9
The Manufacturing Sector

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Manufacturing industry is a crucial ingredient in national economic development. This is because of the value which is added to natural resources and intermediate products through industrial processing. Where this value is retained in an economy, its circulation can sustain many more jobs than are created directly in manufacturing itself. Even in so-called 'post-industrial economies', rising industrial output continues to be a key source of wealth creation despite rapidly contracting employment in manufacturing industry per se. The extraordinarily high rate of economic growth which Ireland experienced in the 1990s was largely driven by rapid expansion of its manufacturing sector, arising principally from a surge of inward investment by transnational firms which began around 1993. This chapter outlines the historical background to this recent phase of strong industrial growth, before examining in some depth the key dimensions of this crucial feature of the so-called 'Celtic Tiger' economy. The chapter concludes with an assessment of the long-term developmental implications of the form recent industrial development has taken, particularly in the light of certain weaknesses in the industrial structure which have become apparent in the early 2000s. Case studies of the microcomputer and pharmaceutical sectors are presented to illustrate key themes raised in the main text. The spatial dimensions associated with successive industrial development phases are also described and analysed.

HISTORICAL BACKGROUND: FROM PROTECTIONISM TO EXPORT-ORIENTED INDUSTRIALISATION

Upon its establishment in 1922, the Irish Free State inherited a small and underdeveloped manufacturing sector, employing only 4.3 per cent of the labour force in 1926 (O'Malley, 1989). The situation changed little during the first ten years of independence during which economic policy remained largely focused on the promotion of agricultural exports. A change in government in the early 1930s led to the introduction of a policy of protectionism which lasted until the late 1950s. This produced the desired results in the form of a spurt of industrial growth in the 1930s which continued in the immediate aftermath of World War II. In spatial terms most of the new industrial enterprises were located in the main cities, and particularly in the Dublin region which constituted the main market, the main port for imported equipment and materials, and the hub of

the national transport system (Breathnach and Walsh, 1994). However, the policy of economic autarky was inevitably doomed to failure. The small size of Ireland's economy ensured that the newly created industrial firms would be too small to expand into export markets once the modest needs of the domestic market were satisfied. The need for these firms to import most of their materials and production equipment created chronic balance-of-trade and payments problems for the government. By the early 1950s, industrial growth had ground to a halt and it was clear that radical measures were required to rescue the economic situation.

During the 1950s a rethink of industrial policy led to a shift to an export-oriented industrialisation strategy. The restrictions on foreign control of industry were gradually relaxed. The Industrial Development Agency (IDA) was assigned the task of promoting Ireland as a location for mobile foreign investment. In addition to the availability of cheap labour, the incentives offered to attract outside investment included substantial capital grants and, in particular, the exemption from taxation of all profits derived from exports. Tariffs on imports were also gradually reduced during the 1960s and 1970s.

The attractiveness of this package was reflected in a substantial build-up of inward investment in the two decades after 1960, boosted in particular by Ireland's accession to the European Economic Community (EEC) in 1973. Between 1961 and 1981, employment in foreign manufacturing firms grew almost fourfold.[1] The USA became by far the most important foreign investment source in this period, accounting for over 40 per cent of employment in foreign manufacturing firms in 1981. On the downside, the generally inefficient indigenous industry, now exposed to external competition, experienced considerable contraction. As a result the foreign sector accounted for all of the growth of 33 per cent in manufacturing employment over the period 1961–81, during which period its share of the total rose from about 10 to 38 per cent (O'Malley, 1989).

Foreign investment in this period was mainly concentrated in the metals and engineering and (from the 1970s) chemicals and pharmaceuticals sectors. In terms of engineering, a key new growth subsector in the 1970s was electronics assembly, reflecting the contemporary growth of this sector in the USA. Foreign firms therefore were contributing both to a sectoral diversification and technological upgrading of the industry structure. Thus, the share of total manufacturing employment taken by the metals and engineering sector jumped from 16 per cent in 1960 to 30 per cent in 1981. Because of its capital-intensive nature, the impact of foreign investment in the chemicals sector was felt more in terms of industrial output and exports than of employment. The sector's share of total industrial output doubled to 17 per cent over the period 1973–84.

No simple stereotypes can be applied to the manner in which Ireland was incorporated into the international economy in the 1960s and 1970s. As will be illustrated in the two case studies at the end of this chapter, different sectors, and different firms within sectors, were drawn to Ireland for different reasons and operated in different ways. Having said that, Ireland had acquired some characteristics of a dependent, peripheral branch-plant economy as conceived in the model of the 'new international division of labour' (Fröbel et al., 1980)

While the surge in US investment in the 1970s was mainly concentrated in high-tech sectors, the actual work which most of the plants provided was largely unskilled (assembly and packaging) and involved a disproportionately high share of women workers (Breathnach, 1993). Their inputs mainly came from affiliate firms located abroad and their outputs were almost entirely exported (McAleese, 1977). In essence, Ireland was being used as a low-cost base for supplying the European market.

One of the key features of this branch-plant industrialisation was a strong tendency to locate in smaller urban centres which dramatically reversed the pattern of concentration in the main cities during the protectionist period. And, with the indigenous industry created during the latter period experiencing substantial contraction in the 1970s, a profound regional restructuring of manufacturing employment occurred, involving strong relative growth of the more rural regions, and especially those in the west of the country (Breathnach, 1985). During the 1960s and 1970s a major element of government industrial policy was to encourage a greater dispersal of development throughout the country by steering new manufacturing activities away from the main urban centres, and especially Dublin (Drudy, 1991). The industrial dispersal policy was to be implemented by the IDA, notably through the provision of selective grants and ready-built factories. This policy was facilitated by the low-skill requirements of foreign branch-plants and their preference for the lower costs and more docile labour available in the rural areas (Breathnach, 1982, 1985).

