 slightly to 94 in 1991, while the ratio for indigenous manufacturing fell to 77 by 1991. The preliminary figures for 1992 indicate that the ratios for both overseas and

indigenous manufacturing increased quite significantly over the 1991 levels, with the increase being greater for overseas industry. Thus, by the end of the period, there was a fairly substantial difference between the two, and each individual category of the secondary services employment contributed something to this overall difference.

Table 5.3: *Number of Associated Services Jobs Per 100 Direct Manufacturing Jobs, Indigenous and Overseas Industry, 1983-1992*

<i>Type of Employment</i>		<i>1983</i>	<i>1987</i>	<i>1990</i>	<i>1991</i>	<i>1992*</i>
A. Direct Manufacturing	I	100	100	100	100	100
	OS	100	100	100	100	100
B. Total Backward Linkage	I	49	41	42	45	46
	OS	54	60	56	56	63
<i>"First Round" Only</i>	I	36	30	31	33	34
	OS	40	44	41	41	46
C. Induced, by Industrial Pay	I	15	14	13	13	13
	OS	15	16	15	15	16
D. Further Induced, by Services Pay	I	6	5	5	5	6
	OS	7	7	7	7	8
E. Further Induced, by Services Pay	I	2	2	2	1	2
	OS	2	2	2	2	2
F. Re-spending of Taxes	I	15	14	13	13	13
	OS	15	16	15	15	16
TOTAL SECONDARY (B-F)	I	86	76	74	77	80
	OS	93	102	95	94	105
DIRECT + SECONDARY (A-F)	I	186	176	174	177	180
	OS	193	202	195	194	205

Notes: See note to Table 5.1

I = Indigenous. OS = Overseas

\* Data for 1992 are based on preliminary IEE survey data which are subject to revision.

*Factors Behind the Differences in Secondary/Direct Employment Ratios*

It may seem rather surprising at first sight that overseas manufacturing has a higher ratio of secondary services employment to direct manufacturing employment than indigenous industry 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 which is generated by overseas industry is not retained within the Irish economy or, in other words, that overseas industry has relatively low linkages with the Irish economy. In fact, there is a good deal of truth in this perception, so it is worth considering how it is nevertheless possible for overseas manufacturing to have a higher ratio of associated services employment than indigenous industry in Table 5.3.

To help to clarify this situation, Table 5.4 shows expenditures in the Irish economy as a percentage of sales for indigenous and overseas manufacturing in 1990. These Irish economy expenditures (IEEs) consist primarily of expenditures on pay and Irish-produced materials and services; we also include profits as part of IEEs in the case of indigenous industry, but not in the case of overseas industry which expatriates most of its profits.

It can be seen in Table 5.4 that total IEEs as a percentage of sales are about twice as high for indigenous manufacturing (at 74.9 per cent) as for overseas manufacturing (at 37.8 per cent). Thus, in this sense, indigenous manufacturing has the stronger linkages with the Irish economy. However, when one looks at the breakdown by category of IEE, it is apparent that spending on pay as a percentage of sales is only a little higher for indigenous than for overseas industry, while spending on Irish services as a percentage of sales is about the same for indigenous and overseas industry. The big difference between the Irish economy expenditure patterns of indigenous and overseas industry is that spending on Irish-produced materials as a percentage of sales is much higher for indigenous industry.

The main point here, as regards explaining the ratios of secondary services employment to direct manufacturing employment in Table 5.3, is that the categories of IEEs which play a part in deriving the estimates of secondary services employment are the expenditures on "pay" and "Irish services". Expenditures on pay or Irish services as percentages of sales are actually quite similar for indigenous and overseas manufacturing. Thus, secondary services employment *per million pounds of sales* by manufacturing would have to be quite similar for indigenous and overseas industry.

As is also shown in Table 5.4 (in the bottom row), overseas manufacturing has higher sales *per employee* than indigenous manufacturing – one-third higher in 1990. Consequently, since expenditures on pay or

Table 5.4: *Irish Economy Expenditures (IEEs) as a Percentage of Sales, Overseas and Indigenous Manufacturing, 1990*

<i>Type of IEE</i>	<i>Indigenous</i>	<i>Overseas</i>
Pay	15.8	14.0
Irish Services	12.3	12.2
Irish Materials	42.5	11.4
Profits	4.2	–
Other IEEs	0.2	0.1
Total IEEs	74.9	37.8
Sales Per Employee	£89,800	£120,100

Irish services as percentages of sales are similar for indigenous and overseas industry, expenditures on these items *per employee* would have to be significantly higher for overseas than for indigenous industry. This results in the higher ratios of secondary services employment to direct manufacturing employment for overseas industry which are seen in Table 5.3. Thus, the higher ratios there for overseas industry are a result of the combination of higher sales per employee for overseas industry together with expenditures on Irish services and pay which are similar to indigenous industry as percentages of sales.

To look into this a little further, it is worth pointing out that the food sector has its own very distinctive structure of costs and Irish economy expenditures. The food sector is very important in Irish indigenous industry but much less so in overseas industry. So if we leave out the food sector and compare indigenous and overseas non-food industry, we would be comparing two groups of industries which are rather more alike in character.

Table 5.5 shows Irish economy expenditures as a percentage of sales in *non-food* manufacturing, for indigenous and overseas industry. The figures for overseas industry are not very different here to those in Table 5.4 because the food sector is not a very large part of overseas industry. However, the figures here for indigenous non-food industry are substantially different to those for all indigenous manufacturing in Table 5.4.

In the food sector, expenditures on Irish materials are exceptionally high as a percentage of sales. At the same time, value-added to materials as a percentage of sales is relatively low, so that expenditures on items other than Irish materials tend to be low as percentages of sales compared to other industries. The effects of leaving out this sector from indigenous industry, therefore, are that indigenous non-food industry has much lower spending on Irish materials as a percentage of sales and higher spending on pay and Irish services as percentages of sales than in total indigenous industry. Indigenous non-food industry also has considerably lower total IEEs as a percentage of sales than total indigenous industry.

As regards the comparison between indigenous and overseas non-food industry, it can be seen in Table 5.5 that total IEEs as a percentage of sales are much higher for the indigenous category, although by a lesser margin than in the case of total manufacturing in Table 5.4. In addition, expenditures on pay, Irish services and Irish materials are all distinctly higher as percentages of sales for indigenous than for overseas non-food industry. Thus, in each of these respects the indigenous category could be said to have consistently stronger linkages with the Irish economy.

At the same time, however, the last row of Table 5.5 shows that sales per employee are twice as high for overseas as for indigenous non-food industry. Consequently, expenditures *per industrial employee* on each of the categories pay, Irish services and Irish materials, would in fact be higher for overseas than for indigenous non-food manufacturing. Thus, even though indigenous industry has the greater tendency to spend in the Irish economy *as a proportion of its sales*, overseas industry can still be spending more in Ireland *per employee* – because of its high level of sales per employee. This means that overseas industry can have levels of associated services employment in Ireland which are higher than indigenous industry when expressed in relation to direct manufacturing employment.

It should be noted, however, that this cannot lead to a simple conclusion that overseas industry is necessarily “superior” to indigenous industry in supporting secondary employment. For the impression of “superiority” of overseas industry in this respect arises only when one expresses the secondary services employment *in relation to direct manufacturing employment*.

It could be equally valid to ask, for example, how much direct manufacturing or secondary services employment is associated with industry *in relation to the value of its sales*. By that criterion, indigenous industry is superior to overseas industry in supporting employment. Given the sales per employee figures in the last row of Table 5.4, indigenous manufacturing has 11.1 jobs per million pounds of sales, while overseas manufacturing has 8.3. And even though indigenous manufacturing has a

Table 5.5: *Irish Economy Expenditures (IEEs) as a Percentage of Sales, Non-Food Manufacturing, 1990*

<i>Type of IEE</i>	<i>Indigenous</i>	<i>Overseas</i>
Pay	24.0	15.0
Irish Services	15.8	12.5
Irish Materials	15.0	8.6
Profits	6.6	-
Other IEEs	0.3	0.1
Total IEEs	61.7	36.2
Sales Per Employee	£56,100	£112,100

somewhat lower ratio of secondary services employment to direct manufacturing employment, indigenous manufacturing still has more secondary services jobs per million pounds of sales, at 8.5, than overseas industry, at 8.1. In the case of non-food manufacturing, these differences in favour of indigenous industry are considerably greater. For the gap between sales per employee for indigenous and overseas non-food manufacturing is greater than for total manufacturing, while indigenous non-food manufacturing also tends to spend a significantly greater share of its sales on pay and Irish services than overseas non-food manufacturing does. (Kennedy (1991) has pointed out previously, referring to 1987 data, that the relative contribution of indigenous and overseas industry to the Irish economy looks weaker for overseas industry when related to its output or sales, but not when related to its employment.)

Since this paper focuses on issues concerning employment, it seems most appropriate to consider how the secondary services employment associated with manufacturing relates to or compares with direct manufacturing employment. But one should be aware that this is not the only way of looking at the matter, and one should be careful, in particular, not to jump to inappropriate policy conclusions from this one perspective on the issue.

#### *Causes of Change in the Secondary/Direct Employment Ratios*

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. 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 more slowly than sales per employee in services.

