PORTER'S INDUSTRY CLUSTERS IN IRISH INDIGENOUS INDUSTRY

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Abstract: Studies by Porter (1990) and others find that competitive and successful industries usually occur in the form of clusters of industries which are linked together through vertical or horizontal relationships. This paper assesses whether the sectors of Irish indigenous industry which look most competitive and successful form such clusters. It is concluded that there is only limited or qualified evidence of Porter-type clusters in Irish indigenous industry but, despite this, there has been a relatively strong competitive performance by most of Irish indigenous industry over the past decade. We also comment on policy implications.

I INTRODUCTION

A good deal of discussion in the 1990s concerning Irish industrial policy has focused on the proposition that a competitive and successful industrial performance requires the development of competitive advantage in clusters of interlinked industries. This discussion reflects the insights of international researchers, particularly Porter (1990). Porter argues that the internationally competitive industries in a country are generally not a number of diverse and unconnected sectors or firms. Rather, competitive and successful industries usually occur in the form of specialised clusters of indigenous or "home-base" industries, which are linked together through vertical relationships (buyers/suppliers) or horizontal relationships (common customers, technology, skills, distribution channels, etc). Porter states that this claim is empirically supported in the studies of the ten countries covered in his book, and he found that "the phenomenon of industry clustering is so pervasive that it appears to be a central feature of advanced national economies" (Porter, 1990, p.149). Since Porter's (1990) study, quite a number of similar studies have been undertaken on other countries (e.g., Hernesniemi, Lammi and Yla-Anttila, 1996, on Finland; Beije and Nuys, 1995, and Jacobs, Boekholt and Zegveld,

1990, on the Netherlands).

In Ireland, Porter's findings influenced the Culliton review of industrial policy, which recommended that policy should aim to develop clusters of related industries, building on sources of national competitive advantage (Industrial Policy Review Group, 1992, pp.73, 74). Subsequently, the National Economic and Social Council (NESC) commissioned a substantial study on industrial clusters in Ireland, examining in particular the relevance of clusters for the competitive advantage of three Irish sectors, dairy processing, the music industry and the Irish indigenous software industry. Reports on these three case studies have been published by NESC (O'Connell, Van Egeraat and Enright, 1997; Clancy and Twomey, 1997; O'Gorman, O'Malley and Mooney, 1997), and further discussion of their broader implications can be found in NESC (1998), particularly the papers by Clancy, O'Malley, O'Connell and Van Egeraat (1998) and by O'Donnell (1998). Clancy *et al*. (1998) concluded that their three case study sectors cannot be regarded as part of fully-developed industry clusters of the type and scale described by Porter, although they do gain appreciable benefits from the presence of some form of groupings of connected or related companies and industries, and from interactions between them.

In this paper, we undertake a more broad-ranging examination of the incidence of industry clusters in Ireland. This analysis encompasses all manufacturing sectors, but without the level of detail on individual sectors found in the three case studies mentioned above. Essentially, we aim to follow the methodology employed by Porter (1990), and other subsequent studies on other countries, in order to identify those sectors in which Irish indigenous industry has achieved the greatest international competitive success. And, again following Porter's approach,

we assess whether these relatively competitive sectors take the form of clusters of connected industries, as Porter's theory would expect.[1] In our conclusions, we consider what our findings can tell us about the importance of clusters for the development of Irish indigenous industry.

As background to this, it should be noted that the general context is one of a relatively successful overall performance by Irish indigenous industry over the past decade. The rate of growth of the output of indigenous industry has been close to twice as high or higher than the industrial growth rate of the OECD or EU. Employment in indigenous industry has been on a rising trend since 1988, while manufacturing employment has been declining in the EU and most other major OECD economies. And the exports of indigenous industry have been growing faster than the manufacturing exports of the OECD or EU. A number of other features combine to confirm that this was a genuinely strong *competitive* performance, rather than simply a response to favourable demand conditions in the rapidly growing Irish economy (O'Malley, 1998).

II RELATIVELY COMPETITIVE INDUSTRIES AND CLUSTERS

Our first objective is to identify those sectors in which Irish industry shows signs of having achieved the greatest international competitive success, following the methodology employed by Porter (1990). Porter's starting point in identifying the relatively competitive industries in a

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[1]This analysis is largely based on work carried out as background for the NESC project mentioned above, and we acknowledge financial support from NESC for this research. The material in this paper has not been published previously, although it is referred to briefly in Clancy *et al.* (1998, pp.29-30).

country is to calculate the country's exports of each product as a percentage of all countries' exports (or "world exports") of that product. If a country's share of world exports of a particular product is greater than its share of world exports of all products, this is taken as an indication suggesting that the country is relatively competitive or has a comparative advantage in that product.