THE 1980s: INDUSTRIAL CRISIS AND POLICY REAPPRAISAL

The vulnerability of peripheral branch-plant industrialisation became starkly apparent in the early 1980s. As a consequence of a severe international economic recession, levels of overseas investment by transnational companies contracted. During this period, Ireland witnessed a shake-out in foreign sector employment, while indigenous industry contracted even more rapidly. There was something of a recovery of inward investment towards the end of the 1980s, so that by 1990 employment in foreign firms had regained the level of 1981 but had further risen as a proportion of total manufacturing employment to 43 per cent.

In this decade, there was growing criticism of the reliance on foreign investment as the key driver of industrialisation and economic growth. In the early 1980s the report by the Telesis Consultancy Group (1982) had already identified the drawbacks of the foreign manufacturing plants in Ireland – notably the fact that they did not embody the key competitive activities of the businesses in which they were engaged, their limited number of skilled workers, and their lack of integration with subsupply industries in Ireland. Telesis recommended a major shift towards the cultivation of indigenous industry. This recommendation was reiterated in the report by the government-commissioned Industrial Policy Review Group (1992), popularly known as the Culliton Report. This report further argued that the best way to develop indigenous industry would be via the cultivation of integrated industrial clusters along the lines advocated by Porter (1990). Such clusters would incorporate end-product firms, supporting

and supplying firms and appropriate institutional and infrastructural supports. While these clusters would largely be built around Irish-based firms, the primary role of future inward investment should be to contribute to the functioning of these clusters rather than acting as stand-alone production operations.

In spatial terms, the 1980s saw a continuation of the relative shift of manufacturing employment away from the main cities. While overall employment in the sector fell by 8 per cent over the decade, most of this was concentrated in County Louth and in Dublin, Cork and Limerick cities, whereas most other counties either held their own, in relative terms, or actually experienced significant growth, with the western counties of Donegal, Galway and Clare leading the way in this respect. Partly in response to this, the 1970s policy of industrial dispersal and encouragement of a shift of manufacturing employment away from Dublin became progressively relaxed in the 1980s (White, 2000b).

THE 1990s: THE 'CELTIC TIGER' ECONOMY

In 1992 nobody foresaw the very strong economic growth that would characterise the rest of the decade and which saw Ireland being dubbed the 'Celtic Tiger'. Between 1991 and 2000 manufacturing employment grew by 30 per cent. More importantly in terms of its overall impact on the economy, manufacturing gross output grew almost threefold in real terms in this period (see Table 9.1). The electrical and optical equipment sector accounted for almost two-thirds of the overall growth in manufacturing employment while the chemicals and paper and printing sectors also displayed above-average growth. Growth in the latter sector mainly reflected the expansion of software reproduction activity (dominated by Microsoft).

In terms of growth of gross output (distorted to an extent by transfer-price manipulation by some of the major firms involved), the chemicals sector actually outperformed electrical and optical equipment, and saw its share of total output double to over one-quarter in the period, although, with a one-third share, electrical and optical equipment was still in first place. Despite a good growth record of its own, the food, drink and tobacco sector – traditionally Ireland's foremost industry – fell from a clear first place in output terms in 1991 to a poor third in 2000. The textile and leather products sector, once a major sector in the Irish industrial economy, was the only one to experience negative growth in the 1990s and had been reduced to a position of virtual irrelevance by 2000.

These developments therefore meant a significant shift in the sectoral composition of the manufacturing sector away from more traditional (and less productive) sectors to more modern 'high-tech' sectors. This shift was intimately associated with a surge of inward investment which began around 1993 and which has been recognised as the main driving force behind the high economic growth rates which characterised the Celtic Tiger (OECD, 1999a). Employment in foreign-owned manufacturing plants grew by over 40 per cent over the period 1991–2000 (see Table 9.2), thereby raising their share of total manufacturing employment from 44 to 48 per cent, despite a strong recovery in indigenous manufacturing employment in the same period (O'Malley, 1998).

Table 9.1 Sectoral composition of manufacturing, 1991 and 2000

Sector	Employment (000s %)					Gross output (€m, 2000 prices)				
	1991	%	2000	%	Change	1991	%	2000	%	Change
Food, beverages, tobacco	44.7	*22.7*	48.1	*18.9*	+7.6	12,172	*37.4*	20,188	*17.2*	+65.9
Textile and leather products	22.3	*11.3*	11.0	*4.3*	-50.7	1,260	*3.9*	1,078	*0.9*	–14.4
Paper and printing	16.8	*8.5*	23.8	*9.3*	+41.7	2,564	*7.9*	12,655	*10.8*	+393.6
Chemicals	14.7	*7.5*	23.2	*9.1*	+57.8	4,186	*12.8*	30,828	*26.3*	+636.5
Metal and metal products	12.9	*6.6*	16.3	*6.4*	+26.4	1,355	*4.2*	2,588	*2.2*	+ 91.0
Machinery and transport equipment	21.3	*10.8*	24.0	*9.4*	+12.7	1,773	*5.4*	3,604	*3.1*	+103.3
Electrical and optical equipment	32.5	*16.5*	69.0	*27.1*	+112.3	5,999	*18.4*	39,624	*33.8*	+550.5
Other	31.7	*16.1*	39.6	*15.5*	+24.9	3,271	*10.0*	6,768	*5.8*	+106.9
All manufacturing industries	196.9	*100*	255.0	*100*	+29.5	32,580	*100*	117,333	*100*	+260.1