The expenditures on services associated with 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 9.8 per cent per annum (in current values). 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 increased slightly. This was the result of continuing slower growth of sales per head in indigenous industry than in services, as well as a small reduction in pay as a percentage of sales, being more than offset by an increase in expenditure on Irish services as a percentage of sales, from 11.6 per cent to 13.1 per cent. Finally, in 1991-92, the total secondary/direct employment ratio for indigenous industry showed quite a significant increase for a single year. This occurred – despite marginal declines both in expenditure on Irish services and in pay as percentages of sales – because sales per head increased a good deal faster in indigenous

industry, at 7.3 per cent, than sales per head in services, at about 1 per cent (in current values).

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 9.8 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 1987-91, the total secondary/direct employment ratio for overseas industry declined, although it remained higher than in 1983. This decline occurred partly because sales per employee now grew more slowly in overseas manufacturing, at 5.6 per cent per annum, than in services, at 7.1 per cent per annum (in current values). In addition, there were small decreases both in expenditures on services as a percentage of sales and in pay as a percentage of sales, which contributed to the decline in the total secondary/direct employment ratio for overseas industry. Finally, in 1991-92, the total secondary/direct employment ratio for overseas industry increased very substantially for a single year. This occurred (a) because the growth in sales per head was much higher in overseas industry, at 6.2 per cent, than in services, at about 1 per cent (in current values), and (b) because overseas industry had quite a significant rise in expenditure on Irish services as a percentage of sales, from 12.8 per cent to 13.9 per cent. Meanwhile, pay as a percentage of sales in overseas industry held steady at 14.9 per cent.

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 1987-91, while sales per employee grew faster in services than in overseas industry in 1987-91.) 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 *volume* of output per employee, or output per employee in *constant* prices. In contrast, our discussion above concerning trends in sales per employee refers consistently to sales in current money values.

A 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 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 its secondary associated employment 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 chapter, secondary services employment associated with indigenous manufacturing declined faster than direct indigenous manufacturing employment in 1983-87, and the ratio of secondary services employment to direct indigenous manufacturing employment declined a little further in 1987-90. After that, however, the ratio of secondary services to direct indigenous manufacturing employment increased in 1991 and 1992. But by 1992, the ratio of secondary services employment to direct indigenous manufacturing employment was still lower than it had been in 1983.

In the case of overseas manufacturing, the ratio of secondary services to direct overseas manufacturing employment increased quite sharply in 1983-87, and while it fell back subsequently in 1990 and 1991 it reached a new peak in 1992 which was significantly above the initial level of 1983. In each of the years 1990, 1991 and 1992, the ratio of secondary services employment to direct manufacturing employment was higher for overseas than for indigenous industry by a fairly significant margin.

We must be careful about what conclusions we draw from this. It would be valid to conclude that 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 benefit for Irish employment through the secondary associated employment in services. This is so despite the fact that a relatively high percentage of the value of the sales of overseas manufacturing 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 services employment which is greater relative

to direct manufacturing employment than in the case of indigenous manufacturing.

It should be noted, however, that this in itself cannot lead to a simple conclusion that overseas industry is necessarily "superior" to indigenous industry in supporting secondary employment, in any absolute sense. For the impression of "superiority" of overseas industry in this respect arises only when one expresses the secondary services employment in relation to direct manufacturing employment.

Since this paper focuses on issues concerning employment, it does seem appropriate to consider how the secondary services employment associated with manufacturing relates to or compares with direct manufacturing employment. But one should be aware that this is not the only way of looking at the matter; for example, if we look at the levels of direct manufacturing employment or secondary services employment in relation to the value of *sales*, indigenous industry looks "superior" to overseas industry in supporting employment. Thus, one should be careful not to jump to inappropriate policy conclusions based only on the perspective of the relationship between secondary services employment and direct manufacturing employment.

A further note of caution about drawing conclusions from the above analysis is that the estimated ratios of secondary services employment to direct manufacturing employment are *average* ratios for an existing stock of industries at given points in time. They should not be interpreted as "marginal" ratios. In other words, further *additions* to manufacturing employment, overseas or indigenous, would not necessarily generate further secondary employment at the same ratios as the average for the stock of such industry shown in this paper.

## Chapter 6

### *SECONDARY EMPLOYMENT ASSOCIATED WITH MATERIALS PURCHASING LINKAGES OF MANUFACTURING*

In this paper up to now, we have not considered the secondary employment associated with 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 generation of employment in the primary sector in a meaningful sense, as was outlined in Chapter 2. In the case of purchasing of materials and components from Irish manufacturing, this was intentionally left out of consideration in Chapter 4, which dealt with the secondary employment associated with 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 secondary employment associated with a *part* of manufacturing, then employment in supplying its purchases of materials and components from *other* Irish industries may be counted as part of the secondary employment associated with 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 associated with a particular sector of industry, we could include the employment in supplying its purchases of inputs from other sectors of Irish industry. Similarly, the secondary employment associated with, say, overseas industry could include the employment in producing the inputs which it purchases from indigenous industry. Since industrial policy has been concerned with developing the materials purchasing linkages of overseas industry in Ireland, it is in fact of some interest to consider the employment involved in producing such inputs for overseas industry.

#### *Employment in Producing Materials Inputs for Overseas Industry*

There are some problems in attempting to estimate the employment involved in producing the Irish materials and components which are purchased 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 associated with 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 Chapter 2. Furthermore, we would wish to count only the effects of purchases by overseas industry of industrial products from indigenous industry, leaving out the 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 not got a fully satisfactory way of estimating what proportion of Irish-sourced manufactured inputs come from indigenous industry as opposed to overseas industry itself, although we can give a very rough or approximate indication of this. Thus, we can only make a satisfactory estimate of the secondary employment associated with overseas industry's purchasing of *all* Irish-sourced manufactured products, whether the source is indigenous industry or overseas industry itself. Then we can give a less dependable estimate or indication of the proportion of this employment which is in indigenous rather than overseas industry.

To estimate the secondary employment in Irish industry which is associated with 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 (Central Statistics Office, 1992) 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. 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 14,000 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 16 in 1991. Thus, the secondary manufacturing employment was increasing both in absolute terms and in relation to direct overseas employment.

The figures above for Irish manufacturing employment associated with 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. 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.

In a somewhat related exercise, Baker (1993, Appendix 2), using the 1985 input-output tables, presented figures which indicate that for every 100 jobs in "high-tech" exporting firms (which would mainly be overseas

firms), there were about 4 or 5 indirect jobs in Irish manufacturers supplying inputs to the "high tech" exporters. This looks rather lower than our estimate above of 12 indirect manufacturing jobs per 100 direct jobs in overseas manufacturing in 1983. However, the difference here would be largely due to the fact that, while Baker's "high-tech" sectors consist very largely of overseas firms, these sectors in fact account for less than half of total overseas manufacturing employment. The overseas firms in the more "traditional" sectors, which are included in our estimates, have stronger purchasing linkages with Irish suppliers than overseas "high-tech" firms. Thus, our higher estimate for the ratio of indirect manufacturing employment in supplying all of overseas manufacturing is in fact compatible with Baker's lower ratio for supplying the "high-tech" sectors only.

It should be noted that not all of the secondary manufacturing employment, which is estimated above as being supported by the purchasing of overseas manufacturing, was in indigenous industry. This is because 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 supported by 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 (14 per cent in 1990), while indigenous manufacturing sells most of its output in Ireland. Consequently, indigenous industry is the source of a large majority (some 79-81 per cent, depending on the year) 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 have to go very largely to indigenous industry.

We can make the (admittedly rather crude) assumption that the proportion of all Irish manufactured inputs for overseas industry which comes from indigenous industry is the same as the proportion of all Irish-made industrial products sold in the Irish market which comes from indigenous industry. On that assumption, about 80 per cent of the Irish-produced industrial products which are purchased by overseas industry come from indigenous industry (with the remaining 20 per cent coming from overseas industry itself).

We can assume, further, that about 80 per cent of the manufacturing employment supported by overseas industry's purchasing of Irish industrial



products is in indigenous industry. On that assumption, indigenous manufacturing employment supported by overseas industry's purchasing of industrial products was about 8,200 in 1983, rising to about 10,800 in 1990 and further to 11,200 in 1991. This means that the indigenous manufacturing employment which is estimated as being supported by purchasing by overseas industry accounted for about 6.3 per cent of total indigenous manufacturing employment in 1983, rising to about 9.6 per cent in 1990 and further to about 10.0 per cent in 1991.

Thus, overseas industry in Ireland constitutes a fairly important and a growing market for indigenous industry, accounting for roughly 10 per cent of indigenous industry's sales or employment. For comparison, the market of the United Kingdom accounts for 14 per cent of the sales of indigenous industry, while the rest of the EU accounts for 8 per cent of its sales (*Census of Industrial Production, 1990*).

#### *Employment in Producing Materials Inputs for Indigenous Industry*

It is possible to use the same methodology to make estimates of the amount of employment in Irish manufacturing which is involved in producing Irish manufactured products which are purchased as inputs by indigenous industry. But the meaning of such figures must be interpreted with care. Clearly a large majority of the Irish industrial products which are purchased as inputs by indigenous industry would come from indigenous industry itself. Thus, the employment generated in producing such inputs would, for the most part, not be *additional* to direct indigenous manufacturing employment.

However, estimates of employment in producing manufactured inputs for indigenous industry can be said to have some meaning, as long as we are careful not to regard this employment as additional to direct indigenous manufacturing employment. Thus, such estimates could be said to indicate simply the number of people whose employment depends on producing manufactured inputs for indigenous manufacturing firms. Or we could also estimate employment in producing manufactured inputs for indigenous industry as a percentage of total direct employment in indigenous industry. Then this percentage – say  $x$  per cent – could be said to indicate that the amount of employment in supplying Irish manufactured inputs to the “average” indigenous manufacturing firm is  $x$  per cent of the firm's own employment.