For an initial indication of products in which Ireland has a relatively large share of world exports, Table 1 lists the top fifty Irish export categories ranked in terms of their share of world exports. As in Porter (1990), the data used here are from the United Nations *International Trade Statistics Yearbook*. The export categories are taken at the lowest level of aggregation for which data are published, which is often the five-digit SITC level. If five-digit SITC categories are not available, four-digit categories are used, and if these are not available the three-digit categories are used. Total Irish exports amounted to 0.79 per cent of total world exports. Since all of the export categories in Table 1 (and many more as well) had a share of world exports which was greater than 0.79 per cent, Ireland's share of world exports of these products was relatively large.

The data in Table 1 refer to 1993 because that is the latest year for which the necessary UN international trade statistics are available at the detailed five-digit SITC level. There are UN international trade statistics for 1995 but, unlike 1993 and earlier years, they include commodity data only at the more highly aggregated three-digit SITC level. In order to check whether there was much change in Ireland's top export categories after 1993, we compared the 1995 three-digit data with three-digit data for 1993 and found that 45 of the top 50 Irish (three-digit) export categories, ranked in terms of their share of world exports in 1995, were also among the top fifty

in 1993. Thus, while there was some change in this, the indications are that the 1993 listing of more disaggregated top export categories in Table 1 would be very largely the same as a more recent listing.

It is perhaps worth pointing out that, at the top of the list of products in Table 1, "Edible products and preparations nes" includes soft drink concentrates, which largely accounts for the size of this item. "Heterocyclic compounds etc" are products of the pharmaceuticals industry. And "Records, recorded tapes and other recorded media" includes software products, which largely accounts for the size of this particular category. Further down the list, "Special transactions", in which Ireland accounts for 3.6 per cent of world exports, includes all exports from the Shannon free airport zone, so that this is not really a product category like the others.

Table 1 also shows the value of Irish exports and Irish imports in each product category. Porter uses such data as a further indication of international competitiveness. In general, he would not include a product as relatively competitive if the balance of trade is negative, unless a country's share of world exports in that category is two or more times its average share. In the case of Ireland's top fifty export products ranked in terms of world export shares, it can be seen in Table 1 that they all have a positive balance of trade. The table also shows that most of them had a rising share of world exports in the period 1986-93.

The products listed in Table 1 are quite varied in nature, but certain types of products occur most frequently. Many of them are products of the food and drink industries, with a particular emphasis on meat and dairy products. There are also quite a number of chemicals and pharmaceutical products, as well as electronic and electrical engineering products.

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Table 2 presents a somewhat different perspective on Ireland's top export products by listing the top fifty Irish export categories ranked in terms of the value of exports, rather than their share of world exports. Again, this table shows a preponderance of much the same type of products as are mentioned above, although electronic and electrical engineering products are rather more prominent in Table 2 than in Table 1.

Another point which is highlighted by Tables 1 and 2 is that many of the products in which Ireland has large exports, and a relatively large share of world exports, come from industrial sectors which are predominantly foreign-owned. All the export categories in these tables which are marked with an asterisk - over half of the categories in each of the tables - come from sectors which are mainly foreign-owned.

Note, however, that this does not mean that overseas firms in Ireland are totally responsible for all of the exports in the categories concerned. The export categories which are referred to come from sectors which are mainly foreign-owned, but which usually include some Irish indigenous firms too. The data which are used here on Irish exports do not give *exports* as such by nationality of ownership of the exporting firms. Rather, the data which are available distinguishing nationality of ownership of firms are data on employment in (NACE) production sectors, from the Forfas employment survey. What we have done is to (a) match the (SITC) export categories to the corresponding (NACE) production sectors; (b) identify which (NACE) production sectors have a majority of employment in foreign-owned firms; and (c) mark the (SITC) export categories coming from those production sectors as coming from industrial sectors which are predominantly foreign-owned.

In Porter's (1990) approach to identifying the relatively competitive industries in a country, industries whose exports are believed to be dominated by foreign-owned companies are generally excluded from consideration. In Porter's interpretation, such industries are not regarded as reflecting the nation's own competitive advantage. Porter (1990, p.740) remarks that in general relatively few industries are excluded for this reason. In the case of Ireland, however, where exports from foreign-owned companies are such a large part of total exports, the exclusion of foreign-dominated industries makes a great difference to the overall picture. Thus, Table 3 is a revised version of Table 1, showing the top fifty Irish export categories which come from predominantly *indigenous* sectors only, ranked in terms of their share of world exports.