Source: Census of Industrial Production

Table 9.2 Employment, gross output and exports in manufacturing by nationality

Nationality	Employment (000)			Gross output (€m, 2000 prices)			Exports as % Gross output	
	1991	2000	Change %	1991	2000	Change %	1991	2000
Irish	110.0	132.6	+20.5	15,176	20,136	+32.7	34.8	33.2
Foreign	86.9	123.0	+41.5	17,413	72,226	+314.8	86.0	91.7
of which German	10.5	10.3	- 1.9	928	1,912	+106.0	91.9	91.3
of which UK	13.0	11.2	-13.8	2,220	3,261	+46.9	42.8	51.6
of which US	39.0	77.1	+97.7	10,136	59,216	+484.2	96.3	94.7
Total	196.9	255.6	+29.8	32,589	92,361	+183.4	62.2	79.0

Source: Census of Industrial Production

More significantly, the output of these plants almost trebled in real terms in the same period, with a corresponding rise in their share of the total from 53 to 78 per cent. The USA was by far the main source of inward investment in the 1990s, during which its share of foreign manufacturing employment rose from 45 to 63 per cent and its share of foreign manufacturing output from 58 to 82 per cent. With the shares of the other main sources of inward investment (the UK and Germany) falling away, the foreign manufacturing sector is now predominantly an American sector.

A combination of factors was responsible for the 1990s surge in foreign manufacturing investment in Ireland, their relative importance varying from sector to sector. The old reliables such as low corporation tax, access to the EU market and an abundant supply of relatively cheap labour (at least during the first half of the decade) continued to prove major attractions. These were the main factors behind the arrival of a large number of relatively low-value-added new assembly-type operations in the electronics and other sectors. However, an additional factor of growing importance has been the availability of a significant reservoir of technically skilled workers due to rising education levels among the growing numbers of young people entering the labour force following a baby boom in the 1970s. Due to the increasing sophistication of manufacturing production processes, demand for such workers has grown among many of the transnational firms in the sectors targeted by the IDA (Breathnach, 1998). A notable example of such a skill-intensive operation is Intel's cluster of wafer fabrication plants in County Kildare.

The 1990s growth in inward investment meant that the thrust towards a shift in policy emphasis to the indigenous sector was effectively sidelined. While employment in indigenous manufacturing did increase by 20 per cent between 1991 and 2000, much of this growth was a spin-off from the foreign sector, in the form of growing demands for certain inputs and the rising consumer demands generated by an increasing, and increasingly well paid, foreign manufacturing workforce. As a result, the export orientation of indigenous industry actually declined from its already low level during the 1990s (see Table 9.2).

In line with the recommendations of the Culliton Report, considerable effort has been undertaken to increase the supply linkages between foreign companies and indigenous industry. In spite of these efforts, between 1991 and 2000 the proportion of materials and services sourced by foreign firms in Ireland fell substantially, from 38 to 27 per cent. There has been little progress in the direction of the kind of Porterian competitive, indigenous, sectoral clusters envisaged in the Culliton Report. Arguably, such clusters would have been difficult to develop in any case since Ireland had few competitive indigenous industries around which such clusters could have been built (O'Malley and van Egeraat, 2000). Nevertheless, research suggests that, even in the absence of fully developed 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, which may consist of foreign companies (Clancy et al., 2001).

In spatial terms, the relative shift of manufacturing employment away from the main cities that had characterised the previous three decades was reversed. During the 1990s, the main urban areas increased their share of manufacturing employment. While Dublin finally reversed its long established downward trend, spectacular growth in the adjoining County Kildare meant that growth in the overall East region exceeded the national average of 26.2 per cent for 1991–2000.[2] While County Cork also experienced above-average growth, the really powerful performers were counties Limerick and Galway, which both experienced growth of over 60 per cent.

By contrast, four rural counties (Carlow and Laois in the Midlands and Donegal and Leitrim in the West) experienced absolute employment decline and many others had below-average growth, especially those in the Border region and Kerry in the Southwest. Donegal was particularly badly hit by the collapse of the Fruit of the Loom clothing operations, which in the mid-1990s employed 2,500 workers in four locations in the county. An important factor in the improved performance of the main urban areas was the growing demand for skilled workers among foreign firms and the large size of a number of major investments in this period, including IBM in Dublin, Intel and Hewlett-Packard in Kildare, Dell in Limerick and Boston Scientific (a medical devices firm) in Galway. The changing fortunes of Dublin were also facilitated by the progressive relaxation of the industrial dispersal policy that had thwarted the city in the 1970s and part of the 1980s.

EVALUATION OF THE RECENT INDUSTRIAL DEVELOPMENT EXPERIENCE

The continuous growth in manufacturing employment which Ireland had experienced since 1993 peaked in the first quarter of 2001, following which it went into sharp reverse. Initially it was thought that this was a short-term response to the collapse of the 'dot.com' bubble in early 2001, but as decline continued into 2005, it became clear that more long-term processes were at work. Of the overall fall of 33,500 (13.2 per cent) between March 2001 and June 2005, 70 per cent was accounted for by just two sectors – textiles/textile products and electrical/optical equipment (consisting mainly of the production of electrical and electronic hardware). By contrast, the medical, precision and optical instruments sector continued its strong growth while the chemicals sector held steady in employment terms. This selective decline in manufacturing employment was reflected in output trends: while total manufacturing output in 2005 was one-quarter higher (in real terms) than in 2000, textiles output fell by one-third and office machinery/equipment hardly grew at all. At the same time, pharmaceuticals output more than doubled, with reproduction of recorded media and medical instruments growing by 82 and 70 per cent, respectively.

While the decline in textiles continued a long-term trend, the sharp fall in electronics employment, and particularly in the office machinery and computers subsector (down 36.6 per cent), appeared to be a major new development affecting what had become one of the hallmark industries of the Celtic Tiger

economy. However, as Egeraat and Jacobson (2004) have pointed out, there was already a well established pattern of contractions and closures in this sector which was masked by the overall growth of employment in the sector. In essence, what has been happening here is that the more routine forms of electrical/electronic assembly, in which skill levels are low and labour costs an important component of total costs, have been finding it difficult to withstand Ireland's rapidly growing wage levels, especially since Ireland's tax advantages have been eroded by intense competition which has been cutting into profit margins in this sector. Accordingly, there has been a growing trend for this type of production to relocate to cheap-labour locations overseas, with a rising proportion shifting to the new EU member states of Eastern Europe (Barry and Egeraat, 2005).