Following the same methodology as in the case of materials purchasing by overseas manufacturing, it is estimated that the employment involved in producing Irish manufactured inputs for indigenous industry was about 24,200 in 1983, declining to about 19,300 in 1990 and about 18,900 in

1991. When expressed in terms of percentages of indigenous manufacturing employment – or numbers of indirect manufacturing jobs per 100 direct jobs in indigenous manufacturing – the estimates are 19 in 1983 and 17 in 1990 and 1991. Thus, the amount of employment in producing Irish manufactured inputs for the average indigenous manufacturing firm was about 17 per cent of the average firm's own employment in 1990 and 1991.

This figure of 17 indirect jobs in supplier industries per 100 direct manufacturing jobs is only slightly greater than the figure of 16 for overseas manufacturing in 1991, which was mentioned above. This is so despite the fact that indigenous manufacturing's expenditure on Irish materials as a percentage of sales is much higher, at 42.5 per cent, than overseas manufacturing's expenditure on Irish materials as a percentage of sales, at 11.4 per cent (see Table 5.4 in the last chapter). The reason for this is partly because a majority of the expenditures by indigenous manufacturing on Irish materials are expenditures on inputs of primary products, particularly for the relatively large indigenous food sector. Expenditures on primary products are left out of consideration here because industry is not considered really to cause the generation of employment in primary sectors supplying inputs to it, as was outlined in Chapter 2.

Apart from expenditures on Irish primary products, indigenous manufacturing also spends a good deal more than overseas manufacturing on purchasing products of the Irish food industry for further processing. Such purchases of food inputs amount to 9.3 per cent of the value of the sales of indigenous manufacturing, compared to 2.0 per cent of sales in the case of overseas manufacturing. But expenditure on other (non-food) Irish manufactured products as a percentage of sales is only a little higher for indigenous manufacturing, at 7.8 per cent, than for overseas manufacturing, at 6.6 per cent.

Thus, expenditure on all Irish materials as a percentage of sales is much higher for indigenous than for overseas industry mainly because of far higher spending on primary products, which is left out of consideration here, and also because of substantially higher spending on food inputs, but not because of a major difference with respect to spending, as a percentage of sales, on other Irish manufactured inputs. Given that sales per employee are about one-third higher for overseas than for indigenous manufacturing (see Table 5.4), expenditures *per employee* on Irish non-food manufactured inputs are therefore actually higher for overseas than for indigenous manufacturing. Expenditures *per employee* on Irish food inputs, however, are higher for indigenous than for overseas manufacturing. Thus, combining

the effects of spending on Irish food and non-food manufactured inputs results in an overall ratio of indirect manufacturing employment to direct manufacturing employment which is almost the same for overseas as for indigenous industry in 1991.

It should be noted, however, that this would not necessarily support a clear and unambiguous conclusion that overseas manufacturing is very nearly as good as indigenous manufacturing at supporting employment in Irish supplier industries. Such a conclusion is suggested only when one expresses the indirect employment *in relation to direct manufacturing employment*. If one looks at employment *in relation to sales*, indigenous manufacturing looks rather better than overseas industry at supporting employment. Thus, per million pounds of sales, indigenous industry has both more direct manufacturing employment than overseas industry and also more indirect manufacturing employment in Irish supplier industries than overseas industry.

This discussion might perhaps be thought to call into question whether there is a real justification for special state policy efforts to strengthen the Irish materials purchasing linkages of overseas industry (as in the National Linkage Programme). Such policy efforts are presumably based on the premise that these materials linkages of overseas industry are relatively weak and that there should therefore be scope to strengthen them. One might ask do our findings reported above cast doubt on that premise about relatively weak materials linkages of overseas industry? For while they may look relatively weak when considered in terms of indirect employment relative to sales, they do not look relatively weak when considered in terms of indirect employment relative to direct employment.

In fact, our findings, which focus on indirect *employment* in Irish supplier industries, are not really best suited to answering this question. For the purpose of addressing this question, it would be more appropriate to ask what proportion of total materials inputs for overseas industry are sourced in Ireland, and how does this compare with indigenous industry?

In 1991, overseas industry purchased 30 per cent of its materials inputs from Irish sources, compared with a much higher figure of 71 per cent for indigenous industry. However, this figure for indigenous industry is greatly affected by the importance of the food sector which purchases nearly all of its inputs in Ireland. In overseas industry, the food sector also purchases a large majority of its materials inputs in Ireland, but the food sector is only quite a small part of all overseas industry. If we leave out the food sector to make for a more suitable comparison, overseas non-food industry purchased 23 per cent of its materials inputs from Irish sources, compared with a considerably higher figure of 36 per cent for indigenous non-food

industry. Also, in 8 out of 10 individual industrial sectors, indigenous industry purchased a greater percentage of its material inputs from Irish sources than overseas industry did. Thus, looked at in this way, the materials purchasing linkages of overseas industry can be regarded as still relatively weak, giving a reasonable basis for the premise underlying policy efforts to stimulate and develop such linkages further.

#### *Causes of Change in Secondary Manufacturing Employment*

It has been shown above that employment in supplying Irish manufactured inputs for overseas manufacturing increased from 10,200 in 1983 to 14,000 in 1991. At the same time such employment in supplying Irish manufactured inputs to indigenous manufacturing declined from 24,200 in 1983 to 18,900 in 1991. This difference in the two trends is partly a simple reflection of the fact that the employment trend within overseas industry itself was stronger than that within indigenous industry in that period.

Thus, other things being equal, one would expect employment in supplying Irish manufactured inputs to overseas manufacturing to have shown a stronger trend than employment in supplying indigenous manufacturing. For if there were no changes in proportions such as spending on Irish manufactured materials as a percentage of sales, and if growth in sales per employee in purchasing industries generally matched that in supplier industries, one would expect the trend of indirect manufacturing employment in the supplier industries to match that of direct employment in the respective purchasing industries.

However, the different trends in direct manufacturing employment in indigenous and overseas industry only partly explain the differences in the trends in indirect manufacturing employment in supplying indigenous and overseas industry. For it was also shown above that the ratio of indirect manufacturing jobs in Irish supplier industries per 100 direct jobs in purchasing industries increased quite substantially from 12 in 1983 to 16 in 1991 in the case of overseas manufacturing, while it declined a little from 19 to 17 in the case of indigenous manufacturing. The different trends in these ratios have to be explained by something other than differences in the direct manufacturing employment trends.

In the case of indigenous manufacturing, in which the ratio of indirect to direct manufacturing employment declined a little, the main reason for this was that spending on Irish materials as a percentage of sales declined in 1983-91, by about 1 percentage point. This decline was only marginal in non-food industries, but it was a more substantial 3 percentage points in the food industry – starting from a relatively high level in 1983 and

remaining relatively high in 1991 despite the decline. Thus, the small decline in the ratio of indirect manufacturing employment to direct manufacturing employment in indigenous industry mainly reflected declining spending on Irish materials as a percentage of sales in the food industry. This trend is the other side of the coin of increasing value-added to materials in the food industry.

In the case of overseas manufacturing, the number of indirect jobs in supplying Irish manufactured inputs per 100 direct manufacturing jobs increased from 12 in 1983 to 16 in 1991. One important reason for this was that sales per employee in overseas manufacturing increased a good deal faster than in indigenous manufacturing. Thus, if nothing else had changed, expenditures per direct employee by overseas industry on Irish manufactured inputs would have increased by significantly more than sales per employee in the supplying industries, thereby giving rise to more indirect employment in relation to direct employment.

In addition to this, overseas manufacturing firms were tending to purchase an increasing proportion of their material inputs from Irish sources during the period, and this would have contributed to the increase in employment in Irish supplier industries relative to direct overseas manufacturing employment. At the level of *total* overseas manufacturing, this increase in the proportion of Irish-sourced materials was rather small. Thus, purchases of Irish-sourced material inputs as a percentage of purchases of all material inputs by total overseas manufacturing only increased from 28.5 per cent in 1983 to just 29.5 per cent in 1990. However, most individual sectors of overseas industry were increasing the share of their materials purchases which came from Irish sources at rather faster rates than this. But the sectors of overseas industry which had relatively high percentages of materials coming from Irish sources tended to have relatively low growth in sales, while those which had relatively low percentages of materials coming from Irish sources tended to have relatively high growth in sales. Thus, even though most individual sectors of overseas industry were increasing the share of their materials purchases which came from Irish sources, the differences in growth rates between sectors meant that at the aggregate level of total overseas industry the increase in Irish materials as a percentage of total materials purchases was rather modest.

For example, the overseas food sector and the drink and tobacco sector purchased a relatively high 67-75 per cent of their material inputs from Irish sources, but these were not particularly fast growing sectors. At the same time, the overseas metals and engineering sector, which did have relatively high growth, purchased just 12.0 per cent of its material inputs

from Irish sources in 1983. This figure increased quite substantially to 18.8 per cent by 1991, but this still meant that the high-growth metals and engineering sector had a below average percentage of materials purchases from Irish sources throughout the period. Thus, there was a general tendency for most individual overseas sectors to purchase increasing proportions of their materials from Irish sources. But owing to the tendency for relatively rapid sales growth among the overseas sectors which had relatively low Irish materials purchasing linkages, this did not show up very strongly in a higher percentage of Irish materials purchasing for overseas manufacturing as a whole.