It can be seen that the composition of the top fifty export products coming from mainly indigenous sectors, in Table 3, is rather different to the make-up of the list of the top fifty export products from all sectors, in Table 1. Most of the pharmaceutical products and the electronic and electrical engineering products which appear in Table 1 no longer appear in the list of mainly indigenous exports in Table 3. Instead, products of the food and drink industries are a good deal more prominent in Table 3, accounting for more than half of the product categories there. The remainder of the top export categories coming from mainly indigenous sectors are fairly diverse, except that there are quite a number of chemicals products, particularly fertilisers and related products. However, it should be noted that it is very likely that a number of the chemicals products actually come mainly from foreign-owned rather than indigenous firms.[2]

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[2]Our procedure for matching SITC trade categories to corresponding NACE production sectors is such that more than ten SITC export categories in chemicals products come from just

Tables 1 to 3 show only the top fifty export categories coming from Ireland, ranked according to one criterion or another. However, there are a good deal more than fifty export categories in which Ireland could be regarded as relatively competitive. In order to present a broader picture of the nature of a country's competitive advantage, Porter (1990) presents "cluster charts" for each of the countries which are examined in his study. These cluster charts include all the products which are found to be relatively competitive in a country, and they display these in a way that is intended to highlight the pattern of competitive industries and the connections between them. Figure 1 presents such a cluster chart for Ireland.

In order to be included in Figure 1, Irish export categories must generally account for at least 0.79 per cent of world exports of that product. This "cut-off" of 0.79 per cent is applied because total exports from Ireland accounted for 0.79 per cent of total world exports, and hence Irish export products which account for more than 0.79 per cent of world exports can be regarded as relatively competitive. For a product to be included in Figure 1, Ireland must generally also have a positive balance of trade in that product, unless the product has a share of world exports which is at least twice as great as 0.79 per cent. A few exceptions to these criteria are made so as to include products which are among Ireland's top fifty in terms of export value (as in Table 2), and which have a balance of trade that is positive to modestly negative, even if they do not qualify on grounds of their export market share. These criteria for drawing up a cluster chart were also applied in Porter (1990).

one NACE production sector, "Basic industrial chemicals (including fertilisers)". This production sector is mainly Irish-owned, but only by a small majority. Since a large minority of this production sector is foreign-owned, it is almost certain that a number of the individual export categories coming from this sector actually come mainly from foreign-owned companies.

Porter applies a further criterion, which is to exclude from the cluster chart industries whose exports come mainly from foreign-owned firms. We have not done this in Figure 1, but instead we have marked with an asterisk the products which come from predominantly foreign-owned sectors. For the countries which are covered in Porter's study, the removal of the predominantly foreign categories is a relatively minor adjustment. In Ireland's case, however, this is such a major step that it was felt to be useful to show the mainly foreign categories, at least for the initial presentation of the cluster chart in Figure 1. But it should be noted that, strictly in terms of Porter's methodology, the cluster chart for Ireland only includes the products in Figure 1 which come from predominantly Irish-owned sectors.

Figure 1 is based on 1993 data because that is the latest year for which the necessary UN international trade statistics are available at the detailed five-digit SITC level, as discussed above. In order to check whether a more up-to-date cluster chart would look much different, we compared the more recent 1995 data (available at the more highly aggregated *three-digit* level only) with three-digit data for 1993. We found that 39 of the 42 (three-digit) export categories which would qualify for inclusion in a 1995 cluster chart would also be included in a chart for 1993. Thus, while there were some changes, the indications are that our 1993 cluster chart in Figure 1, using more disaggregated export categories, would be very largely the same as a more up to date chart.[3]

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[3]O'Donnellan (1994, Table 1) has previously presented a type of cluster chart for Ireland based on 1987 data. This was a more simplified version than our Figure 1, using only three-digit product categories and making no distinctions by nationality of ownership, whereas our Figure 1 follows Porter's approach in using the full available detail of five-digit or four-digit product categories and in attempting to identify the predominantly foreign-owned categories.

In Figure 1, the numbers which precede the names of the product categories are the relevant SITC product codes. And the numbers in parentheses after the names of the products show Ireland's percentage share of world exports of the products concerned. The products are displayed in the cluster chart in the same types of groupings as in Porter's charts. This involves distinguishing 16 pre-determined broad end-use groups and, within each of these, sub-groups of "primary" goods, machinery used for their production, specialty inputs for the goods, and associated services. This arrangement is intended to highlight patterns of competitive advantage and the possibility of connections or relationships between industries in the various groupings or clusters. However, it would require a good deal of painstaking research to establish whether there really are significant connections or relationships existing between the industries in each group or cluster. Our arrangement of the industries into clusters, therefore, should be seen in the spirit of a hypothesis or suggestion that there could potentially be relevant connections between the industries in each "cluster", rather than a claim that there definitely are such connections.

With this caveat in mind, Figure 1 suggests that many of the relatively competitive industries in Ireland are to be found in a number of principal groupings, which might possibly have the connections and relationships characteristic of Porter's industry clusters. There are major groupings or clusters in the areas of food and beverages and related industries, semiconductors and computers, chemicals, healthcare products (including pharmaceuticals), and textiles/apparel.