The loss of low-skill jobs has meant an increasing concentration of employment in high-productivity and high-skill sectors which are likely to prove more stable in the long run. In addition, the IDA's growing emphasis on the attraction of inward investment in such areas as financial services, software and shared services (see Chapter 10) has also generally meant jobs of higher quality than in traditional manufacturing. Overall, the Irish economy still experiences strong employment growth. With unemployment at low levels, the IDA's traditional remit of job creation has been substantially replaced by a new emphasis on retaining and upgrading existing industrial projects and a growing concern with achieving a better regional spread of new investments. As regards the first of these objectives, the IDA is seeking to encourage foreign production plants to add on additional functions, such as research and development (R&D) and financial and administrative services, and to forge deeper links with local research institutes and input suppliers. The idea here is that by enhancing the status of the Irish operations within the global production systems of the firms in question, and increasing their level of linkage with the local economy, these operations will become more 'embedded' in Ireland and therefore less vulnerable to future relocation.

The strategy has been a success in that a substantial number of foreign companies have upgraded their Irish operations by adding additional functions, notably R&D, technical support and financial services. However, these actions can actually mask a reduction in manufacturing employment. In some cases, additional service functions have largely or entirely supplanted the original manufacturing functions. Thus, the Ericsson and former Digital (now Hewlett-Packard) facilities in Athlone and Galway, respectively, have seen routine manufacturing being entirely replaced by software development (Barry and Egeraat, 2005).

Meanwhile, the IDA's efforts towards achieving a better regional spread of inward investment are guided by the National Spatial Strategy (NSS) launched by the Irish government in 2002 (Department of the Environment and Local Government, 2002). The NSS seeks to develop a more balanced urban system in Ireland through the selective promotion of development in and around a set of regional urban centres. Planned improvement of the social, cultural, technological and commercial infrastructures of these centres, it is hoped, will

allow them to act as 'gateways' for the attraction of productive investment into the centres themselves or their surrounding hinterlands.

The IDA has taken the lead in implementing this policy through the formulation of a policy which seeks to promote particular industrial specialisms in the gateway centres (Breathnach, 1999). If local higher education institutions focus on the production of graduates in these specialisms, the resulting supply of skilled workers can act as an important magnet for firms in the industries concerned. The resultant localised concentrations of firms in particular sectors in turn can further stimulate local centres of research excellence focused on the technological needs of the respective sectoral clusters and might create greater supply opportunities for locally-based input suppliers. Already there is some evidence of the emergence of such clusters in some centres. Thus, in 2002, County Galway accounted for 5.6 per cent of national manufacturing employment but 22.8 per cent of employment in the medical, precision and optical instruments sector. Such a policy, therefore, if successful, would see foreign firms playing the crucial anchor role in the creation of Porterian-type industrial clusters with a relatively high degree of stability, although the level of vertical material supply linkages will probably remain limited.

CASE STUDIES

The Microcomputer Sector: Rise and Demise

The microcomputer hardware sector is defined as the sector producing personal computers, workstations and entry-level servers, and includes system assembly plants and computer component plants. The basis of the microcomputer hardware industry in Ireland was laid in the early 1970s, when the decision by Digital Equipment Corporation to set up a large minicomputer manufacturing plant in Galway in 1971 was quickly followed by the attraction of five other minicomputer assemblers. The economic crisis of the early 1980s and the increasing popularity of the microcomputer led to the closure of some of these plants but employment losses were offset by the arrival of the first microcomputer assemblers (notably Apple Computers). The early 1990s were characterised by a further spate of closures in the sector, mainly related to the changing competitive position of individual companies. However, there was a simultaneous surge in investment by other microcomputer assemblers which led to strong employment growth in the sector during the rest of the decade (see Figure 9.1).

In 1998, the microcomputer assembly sector reached a peak in employment terms, when, according to the Irish Economy Expenditure (IEE) Survey, five branded computer makers and one contract electronic manufacturer employed over 6,700 permanent staff. A different study, drawing on company interviews, suggests that the assemblers employed just under 10,000 (Egeraat and Jacobson, 2004). Manufacturing activities in most of the companies in question were restricted to the final assembly and test of PCs and low-end servers. During the 1990s most of the firms in question acquired non-manufacturing functions

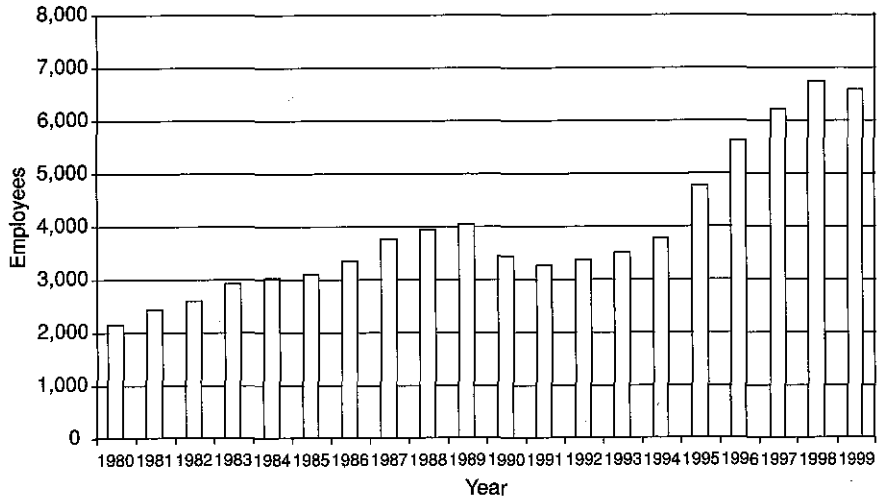

Figure 9.1 Employment in computer assembly plants, 1980–99

Source: Based on IDA/Forfás Irish Economy Expenditure Surveys

such as sales and technical support call centres and European logistics centres, but few or no R&D functions. Due mainly to their large size, these plants were generally located in the larger urban centres (see Figure 9.2).