## Chapter 7

### CONCLUSIONS

This paper has presented estimates of secondary employment associated with manufacturing industry, outside the manufacturing sector itself. This included associated employment supported in services by industry's purchasing of services inputs, employment supported in services by the expenditures of industrial employees on services, and employment in services supported by the re-spending of taxes arising from industry and its employees.

#### *Secondary Services Employment Associated with Total Manufacturing*

It was found that, in all of these categories combined, there were approximately 168,100 services jobs which were associated with manufacturing industry in 1991. This meant that there were about 84 associated services 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 87 or 88 associated services jobs per 100 direct manufacturing jobs.)

It may be worth repeating here that, for the reasons discussed in Chapter 2, we would not really regard the entire number of jobs which are estimated as being associated with manufacturing as a "net" contribution to total employment which is all *caused* to exist by industry.

#### *Trends Over Time in Secondary Services Employment Associated with Total Manufacturing*

Looking at trends over time, it was found that the total secondary services employment associated with manufacturing tended to change at slightly different rates to total direct employment within manufacturing itself. The ratio of total secondary services employment to direct manufacturing employment drifted slowly downwards over the period 1983-90, from 89 to 83 jobs per 100 direct manufacturing jobs. This was followed by a small increase to 84 per 100 in 1991 and a larger increase to

91 per 100 according to the preliminary estimate for 1992. Thus, by 1992, it is estimated that the ratio of total secondary services jobs per 100 direct manufacturing jobs was just slightly higher than the ratio in 1983, after a decline in the intervening period.

In the Introduction to this paper, it was noted that there was generally relatively strong growth in manufacturing production in this period, even at times of no growth or decline in manufacturing employment. The possibility was mentioned that this might have meant that growing purchases of services by manufacturing industry were sustaining a stronger trend in secondary services employment than in direct manufacturing employment. However, the findings of this paper indicate that this was not really the case, and that trends in secondary services employment associated with industry were for the most part not greatly different to trends in direct manufacturing employment.

In the period 1983-91, at least, it would have made rather little difference to one's judgement of industry's overall employment performance whether one considered the associated services employment or not. For there were only quite small changes in the relationship between direct manufacturing employment and total secondary services employment, so that direct manufacturing plus secondary services employment combined changed at only slightly different rates to direct manufacturing employment alone. In the period 1983-91 as a whole, direct manufacturing employment fell by -1.0 per cent per annum while direct plus secondary services employment combined fell by -1.3 per cent per annum. In the sub-period 1983-87, direct manufacturing employment declined by -2.9 per cent per annum while direct plus secondary services employment combined declined by -3.2 per cent per annum. In the sub-period 1987-91, direct manufacturing employment recovered to grow by 0.9 per cent a year while direct plus secondary services employment combined grew by 0.6 per cent a year.

The preliminary figures for 1992, however, indicate that direct plus secondary services employment combined grew at a substantially higher rate than direct manufacturing employment in 1991-92. This shows that the relationship between secondary and direct manufacturing employment is capable of changing quite sharply, although in fact it changed only quite slowly throughout the period 1983-91.

#### *Secondary Services Employment Associated with Indigenous and Overseas Manufacturing*

Looking at indigenous and overseas manufacturing separately, 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 services employment associated with indigenous industry was found to be poorer than that of its direct employment. Thus, the ratio of secondary services employment to direct manufacturing employment declined for indigenous industry. There were about 86 secondary jobs in services per 100 direct indigenous manufacturing jobs in 1983, falling to about 74 per 100 in 1990. The figure then increased to 77 in 1991 and an estimated 80 in 1992, which was still below the figure of 86 in 1983.

Overseas industry had a stronger record of direct manufacturing employment than all industry, and the record of secondary services employment associated with overseas industry was somewhat stronger again. 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 94 per 100 in 1991 and an estimated 105 per 100 in 1992.

Thus, by 1991, there were 94 secondary jobs in services per 100 direct jobs in overseas manufacturing, while there was a lower ratio of 77 per 100 for indigenous industry. The preliminary estimates for 1992 indicate that the gap between these figures for overseas and indigenous industry widened in 1992. 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.

It may be concluded from this that 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 associated services. This is so despite the fact that a relatively high percentage of the value of the sales of overseas manufacturing is not spent in Ireland, but is rather spent on imported inputs or is taken out of the country in the form of profit outflows. The amount which is spent within the country, on wages and salaries and on Irish services, has been sufficient to have supported secondary services employment which is greater relative to direct manufacturing employment than in the case of indigenous manufacturing.

It should be noted, however, that this in itself cannot lead to a simple conclusion that overseas industry is "superior" to indigenous industry in supporting associated services employment, in any absolute sense. For the impression of "superiority" in this respect arises only when one expresses

the secondary services employment in relation to direct manufacturing employment. If one were to look at the levels of either direct manufacturing employment or secondary services employment in relation to the value of *sales* – i.e., numbers of jobs per million pounds worth of sales – indigenous industry would look “superior” to overseas industry in supporting employment.

Thus, one should be careful not to jump to inappropriate policy conclusions based only on the perspective of the relationship between secondary services employment and direct manufacturing employment. In particular, we would *not* wish to conclude from this that overseas industry is better than indigenous industry at supporting employment, or that policy efforts should give priority to promoting overseas industry for that reason. Indeed, it seems clear that major efforts to develop indigenous industry are called for, most obviously because there is little sign that overseas investment alone could be sufficient to make a satisfactory contribution to the country’s employment needs. However, it does seem valid to conclude that overseas industry does make a significant contribution to supporting secondary services employment as well as direct manufacturing employment. Its employment impact should not be overlooked, despite the fact that much of the value of its turnover is not spent in Ireland.

#### *Employment Associated with Purchasing by Industry of Irish Manufactured Inputs*

We also looked at employment supported by overseas and indigenous industry’s purchases of manufactured materials and components 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 14,000 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 16 in 1991. Thus, the secondary manufacturing employment was increasing both in absolute terms and in relation to direct overseas employment.

It should be noted, however, that these estimates of secondary employment in Irish manufacturing in producing industrial products as inputs for overseas industry are rather different in character to the estimates of secondary services employment. This is because some of the secondary employment in the supplier industries concerned is in overseas industry itself, i.e., some overseas firms purchase some manufactured inputs from other overseas firms in Ireland. Thus, unlike the secondary services employment, this secondary manufacturing employment is not all *additional* to direct overseas manufacturing employment. To take account of this point we also presented rather rough or approximate estimates of

the amount of secondary employment in producing industrial products for overseas industry which is in indigenous industry alone. These estimates were about 8,200 in 1983 rising to about 11,200 by 1991; this estimate for 1991 amounts to about 10 per cent total indigenous manufacturing employment in that year.

In the case of indigenous manufacturing, it was estimated that the employment involved in producing Irish manufactured inputs for indigenous industry was about 24,200 in 1983, declining to about 18,900 in 1991. When expressed in terms of numbers of indirect manufacturing jobs per 100 direct jobs in indigenous manufacturing, the estimates are 19 in 1983 and a slight decline to 17 in 1991.

Again, it should be noted that these estimates of secondary employment in Irish manufacturing in producing industrial products as inputs for indigenous industry are rather different in character to the estimates of secondary services employment, to the extent that much of the secondary employment in the supplier industries concerned is in indigenous industry itself. Thus, unlike the secondary services employment, the secondary manufacturing employment is not all *additional* to direct indigenous manufacturing employment. Nevertheless, the estimates of secondary manufacturing employment do have some meaning, in so far as they indicate that the amount of employment in producing Irish manufactured inputs for the average indigenous manufacturing firm is about 17 per cent of the average firm's own employment.

The figure of 17 indirect manufacturing jobs per 100 direct manufacturing jobs for indigenous industry is almost the same as the figure of 16 for overseas industry in 1991. But it should be noted that this would not necessarily support a clear and unambiguous conclusion that overseas industry is very nearly as good as indigenous industry at supporting employment in Irish supplier industries, in any absolute sense. Such a conclusion is suggested only when one expresses the indirect employment in relation to direct manufacturing employment. If one were to look at the levels of either direct or indirect manufacturing employment in relation to the value of *sales*, indigenous manufacturing would look rather better than overseas manufacturing at supporting employment.

Thus, one should again be careful not to jump to inappropriate policy conclusions based only on the perspective of the relationship between secondary manufacturing employment and direct manufacturing employment. However, it does seem valid to conclude that overseas industry does make quite a significant contribution to supporting secondary manufacturing employment as well as direct manufacturing

employment. Its employment impact should not be overlooked, despite the fact that much of the value of its turnover is not spent in Ireland and that much of its material inputs are imported.

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## Appendix

### *METHODOLOGICAL PROCEDURES*

#### *Chapter 3: Derivation of Grossed Up Estimates from the Irish Economy Expenditures Survey*

As is outlined at the start of Chapter 3, the Irish Economy Expenditures (IEE) Survey, which has been undertaken by the IDA (and now by Forfas) each year since 1983, covers manufacturing companies which employ 30 people or more. This survey 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. When all their expenditures are subtracted from their sales, profits emerge as a residual. (Information on response rates to the IEE survey is contained in Chapter 3.)