Figure 2 presents a different version of the cluster chart for Ireland. The first difference from Figure 1 is that the products of predominantly foreign-owned industries are now excluded, so

that Figure 2 includes only the predominantly Irish-owned industries, as in Porter's cluster charts. The other difference from Figure 1 concerns the "cut-off", or the share of world exports required for including categories in the chart. In order to be included in Figure 1, categories generally had to account for at least 0.79 per cent of world exports of the product concerned, because total exports from Ireland accounted for 0.79 per cent of total world exports. However, a substantial majority of total Irish exports comes from foreign-owned firms, so that the share of total Irish indigenous exports in total world exports amounts to less than half of 0.79 per cent. Consequently, an Irish indigenous industry which accounts for, say, 0.5 or 0.6 per cent of world exports of its products would actually have a relatively large share of world exports by the standards of Irish indigenous industry in general. The figure of 0.79 per cent results mainly from the great influence of foreign-owned firms in Ireland, and consequently it sets a standard which is arguably too high for assessing whether specific indigenous industries have a relatively large share of world exports. This is an issue which was not encountered to anything like the same degree in Porter's studies of countries where foreign-owned companies are less influential.

To take account of this point, we apply a lower "cut-off" of 0.4 per cent of world exports as a criterion for including the mainly indigenous industries in Figure 2. (In practice, as can be seen in Figure 2, only a minority of the categories there are included on the basis of lowering the cut-off from 0.79 to 0.4).

Comparing Figure 2 with Figure 1, it can be seen that the major groupings or clusters of industries in semiconductors/computers and in healthcare products (including pharmaceuticals), which were a feature of Figure 1, are missing in Figure 2. Among the indigenous industries in Figure 2, there is still a major grouping or cluster in the area of food and beverages, with a

particular focus on meat and dairy products; however, the machinery and specialty inputs industries related to this grouping are limited in scope. There also appears to be a somewhat smaller cluster in chemicals (particularly fertilisers and related products). However, it is noticeable that there is a complete absence of machinery and specialty inputs industries related to this grouping. Furthermore, there are two other reasons why there is really less to this chemicals "cluster" than meets the eye. First, it is almost certain that a number of the products here actually come mainly from foreign-owned firms (see footnote 2 above), and second, some of the other products would come largely from one large state enterprise rather than a cluster of firms or industries. Apart from this, there appears to be a grouping of products in the area of textiles/apparel, but about half of these are essentially products of agri-processing and it might be more meaningful to regard them as part of the group of food and agriculture-related industries. Otherwise, the relatively competitive indigenous industries are mostly rather diverse.

III CONCLUSIONS

Our principal finding is that, apart from food-related industries, there is distinctly limited evidence of a presence of substantial "clusters" of competitive indigenous industries of the sort which Porter's theory suggests are generally required for international competitive advantage. Despite this, however, there has been a relatively strong competitive performance by most of Irish indigenous industry over the past decade.

It may be that Porter's theory still has considerable validity, in the sense that it may apply to most successful industries in most advanced economies much of the time. Nevertheless, it

seems clear that there can at least be sufficient scope for an unusually small and open economy such as Ireland to make substantial progress in indigenous development without strong Porterian clusters. We would conclude that it does not appear to be necessary for Irish industrial policy to focus heavily on the development of predominantly indigenous industry clusters of the type and scale described by Porter as the general case.

However, an important qualification or clarification to this conclusion arises from findings discussed by Clancy *et al.* (1998). They find that, even in the absence of fully developed Porterian clusters, there generally are appreciable benefits for the competitive advantage of Irish industries arising from the presence in Ireland of some form of groupings of connected or related companies or industries, and from interactions between them. Such beneficial relationships in groupings of companies or industries can include, for example, customer/supplier relations, rivalry between competitors, the effects that groups of firms using similar skills have on the development of pools of specialised skills, the process of entrepreneurial spin-offs from existing groups of firms, information flows and knowledge transfers.

Companies' competitive advantage can benefit from such relationships even if the groupings concerned lack significant features of Porter's general concept of "clusters". For example, industries in the grouping may not necessarily be sufficiently large and successful to have a relatively large share of world exports. Or major parts of such groupings may commonly consist of foreign-owned companies in Ireland, whereas Porter's clusters are predominantly indigenous, as the usual rule. Also, such groupings may not necessarily include in Ireland some important components of a full-scale cluster, such as suppliers, customers or related industries.

Based on these findings of Clancy *et al.* (1998), we would conclude that, while it is not necessary for Irish industrial policy to focus on developing clusters of the same type and scale described by Porter as the general case, it would commonly be advantageous for policy to include a conscious element of building on different types of relatively successful groups of connected companies or industries. The groups concerned may be lacking in major features of Porter's clusters, and foreign-owned firms may be important components of them.

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