Between 1998 and 2002, the Irish microcomputer assembly sector experienced serious job losses and plant closures. Of the six microcomputer companies in operation in 1998, by 2002 only Dell and Apple were still assembling microcomputers (and at a much reduced level, in the case of Apple). This reversal in the fortunes of the microcomputer assembly industry clearly demonstrates the vulnerability to changing circumstances of a branch-plant economy such as Ireland's. During the 1980s and most of the 1990s Ireland offered a number of advantages to the microcomputer assembly firms. First, the microcomputer assembly firms were increasingly competing on the basis of offering a wide range of customised products and fast market response. This, in combination with the high value and bulky nature of the systems, favoured the location of assembly plants at or near the main global markets (Egeraat and Jacobson, 2005). Hence one of Ireland's attractions was its close location, and access, to the European market. Within this European market, microcomputer firms were attracted to Ireland by the fiscal and financial incentives, the relatively low labour costs and the flexibility of the labour force. Although computer assembly plants require a certain amount of skilled staff, the majority of the work is largely unskilled so that wage rates represent a relatively important location factor.

By the end of the 1990s, rising wage rates meant that the Irish computer industry was experiencing increasing competition from low-wage production locations. With respect to system assembly operations, competition from the Far East was not the biggest threat since supplying the valuable, customised

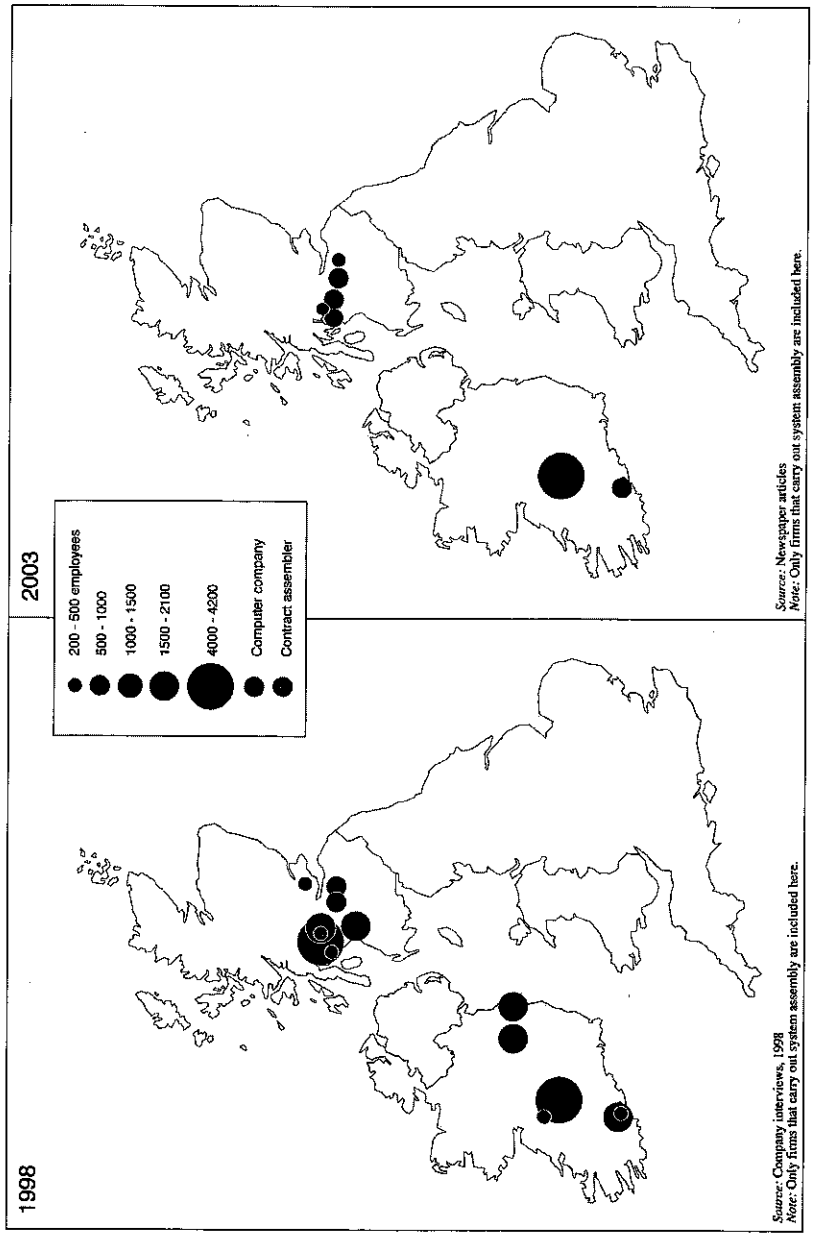

Figure 9.2 Location of main microcomputer assemblers in Ireland and Scotland, 1998 and 2003

Sources: Author interviews (1998) and collated data from newspaper articles; Ordnance Survey Ireland

systems with short lead times from the Far East would have incurred high logistics costs because of the bulky nature of the systems. However, the opening up of Eastern Europe created new production locations offering low wages and a sufficiently skilled labour force, a short distance from the EU market. It is this development, in combination with a competition-induced shake-out of individual companies (in turn partly the result of a general price decline and a global decline in microcomputer revenues in the early 2000s), which has been largely responsible for the closure of computer assembly facilities in Ireland since 1998.