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. The method used to gross up the survey results is to multiply the survey data by the ratio of national employment (using IDA/Forfas 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. These 18 sectors are:

- non-metallic mineral products (NACE code 24)
- chemicals, including man-made fibres (NACE 25,26)
- metals and engineering (NACE 22, 31-37) *sub-divided* into 6 different parts
- food (NACE 411-423) *sub-divided* into 4 different parts
- drink and tobacco (NACE 424-429)
- textile industry (NACE 43)
- clothing, footwear and leather (NACE 44-45)
- timber and wooden furniture (NACE 46)
- paper and printing (NACE 47)
- miscellaneous industries (NACE 14, 48-49).

Thus, the 18 sectors consist of 8 of the 10 standard broad industrial sectors plus 10 sub-divisions of the other 2 – namely, 6 sub-divisions of metals and engineering and 4 sub-divisions of food. Since metals and engineering and food are much the largest of the 10 broad industrial sectors, it was considered possible to divide them up for the purpose of grossing up survey data, and since their component parts have widely varying expenditure patterns it was considered desirable to do so.

In the case of metals and engineering, the standard NACE classification provides for 8 sub-divisions (NACE 22 and 31-37). However, some of these sub-divisions are rather small in Ireland, particularly when divided further into indigenous and overseas components. For this reason, it was thought best to combine some of them together with others which have similar expenditure patterns and sales per employee, for the purpose of grossing up survey data. Thus, only 6, rather than 8, sub-divisions of metals and engineering are employed. In the case of indigenous industry, these are:

- production and preliminary processing of metals (NACE 22)
- manufacture of metal articles (NACE 31)
- mechanical engineering (NACE 32)
- office and data processing machinery (NACE 33) and instrument engineering (NACE 37) combined
- electrical engineering (NACE 34)
- motor vehicles (NACE 35) and other transport equipment (NACE 36) combined.

In the case of overseas industry, the same sectoral divisions are employed, except that NACE 22 (being very small) is combined with 31, while NACE 33 and 37 (being relatively large) are treated separately.

The food industry is divided into 4 categories for the purpose of grossing up the survey data, as follows:

- slaughtering and processing of meat (NACE 412)
- dairy products (NACE 413)
- "food group 3"; fruit and vegetable processing (NACE 414), sea-food processing (NACE 415), grain milling (NACE 416), manufacture and refining of sugar (NACE 420) and animal and poultry foods (NACE 422)
- "food group 4"; oils and fats (NACE 411), pasta (NACE 417), starch products (NACE 418), bread, biscuits and flour confectionery (NACE 419), cocoa, chocolate and sugar confectionery (NACE 421) and other food products (NACE 423).

The logic behind these groupings follows from some consideration of relevant points of similarity and difference between different branches of



the food sector. Thus, it has been noted previously (Matthews and O'Connor, 1987) that some food sector branches are largely engaged in processing of output from the primary sector, while others are basically involved in secondary processing of output from other food industries. It has also been noted elsewhere (Riordan, 1989) that some branches of the food sector are largely engaged in processing of *Irish* output, while others import much of their inputs and could well survive without supplies of materials from Ireland. In addition, some food sector branches are largely engaged in basic (relatively low value-added) processing of materials, while others have much higher value-added.

These distinctions seem relevant to the question of how to group together different parts of the food industry for the purpose of grossing up survey data for an analysis of linkages and secondary effects of industries. It seems logical to try to group the branches of the food industry into categories which are similar in terms of principal sources of materials (primary or industrial, Irish or foreign) and in terms of value-added to materials.

Thus, the meat processing and dairy products sectors are both largely engaged in basic processing of almost exclusively Irish-sourced primary produce; the cost of their material inputs is about 80 per cent or more of the value of their sales and more than 90 per cent of the materials are Irish. Each of these sectors is large enough to stand on its own for the purpose of grossing up survey data, whereas the other food sectors mostly are not.

"Food group 3" consists of branches which are also largely engaged in processing of primary (rather than manufactured) produce. But compared to meat or dairy products, value-added to material inputs is higher and a somewhat lower proportion of the materials is sourced in Ireland; the cost of the material inputs of this group is about 70 per cent of the value of sales and about 80 per cent of the materials are of Irish origins.

"Food group 4" consists of sectors which are largely engaged in processing, not of primary produce, but of output from other food industries, whether Irish or foreign-based. Compared to other food industries, this group also has higher value-added to materials and it imports a higher proportion of its materials; the cost of the material inputs of this group is less than 50 per cent of the value of sales and just over half of the materials are of Irish origins.

The grossing up procedure which is employed – multiplying IEE survey data by the ratio of national employment to survey employment – 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 flaw in this is that sales per employee (and hence probably expenditures on inputs per employee) tend to be lower for the small firms employing less than 30 people, which are all excluded from the survey, than for larger firms. However, as noted in Chapter 3, examination of *Census of Industrial Production* (CIP) data on gross output per employee by size class of establishments indicates that this flaw would have only minor effects on our estimates.

Nevertheless, it was considered whether it would be worth trying to use CIP data on output per employee by size class to refine the grossing up procedure. For example, if the CIP shows that small firms with less than 30 employees in a particular sector have gross output per employee at, say, 80 per cent of the level of larger firms, one might estimate the sales and expenditures per employee of the smaller firms at 80 per cent of the level of firms in that sector responding to the IEE survey. However, there proved to be some difficulties with this idea.

First, the grossing up of the IEE survey data is done for separate categories of industry which are distinguished by nationality and by sector. This is because response rates to the survey differ by nationality and by sector, as do expenditure patterns and sales per employee. Therefore, if CIP data on differences by size class were to be used to refine the grossing up procedure, there would have to be CIP data available by nationality, by sector and by size class, i.e., by all three classifications at the same time. But the CIP does not, in fact, provide data broken down by this three-way classification.

It might be possible to obtain unpublished details from the CIP, but there is the further problem that classifications of firms by nationality and by sector in the CIP differ somewhat from those in the IDA's IEE survey and employment survey which are our basic data sources for this paper. Thus, for example, the CIP's "Irish textiles" sector consists of a somewhat different group of firms to the IDA's "Irish textiles" sector, even though they are, of course, mostly the same. Thus, if one applied information by nationality and sector from the CIP to adjusting grossed up estimates from the IDA's survey, there would be small errors in the resulting estimates for many categories because of the differences in classification.

Consequently, it is very doubtful whether it would be worthwhile to use the CIP information to try to improve on our grossing up procedure, since the errors involved in our grossing up procedure – arising from lower sales per employee in the small firms which are excluded from the IEE survey – are quite small in any case. As is mentioned in Chapter 3, the errors from this source are probably of the order of less than 1 per cent for overseas industry and about 2-3 per cent for indigenous industry.

*Chapter 3: Checking the Accuracy of the IEE Data*

In Table 3.1 in Chapter 3, estimates of sales obtained from the IEE survey are compared with CIP Gross Output and "Adjusted CIP Gross Output", in order to check the accuracy of the IEE estimates. The need for comparing with the "adjusted" CIP gross output arises because the coverage of the CIP leaves out very small firms with less than three employees, whereas the estimates obtained from the IEE survey include these very small firms. This is because the IEE sales estimates are obtained using the IDA/Forfas employment survey to gross up the IEE survey results, and the IDA/Forfas employment survey does not leave out the very small firms with less than three employees. Consequently, the numbers reported in the IDA/Forfas employment survey are a little larger than CIP employment, and our estimates of sales obtained from the IEE survey grossed up by the IDA/Forfas employment survey would therefore be expected to be a little larger than CIP gross output.

For this reason, CIP gross output is adjusted in Table 3.1 to make it more closely comparable to the coverage of the IEE sales estimates. The 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/Forfas employment survey, and if the additional employment was all in firms with gross output per employee the same as in the size class of very small CIP establishments which employ from 5 to 9 people. (There is a CIP size class of even smaller firms employing less than 5, but this includes firms which had existed and had some output in the year of the census concerned, but had *no* employment by a specified date in September of that year; thus output per employee for this size class is rather distorted.)

For example, in 1990, employment in the IDA/Forfas employment survey was 3.2 per cent greater than in the CIP, and gross output per employee in the 5-9 employment size class in the CIP was 47 per cent of average gross output per employee for all CIP firms. In this case the "adjusted" CIP gross output is estimated by increasing actual CIP gross output by 47 per cent of 3.2 per cent, i.e., by 1.5 per cent.

*Chapter 4: Estimation of Services Employment Associated with Industrial Purchasing*

In Chapter 4, the services employment in block B of Figure 4.1 or 4.2 is estimated as follows. First, the IEE survey data (grossed up as outlined above) provide estimates of expenditures by manufacturing on Irish services inputs. In 1991, for example, it is estimated that manufacturing industry's expenditure on all Irish services inputs was £2,699.9 million. These expenditures on "services" include not only services as

conventionally defined, but also the non-manufacturing service industries, namely, electricity, gas and water; however, these account for only a small minority of industry's expenditures on all "services".

Second, we need to estimate how many people were employed in producing the Irish services purchased by industry. For this, data are required on gross output or sales of services and on employment in services, in order to calculate gross output or sales per employee. Then we can divide industry's expenditures on Irish services inputs by Irish services' gross output or sales per employee to obtain estimates of employment in Ireland in producing the services which are purchased by industry. A problem here is that the data on services output which are regularly available from the *National Income and Expenditure* (NIE) are not gross or final output measures, but rather they are measures of the contribution of services to Gross Domestic Product, i.e., they are measures of value-added in services. Since our estimates of manufacturing industry's purchases of Irish services refer to purchases of final or gross output (and not of value-added), the NIE data on services value-added cannot be used directly to estimate employment in producing the services purchased by industry. Instead we need data from some other source which measure sales or gross output of services.

For this, we have to turn to the input-output tables published by the Central Statistics Office (1992), which provide gross or final type measures of services output, but only for 1985. Summing up the output of all service sectors in the 1985 input-output table (including electricity/gas/water) gives total services output of £14,915.7 million (of which, incidentally, just £1,136.8 million, or 7.6 per cent, was in electricity, gas and water). Then from the Labour Force Survey for 1985, we find that employment in all services (including electricity, gas and water) was 617,100. Dividing the above output by employment gives output per head of £24,171 for all services (including electricity, gas and water) in 1985. The grossed up IEE survey data give an estimate of expenditure by manufacturing industry on Irish services (including electricity, gas and water) of £1,941.2 million in 1985. So we divide this figure by £24,171 to obtain an estimate of 80,300 people employed in producing the Irish services which were purchased by manufacturing industry in 1985.

The same procedure cannot be followed for years other than 1985, because input-output tables are not available for other years. Rather the data on services output which are available for other years are the value-added type of measures of the contribution of services to GDP, from the annual *National Income and Expenditure* (or the annual *Economic Review and Outlook* which reproduces the same data). These data are available for

services, although they do not distinguish electricity, gas and water separately but rather include it with "industry". Using these data on services (necessarily without electricity, gas and water) together with Labour Force Survey figures on employment in services (also without electricity, etc.), we can calculate the contribution *per employee* of services to GDP for each year 1983 to 1992.

We then convert these figures for the contribution *per employee* of services to GDP into an index to the base year 1985 = 1.00, and use the resulting index, multiplied by 1985 services gross output per employee, to estimate services gross output per employee for years other than 1985.

For example, in 1985 the contribution *per employee* of services to GDP was £13,514, and in 1991 it was £20,945, i.e., 1.55 times greater than in 1985. Thus we estimate that, in 1991, services gross output per employee was 1.55 times greater than the 1985 figure of £24,171, which is £37,465. The grossed up IEE survey data give an estimate for spending by manufacturing on Irish services of £2,699.9 million in 1991. So we divide this figure by £37,465 to obtain an estimate of 72,100 people employed in Ireland in producing the services which were purchased by manufacturing in 1991. This figure of 72,100 appears in the top part of block B in Figure 4.2, which refers to 1991, and corresponding figures for other years are calculated in a similar way.

This procedure for estimating services gross output per employee for years other than 1985 in effect assumes that value-added in services is a constant proportion of gross output or sales. Or, to put it another way, it assumes that gross output or sales per head in services changes at the same rate as value-added or contribution to GDP per head. To the extent that this is not so, there is some margin of error here, but this seems to be the best way of making these estimates in the absence of gross output or sales data for services for years other than 1985. (More precisely, our procedure for estimating services gross output per employee for years other than 1985 assumes that gross output or sales per head in services, *including* electricity, gas and water, changes at much the same rate as value-added per head in services without electricity gas, and water; however, electricity, gas and water is such a relatively minor proportion of the total that its inclusion or exclusion could have only very minor effects on the relationship between the rates of change of value-added per head and sales per head.)

Another point worth mentioning is that the IEE data on expenditures by manufacturing on Irish services are aggregated data for expenditures on all services, not broken down by branch of services. Consequently, to estimate employment in Irish services purchased by manufacturing, we use average output per employee in all services, rather than being able to

distinguish between expenditures by manufacturing on different types of services and using different figures on output per employee for each category of services concerned. (Actually, some limited disaggregation of the IEE services expenditure data – distinguishing expenditures on certain types of services – is possible; but this would not break down services into categories for which statistics on output per employee would be obtainable, so such disaggregation is not used.)

The effect of this procedure is an implicit assumption that average output per employee in all services is much the same as average output per employee in the mix of services which are purchased by manufacturing. Again, to the extent that this is not so, there is some margin of error here, but the procedure adopted is a result of data constraints.

A particular point here concerns electricity, gas and water, which has an exceptionally high level of output per employee – 3.3 times higher than in other services in 1985. Thus, if electricity, gas and water represented a significantly different proportion of the services purchased by manufacturing than it does of all services output, then average output per employee in the mix of services purchased by manufacturing could differ noticeably from average output per employee in all services. However, the indications are that this is not a serious problem because, in fact, electricity, gas and water accounts for a similar proportion of the services purchased by manufacturing as it does in all services output.

Thus, data from the *Census of Industrial Production* indicate that manufacturing industry's expenditure on electricity is equal to 0.9 per cent of its gross output while its expenditure on other fuel and energy – apart from coal, turf and petroleum oils – is 0.2 per cent of its gross output. Therefore, industry's expenditure on electricity and gas is over 0.9 per cent and probably close to 1.1 per cent of its gross output. The IEE survey data show that industry's expenditure on all services (including electricity, gas and water) is equal to about 13 per cent of its sales, its sales being very close to its gross output. Thus industry's expenditure on electricity and gas as a percentage of its expenditure on all services is more than  $0.9/13$  and probably close to  $1.1/13$ , i.e., more than 6.9 per cent and probably close to 8.5 per cent of expenditure on all services. And, as noted above, electricity, gas and water accounts for 7.6 per cent of all services output in the 1985 input-output table. Assuming that water is of relatively little significance here, it appears, therefore, that electricity, gas and water represents much the same proportion of the services purchased by manufacturing as it does in all services output.

Next we outline the method for estimating services employment in the lower part of block B in Figure 4.1 or 4.2. This employment in the lower

part of block B is employment in the services which are required as inputs in order to produce the services which are purchased directly by manufacturing industry, plus further employment in the services required to produce those services...and so on through each succeeding round of services inputs. Input-output tables are essential for making such an estimation, and again we have the necessary table only for 1985.

In 1985, the total output of services (including electricity, gas and water) was £14,915.7 million; this is the sum of the figures for all branches of services in the last or "total output" column of the input-output table. It can also be calculated from the input-output table that, of this total output of all services, £4,040.35 million was "intra-services" sales, i.e., the sum of all output of branches of services (including electricity, gas and water) which was sold as inputs to all branches of services (including electricity, gas and water). Thus, in order to produce £14,915.7 million worth of services, £4,040.35 million worth of services was required as inputs.

Or one could say that for a pound's worth of sales of services, .2709 pounds' worth of services was required as inputs for those services (.2709 being 4,040.35 divided by 14,915.7). In turn, the services inputs required for those services inputs would be worth  $.2709 \times .2709$  pounds, the next round of services inputs required for those services inputs would be worth  $.2709 \times .2709 \times .2709$  pounds...and so on through all the rounds of services inputs. Summing up this series of rounds of services inputs indicates that for a pound's worth of sales of services, .372 pounds' worth of services were required as all the rounds of services inputs.

An alternative way of looking at this is to say that the "net sales" of the services sector to *non-services* customers were £14,915.7 million (in total services output) minus £4,040.35 million (in "intra-services" sales), which equals £10,875.35 million. Thus, in order to produce £10,875.35 millions' worth of services for sale to customers *outside* the services sector, a further £4,040.35 millions' worth of services was required as total "intra-services" inputs. Or, one could say that for every pound's worth of "net sales" of services to non-service customers, a further .372 pounds' worth of "intra-services" sales was required as total intra-services inputs (.372 being 4,040.35 divided by 10,875.35). Thus, either way, one reaches the same figure of .372 pounds' worth of total intra-services inputs required per pound's worth of net sales of services.

According to the estimates from the IEE survey, manufacturing spent £1,941.2 million on Irish services (including electricity, gas and water) in 1985. One way of looking at the services employment implications of this is that gross output per employee in services was £24,171 in 1985, so that estimated employment in producing the services purchased directly by

manufacturing was 1,941.2 million/24,171, which is 80,300. Then for every pound's worth of "net sales" of services to non-service customers, there are a further .372 pounds' worth of services required as all the rounds of services inputs. Thus, the £1,941.2 million spent by manufacturing on "net sales" of services required a further £722.1 million (i.e., .372 times 1,941.2 million) of "intra-services" inputs. At average gross output per employee in services of £24,171, this implied 29,900 further jobs in producing the "intra-services" inputs for the services purchased directly by manufacturing.

Or a short-cut which produces the same result would be to say that once we have estimated that there are 80,300 jobs in producing the services which are purchased directly by manufacturing, that there are .372 times that number engaged in producing the required "intra-services" inputs. Thus, .372 by 80,300 equals 29,900 – the same result as before.

An alternative approach – which again arrives at the same results – would be first to divide the £1,941.2 million spent by manufacturing on Irish services by total output per head in services (£24,171 in 1985), to give 80,300 employed in services purchased directly by manufacturing. Then one can estimate the *total* number employed *both* in the services purchased directly by manufacturing *and* in the required "intra-services" inputs; then by subtracting 80,300 from this number, one arrives at the estimate for numbers engaged in producing the "intra-services" inputs.

To do this, note that all those employed in services are engaged either (1) in producing services for "net sales" to non-services customers or (2) in producing the "intra-services" inputs which are required to produce services for "net sales" outside the services sector. The work of both of these sets of services employees, i.e., all services employees, is required to produce the eventual "net sales". With total services employment at 617,100 in 1985, and "net sales" of services to non-services customers at £10,875.35 million, we can calculate "net sales" of services per employee to be £17,623. It is estimated that manufacturing spent £1,941.2 million on Irish services which, divided by £17,623, gives an estimate of 110,200 employed both directly and indirectly in services supported by the purchasing of manufacturing. Subtracting from this number the figure of 80,300 for those employed in producing the services purchased directly by manufacturing gives an estimate of 29,900 for those employed in producing the required "intra-services" inputs; this is the same figure which was arrived at before by different means.