The computer component sector shows a slightly different dynamic. In the early 1990s indigenous companies had begun to capture an increasing share of the local market for low-end material inputs while the IDA succeeded in attracting an increasing number of overseas medium-tech component and subassembly manufacturing plants. However, the situation started to change in the second half of the decade as rising wage rates made Ireland a relatively expensive production location, particularly compared to some of the low-wage economies in the Far East. In this case, unlike microcomputer assembly, the movement of production to these locations was not impeded by logistical considerations. Many components have a small physical volume, which makes airfreight a feasible option. In addition, the low value of many components reduces the interest costs incurred by large (in-transit) inventories. Although Ireland continued to attract a number of high-tech component manufacturing projects, between 1995 and 1998 a large number of low- and medium-tech manufacturers closed their Irish plants and shifted production abroad, mainly to the Far East. As a result, the growth in local sourcing by the computer assemblers stagnated and, by the turn of the twentieth century, they were, on average, sourcing no more than 10 per cent of their material inputs in Ireland (Egeraat and Jacobson, 2004).

The Pharmaceutical Sector: Continued Growth

The pharmaceutical sector includes a range of related activities.[3] The main subsectors in Ireland are the production of *active pharmaceutical ingredients* (API), the most important ingredients of a finished drug (i.e., responsible for its pharmacological effect), and the *formulation* of drug products (i.e., the blending of the API and other ingredients into a finished drug). In contrast to the microcomputer sector, the Irish pharmaceutical sector has been characterised by virtually continuous growth since its inception in the 1950s.

The first substantial investments by foreign pharmaceutical companies in Ireland followed promptly from the shift towards more outward-looking economic policies from the end of the 1950s. However, the sector really took off in the 1970s (see Figure 9.3) when the IDA identified fine chemicals as one of its target sectors, leading to a series of new investments, notably by US-based companies. While employment stagnated during the recessionary early 1980s, unlike other sectors, it did not fall significantly. Since the mid-1980s employment growth in pharmaceuticals has been both strong and continuous – even after 2001, when employment in most other manufacturing sectors contracted. By

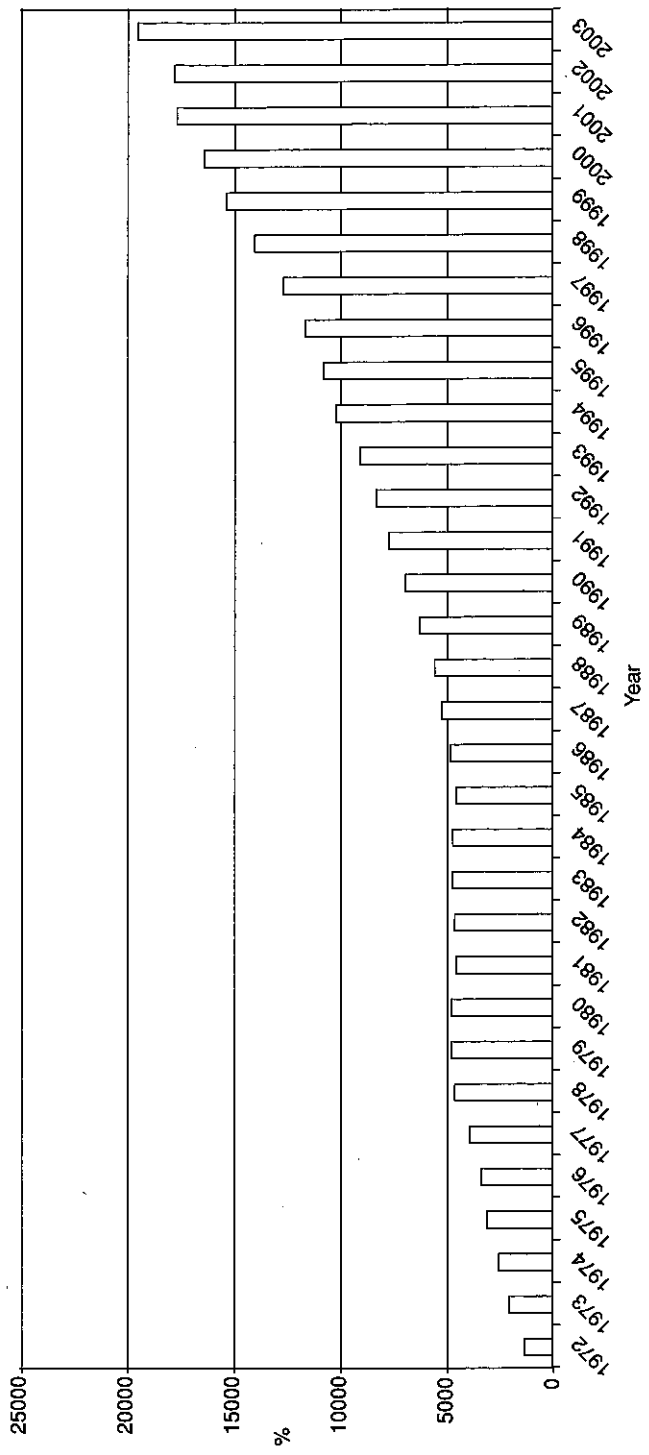

Figure 9.3 Employment in the pharmaceutical sector, 1972–93

Source: Based on IDA/Forfás Irish Economy Expenditure Surveys

2003 the pharmaceutical industry had developed into one of the main industrial sectors in Ireland, employing nearly 19,500 people in 95 operations (74 foreign operations employing 18,074 and 21 indigenous operations employing 1,401).[4] Foreign companies, accounting for 93 per cent of total employment, dominate the industry, the vast bulk of whose production is exported.