For years other than 1985, there are no input-output tables, but since input-output structures change quite slowly we can use the ratios or relationships from the 1985 table for other years, even though the absolute



figures would, of course, be changing significantly over time. Thus, the simplest way to estimate, for other years, services employment in producing all the "intra-services" inputs for services purchased directly by manufacturing is to multiply estimated employment in services purchased directly by manufacturing by .372. For example in 1991, as seen in the top part of block B in Figure 4.2, it was estimated that 72,100 were employed in producing services directly for manufacturing; and .372 times this number, or 26,800, are estimated to be engaged in producing the "intra-services" inputs, as seen in the lower part of block B in Figure 4.2.

Alternatively, one could use other more elaborate methods, but these produce the same results. For example, one could estimate "net sales" of services to non-service customers per service sector employee in 1991, by increasing the 1985 figure for this in line with the 1991 index of services' contribution to GDP per employee (calculated as explained earlier in this section). This would be £17,623 multiplied by 1.55 which is £27,316. Then, as outlined above, spending by manufacturing on Irish services in 1991 (at £2,699.9 million), divided by 1991 "net sales" of services to non-service customers per service sector employee (at £27,316), gives a total of 98,800 employed both directly and indirectly in services supported by the purchasing of manufacturing in 1991. Subtracting from this the figure of 72,100 for those employed in the services purchased directly by manufacturing gives 26,700 estimated to be engaged in producing the "intra-service" inputs. Apart from a negligible rounding error, this produces the same result as the simpler method outlined in the paragraph above.

#### *Chapter 4: Estimation of Services Employment Associated with Expenditures of Manufacturing Employees*

In Chapter 4, the services employment in block C of Figure 4.1 or 4.2 is estimated as follows. First, the grossed up IEE survey data provide estimates of the total pay bill, or total labour costs, of manufacturing industry. In 1991, for example, this was £3,183.5 million.

In order to obtain total expenditure by manufacturing employees, we need to deduct from the total pay bill employers' and employees' social security payments and employees' income taxes, as well as employees' savings. Data on employers' and employees' social security payments and employees' income taxes, expressed as a percentage of total labour costs, were obtained for each year 1983-92 from the database compiled for the ESRI's macroeconomic model; in 1991, this came to 26.3 per cent of total labour costs. This is the average for total national labour costs, rather than for manufacturing alone, but since average industrial pay is close to the

average for all sectors, this seems acceptable. After deducting these taxes, employees were left with 73.7 per cent (in 1991) of the pay bill as disposable income, which was £2,346.2 million.

In order to deduct savings, we again use national average rates, since data on savings behaviour of manufacturing employees are not available. Data on Personal Savings were obtained from Table 9 of the *National Income and Expenditure*, and with data on Personal Income after taxes from the same source it was possible to calculate savings as a percentage of after-tax disposable income. Thus, from the after-tax disposable income of manufacturing employees we deduct savings to obtain a figure for their expenditure; in 1991, this amounted to £2,071.5 million.

We then need to estimate how much of the expenditure by manufacturing employees is spent on Irish services. To do this, we again use national average rates, in the absence of suitable data on expenditure patterns of manufacturing employees alone. From the input-output tables for 1985, it can be calculated that, on average, 35.9 per cent of personal expenditure is spent on Irish services. This allows us to estimate that manufacturing employees spent £743.7 million on Irish services in 1991.

Having arrived at a figure for spending by manufacturing employees on Irish services, the remaining procedure for estimating the implications of this for employment in Irish services is the same as in the case of industry's spending on services, as outlined above. This means that we are again assuming that output per employee in the mix of services which are purchased by manufacturing employees does not differ much from output per employee in all services. To the extent that this is not so, there may be some margin of error here. Following this procedure, it is estimated that about 19,900 people were employed in providing the £743.7 million worth of services for manufacturing employees in 1991, with a further 7,400 employed in providing all the "intra-services" inputs required for those services, as shown in block C of Figure 4.2.

*Chapter 4: Estimation of Services Employment in Blocks D and E of Figure 4.1 or 4.2.*

In Chapter 4, the services employment in blocks D and E of Figure 4.1 or 4.2 is estimated as follows. First, the employment in block D depends on the expenditures of the service sector employees in block B. We already have an estimate of the number of employees in block B, obtained as explained above. We then need to estimate their remuneration. From Table 2 of the *National Income and Expenditure*, we derive a figure for total "remuneration of employees" in the services sectors, and from the *Labour Force Survey* we obtain total employment in services. Dividing the former by the latter gives average remuneration per employee in services. This figure

is then multiplied by the number of services employees in block B of Figure 4.2 to obtain an estimate of their remuneration.

This estimate of the remuneration of services employees in block B is before tax, and it includes all elements of wage costs including employers' and employees' social security contributions. In this respect, it is comparable to the initial total pay bill or labour costs of manufacturing employees, which was referred to above in explaining how we estimated services employment (in block C) arising from spending of industrial pay. Thus, the procedure used to estimate services employment in block D, arising from spending of the pay of those in block B, is the same as that outlined for estimating employment in block C arising from the spending of industrial pay. (In practice, however, it is not necessary to replicate each individual step in that procedure. Rather, we know from the *previous* procedure how many services jobs result per million pounds of overall pay costs for the relevant employees who are purchasing the services. Thus, we only need to apply these ratios of service jobs per million pounds of pay costs, for the relevant years, to obtain the required services employment estimates.)

Next, the employment in block E of Figure 4.1 or 4.2 depends on the expenditures of the service sector employees in block C. The procedure for estimating the employment in block E is exactly analogous to that for estimating employment in block D, except that we start with the numbers employed in block C rather than block B.

#### *Chapter 4: Estimation of Services Employment Supported by the Re-Spending of Taxes Arising from Manufacturing Industry*

The services employment in block F of Figure 4.1 or 4.2, i.e., services employment supported by the re-spending of taxes arising from manufacturing industry, is estimated as follows. First, from the procedure outlined above for estimating the effects of spending of industrial pay, we have estimates for each year of employers' and employees' social security contributions and employees' income taxes. (This amount was previously deducted from manufacturing industry's pay bill before estimating industrial employees' purchasing of Irish services.) From the same earlier procedure, we also have estimates for each year of expenditure by manufacturing employees. We further calculate, from the input-output tables, that on average 16.9 per cent of personal expenditure goes to the government in the form of indirect taxes (VAT and excise). Therefore, we add that percentage of expenditure by manufacturing employees to the PRSI and income tax take, to arrive at an estimate of taxes arising from manufacturing. This estimate for 1991 is £1,187.4 million. (As mentioned

in the text of Chapter 4, this leaves out taxes on manufacturing profits, which are referred to separately.)

To estimate the effects of the re-spending of taxes arising from manufacturing, it is aimed to treat the amounts concerned as being spent by the public sector according to the same pattern as public expenditure in general. The basic source for deriving the breakdown of public expenditure required for this is Table 21 of the *National Income and Expenditure* on "Receipts and Expenditures of Public Authorities".

An initial point to note here is that the major items on the "receipts" side include not only taxes but also borrowing, while the "expenditures" include repayments of debt principal as well as other expenditures. We make the simplifying assumption that debt principal repayments are funded from borrowing rather than from taxation (as would be the case if the public debt were in a steady state, neither rising nor falling). Thus, the public expenditure which taxes arising from industry are deemed to be helping to fund is all public expenditure *other than* debt principal repayments, and our aim is to treat the taxes arising from industry as being spent according to the pattern of all public expenditure other than debt principal repayments.

This procedure may be justified partly on the grounds that borrowing has in fact been sufficient to cover debt principal repayments. Borrowing and debt repayments are also obviously linked to each other in the sense that one begets the other. There is also the point that the amounts for both borrowing and repayments of debt principal can be highly variable from year to year, depending on the timing of when particular loans fall due for repayment and whether this creates particular needs for new borrowing at such times. Thus, if we were to take it that taxes arising from industry go partly to repaying debt principal, the proportion so doing could vary substantially from one year to the next. Hence, the estimated employment associated with re-spending of taxes arising from industry could vary quite substantially for reasons which would have nothing to do with the behaviour or performance of industry but rather would arise from details of timing of public debt management. This would hardly be appropriate when in reality it is primarily borrowing which fluctuates in response to fluctuations in the timing of debt repayments.

Our aim, therefore, is to treat the taxes arising from industry as being spent according to the pattern of all public expenditure other than debt principal repayments. In the case of 1991, total public authorities expenditure was £15,277.5 million, of which £2,735.7 million was "redemption of securities and loan repayments" (or debt principal repayments), leaving £12,541.8 million as expenditure on all items other

than debt principal repayments. For our purposes, we divide this amount into four categories: (1) foreign debt interest, or "national debt interest paid to the rest of the world" which, from Table 24 of the *National Income and Expenditure (NIE)*, was £1,030.7 million in 1991; (2) current expenditure on goods and services which, from Table 21 of the *NIE*, was £4,872.3 million in 1991; (3) transfer payments, domestic debt interest and subsidies, which was £5,678.2 million in 1991 (this is calculated as the sum of transfer payments, national debt interest and subsidies in Table 21 of the *NIE* minus foreign debt interest from Table 24 of the *NIE*); and (4) capital expenditure which (excluding "redemption of securities and loan repayments") was £960.7 million in 1991, from Table 21 of the *NIE*.