The reasons for locating in Ireland were quite different for pharmaceutical firms compared with those in other sectors. The low rate of corporation tax is particularly attractive to the highly profitable pharmaceutical firms, notably for investments in high-value-added activities such as API manufacturing. The benefit of low local corporation tax has been further exploited by extensive practice of transfer-price manipulation. To an extent the firms were also attracted by the low wage rates until the mid-1990s. Yet given their sophisticated production processes and stringent quality standards, pharmaceutical plants have always required a relatively large number of educated and technically skilled workers and firms would not have located in Ireland in the absence of such a pool. Until now, only a small number of countries offered this combination of factors for attracting API plants, notably Ireland, Singapore and Puerto Rico. Relatively free access to the European market has also been an important attraction of an Irish location, in spite of the persistence of non-tariff barriers in the industry (White, 2000a).

Some of these factors also explain the resilience of the sector in the period since 2001. High profitability means that Ireland's low-tax regime remains a key attraction. The requirement of relatively large numbers of skilled workers has made the plants more tolerant of rising wage levels. In addition, the capital-intensive nature of the API plants and the level of 'sunk costs' make the plants less 'footloose'. Yet interviews conducted at pharmaceutical plants in Ireland suggest that rising wage levels and operating costs in general are also beginning to reduce Ireland's competitiveness in this sector (Egeraat, 2006a). Rising wage costs in Ireland are increasing the relative attractiveness of its main competitors, notably Singapore. At the same time a number of new low-cost countries, notably China and India, are entering the market for certain API investment projects, particularly the more traditional chemical synthesis operations. Over the last five years Ireland has attracted relatively few new projects in this segment.

Recent investments indicate a further upgrading of the Irish pharmaceutical sector. The IDA has been successful in attracting a number of more advanced biopharmaceutical projects (notably Wyeth Biopharma in Dublin) that tend to employ even higher proportions of skilled workers. In addition, a number of companies have added non-manufacturing activities to their Irish operations, notably process development laboratories (e.g., Bristol-Meyers Squibb in Dublin).

The industry's two main subsectors portray quite different spatial configurations (see Figures 9.4 and 9.5). The formulation plants are, and have always been, widely dispersed throughout the country. The API sector, on the other hand, is strongly concentrated, notably in County Cork, which accounts for 48 per cent of total employment in the subsector, with Dublin accounting for another 26 per cent. Cork Harbour established itself as the main centre of API production