We then calculate the amount spent on each of these four categories as a percentage of total public expenditure other than debt principal repayments, and we take it that the same percentages of the taxes arising from manufacturing industry are allocated to expenditure on each of the four categories. For example, the amount spent on foreign debt interest in 1991 was £1,030.7 million which is 8.2 per cent of the total of £12,541.8 million, so we regard 8.2 per cent of the taxes arising from industry as going to pay foreign debt interest. In the same way, it is estimated that, in 1991, 38.8 per cent of these taxes was spent on providing current goods and services, 45.3 per cent went to transfer payments, domestic debt interest and subsidies, and just 7.7 per cent was spent on capital investment.

In order to estimate the implications of these expenditures for Irish services employment, we first leave aside the amount which left the Irish economy in the form of foreign debt interest payments, on the grounds that this made no contribution to Irish employment. Then we use the input-output table for 1985 to allocate appropriate proportions of the other amounts to expenditure on Irish services, as opposed to other Irish products or imports.

Specifically, the public authorities' current expenditure on goods and services corresponds to the "Net Government" column in the input-output tables. The input-output table shows that nearly all of this (over 93 per cent) was spent on Irish services (excluding electricity, gas and water), with the remainder going to building and construction in which the output to employment ratio is not very different to services. Thus, we treat all of public current expenditure on goods and services as being spent on Irish services, excluding electricity, gas and water. (Actually, the input-output table indicates that 2 per cent of "Net Government" expenditure goes to taxation, but we do not deduct this on the grounds that this is also re-spent anyway.) In the case of 1991, this means that £460.7 million is so allocated to expenditure on Irish services under this heading - £460.7 million being

38.8 per cent of the estimated £1,187.4 million in taxes arising from manufacturing.

Public capital expenditure is best treated as being allocated by sector as in the "Gross Fixed Capital Expenditure" column of the input-output table. The input-output table indicates that 34.9 per cent of this is spent on imports or Irish industrial and agricultural products, with the remaining 65.1 per cent being spent on Irish services (excluding electricity, gas and water) or building and construction. (Actually, a small part of this 65.1 per cent goes to taxation, but we do not deduct this on the grounds that this is also re-spent anyway.) Since building and construction has an output to employment ratio which is similar to services, we treat 65.1 per cent of public capital expenditure as being spent on Irish services (excluding electricity, gas and water); thus we combine 65.1 per cent of the capital expenditure with all the current expenditure on goods and services and treat this amount as being spent on Irish services (excluding electricity, gas and water). In fact the data indicate that 86 per cent of this combined total of the two categories goes to Irish services (excluding electricity, gas and water), with the remainder going to building and construction, so there cannot be much loss of accuracy in treating it all as going to Irish services.

The transfer payments, domestic debt interest and subsidies which are paid for by taxes arising from industry mainly end up as incomes of individuals, so this amount is best treated as being spent on Irish services in the same proportion as "Personal" expenditure in the input-output table. First, however, we deduct personal savings at national average rates. From Table 9 of the *NIE*, we obtain figures for Personal Savings (£2,147 million in 1991) and for Personal Income after tax (£18,333 million in 1991), and calculate the former figure as a percentage of the latter to give savings as a percentage of income (which is 11.7 per cent in 1991). Thus, we deduct this amount of savings and treat the remainder (88.3 per cent in 1991) of transfer payments, domestic debt interest and subsidies as being spent on Irish services in a similar proportion to "Personal" expenditure in the input-output table.

It was noted above (in the section in this Appendix on "Estimation of services employment associated with expenditures of manufacturing employees") that 35.9 per cent of personal expenditure in the input-output table is spent on Irish services. However, part of personal expenditure in the input-output table *also* goes to indirect taxation (VAT and excise). Since we are dealing here with the estimation of services employment supported by the re-spending of taxes, we would not want to discard that part of personal expenditure which goes to indirect taxation, because that indirect taxation is in turn re-spent.

One approach to dealing with this could be to deduct the indirect tax element from personal expenditure and to treat the indirect tax as being re-spent again according to the overall pattern of public expenditure. However, we adopt a more simplified procedure which, although more crude, would make little quantitative difference. Thus, the transfer payments, domestic debt interest and subsidies expenditure (after savings) is treated as being spent on Irish services in the same proportion as "Personal" expenditure in the input-output table excluding the tax minus subsidy item. This means that 43.3 per cent of it is treated as being spent on Irish services (including electricity, gas and water), rather than the figure of 35.9 per cent which would apply if we took expenditure on Irish services as a percentage of total "personal" expenditure including the tax minus subsidy item. Thus, in the example of 1991, 43.3 per cent of 88.3 per cent – i.e., 38.2 per cent – of transfer payments, domestic debt interest and subsidies is treated as being spent on Irish services (including electricity, gas and water).

At this point, we have the taxes arising from manufacturing allocated to categories of public expenditure, with proportions of each category being spent on Irish services, as follows. The amount going to foreign debt interest is not spent on Irish services at all. All of the amount going to current expenditure on goods and services plus 65.1 per cent of the amount going to capital expenditure is treated as being spent on Irish services *excluding* electricity, gas and water. There is an amount going to transfer payments, domestic debt interest and subsidies, from which savings are deducted and then 43.3 per cent of the remainder is spent on Irish services *including* electricity, gas and water. (Note that the reason for the different treatment of electricity, gas and water in the above categories is because the input-output table indicates that part of "personal" expenditure goes to electricity, gas and water, while "net government" and "gross fixed capital formation" expenditure are not spent on electricity, gas and water.)

Having obtained, for each year, estimates of expenditures on Irish services from the taxes arising from manufacturing, the procedure for estimating the effects of this on Irish services employment is similar to the procedure already outlined above in the case of spending by industry or employees on services. In the case of spending of transfer payments, domestic debt interest and subsidies – which are partly spent on electricity, gas and water – it is exactly the same as the previously outlined procedure. However, in the cases of current expenditure on goods and services and of capital expenditure – which are not spent on electricity, gas and water – the procedure is slightly different. The difference is that the employment

involved in producing the services which are purchased under these headings is calculated using output to employment ratios for services *excluding* electricity, gas and water.

*Chapter 6: Estimation of Secondary Employment in Irish Industry Associated with Manufacturing Industry's Purchasing of Materials*

In order 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 in each year concerned. Then we use the official input-output tables for 1985 to estimate how much of this is spent on Irish manufactured products as opposed to Irish primary products.

The input-output table indicates which sectors the Irish materials inputs purchased by individual sectors come from. In the case of most manufacturing sectors, it shows that more than 98 per cent of their spending on Irish materials and components is spent on products of manufacturing sectors other than the food sector. We assume that much the same is true of the overseas components of these sectors (the input-output table distinguishes individual sectors, but does not distinguish overseas from indigenous firms). Thus, for overseas firms in these sectors, we take it that *all* of 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 in the year concerned. We use sales per employee for *indigenous* rather than *all* non-food manufacturing on the grounds that most of the inputs purchased in Ireland would come from indigenous industry. They would have to come from indigenous industry in significantly greater proportion than the share of indigenous industry in total manufacturing output, because overseas industry sells so little to the Irish market while indigenous industry sells primarily to the Irish market. Thus, indigenous industry accounts for a much larger share of products which are both produced and sold in Ireland than it does of all products which are produced in Ireland. The required sales per employee data for indigenous non-food manufacturing are obtained using the grossed up IEE survey data and IDA Employment Survey data.

While virtually all of the spending by most manufacturing sectors on Irish-sourced materials and components goes to non-food manufacturing sectors, there are some sectors for which this is not the case. The 1985 input-output table indicates that the sectors which spend significant



amounts on Irish primary products or on Irish food sector output are meat/meat products, milk and dairy products, other food products, beverages, textiles/clothing and wooden products/furniture.

In the case of these sectors, we again use the grossed up IEE survey data for each year concerned to derive the amount of expenditures by overseas industry on all Irish materials and components. Then we use the 1985 input-output table to estimate what proportion of these expenditures go to the primary sector, the food sector and non-food manufacturing sectors. For example, the 1985 input-output table indicates that, of the expenditure by the "other food products" sector on Irish materials and components, 28.0 per cent was spent on Irish primary products, 59.2 per cent was spent on products of the food sector, and 12.8 per cent was spent on non-food manufacturing products. We take it that the same proportions apply to the overseas component of the sector, in 1985 and in other years as well, and thus obtain estimated expenditure on each of the three types of products for each year.

(Note that in order to use such proportions derived from the input-output table to distribute expenditure estimates derived from the grossed-up IEE survey data, it is necessary to have sectoral classifications from both sources which match or correspond to each other. For some sectors this is not a problem, but in other cases it is necessary to combine some input-output sectors or some IEE sectors to obtain matching classifications. For example, the two input-output table sectors, textiles/clothing and leather/footwear, have to be combined together to match the combination of the two IEE survey sectors, textiles and clothing/footwear/leather.)

Having obtained estimates of expenditures by overseas firms in the sectors mentioned above on each of the three categories, primary products, food sector products and non-food manufacturing products, the expenditure going to the primary sector is then left out of consideration. 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.

Chapter 6 also includes estimates of employment in producing Irish manufactured inputs for indigenous industry. These estimates are calculated in the same way as for overseas industry. The only difference is that we start with the expenditures by *indigenous* industry on Irish materials, and then calculate the employment implications of this in the same way as in the case of overseas industry.

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