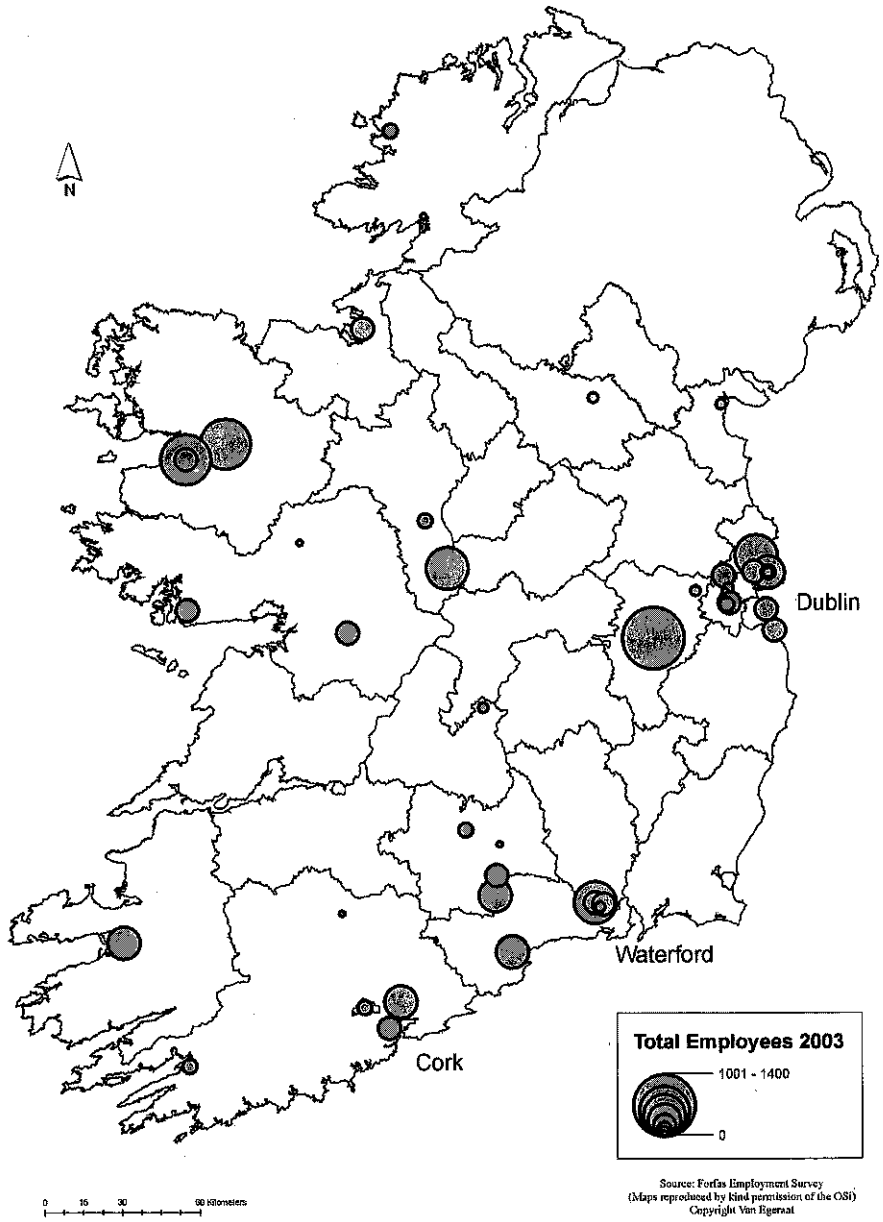

Figure 9.4 Location of drug product operations, 2003

Sources: Forfás Employment Survey (2002); Ordnance Survey Ireland

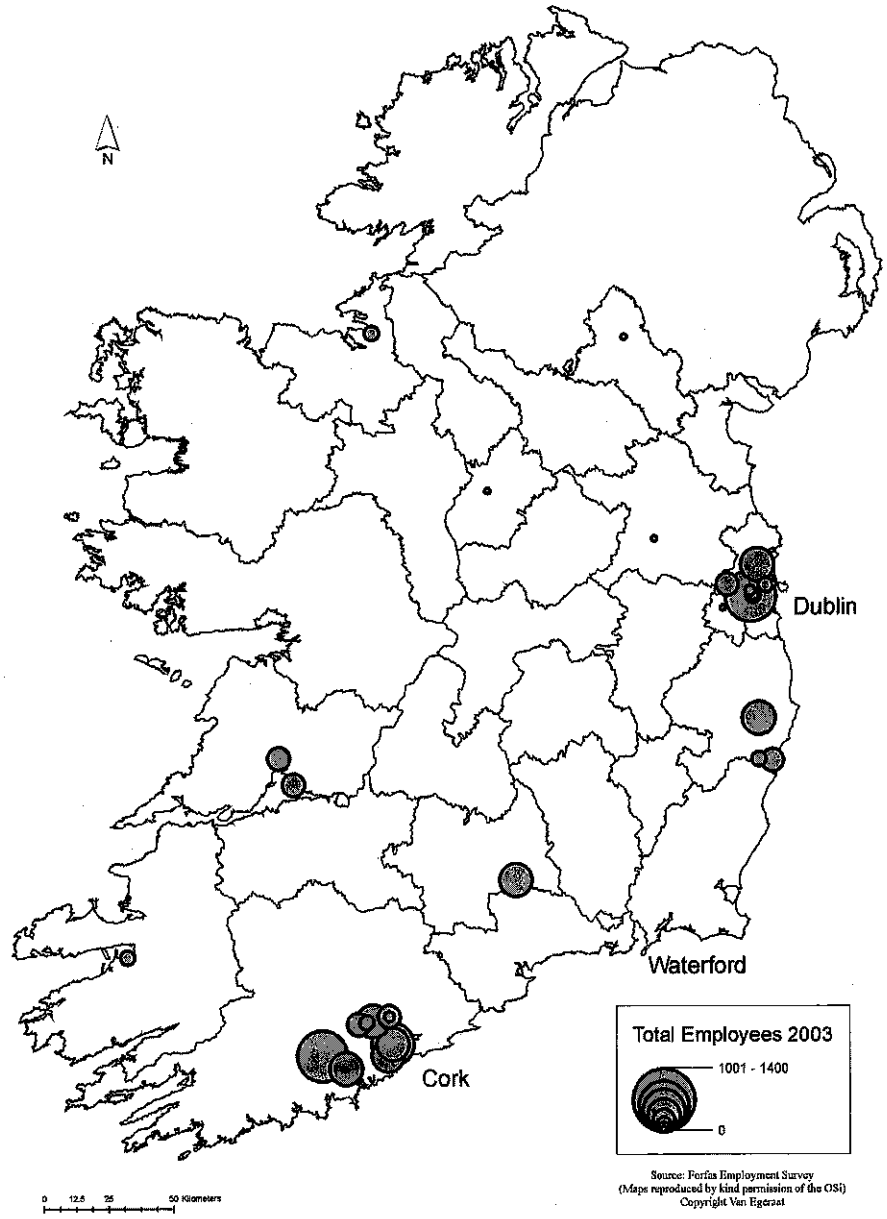

Figure 9.5 Location of active ingredient operations, 2003

Sources: Forfás Employment Survey (2002); Ordnance Survey Ireland

during the 1970s and early 1980s. The main factors responsible for this included the infrastructural requirements of the API plants, notably in relation to effluent disposal, power and fresh water supply; the government's spatial dispersal policy of the 1970s and 1980s; the related spatially selective promotional activities of the IDA; and labour requirements. During the 1970s, the IDA concentrated its limited resources and promotional activities in relation to the pharmaceutical industry in Cork Harbour which, as a result, became an obvious location for API production. The tertiary-level education facilities in Cork City provided the required stream of science and engineering graduates.

Yet some firms at the time chose to establish smaller API plants elsewhere, sometimes in small rural towns adjacent to inland rivers that were used for discharging wastewater. Increasingly strict environmental regulations from the end of the 1980s reduced the attractiveness of these sites and increased the suitability of locations in or near large urban centres where high-capacity infrastructural facilities were readily available and which could provide a pool of suitably skilled labour. This has particularly favoured both Cork Harbour and Dublin (no longer restricted by the dispersal policy of the 1970s and 1980s). Eight of the 15 new API sites established between 1987 and 2004 are located in Dublin and four in Cork Harbour. The current IDA strategy, however, might well lead to a yet different spatial distribution of API activity in Ireland. The IDA is, at present, promoting five strategic sites with the required infrastructure for large-scale biopharmaceutical production – Cork, Ringaskiddy, Oranmore (Galway), Waterford and Dundalk (see also O'Kane, 2005). The future might therefore well be characterised by a further spatial deconcentration of API activity. Such a development would further underline the importance of spatial planning and infrastructure provision in determining the spatial configuration of this sector.

CONCLUSION

One of the main characteristics of the manufacturing sector in Ireland is the dominant role played by foreign direct investment. The shift towards an export-oriented industrialisation strategy at the end of the 1950s resulted in strong growth in employment in foreign-owned manufacturing plants and contraction of the indigenous manufacturing sector. During the 1960s and 1970s, foreign companies were attracted mainly by the low rate of corporation tax and low wage levels. Although much of the investment in this period was concentrated in high-tech sectors, the actual work in many foreign plants was largely unskilled. The vulnerability of this branch-plant industrialisation became apparent during the 1980s when Ireland witnessed a shake-out in foreign sector employment. The 1990s witnessed a new surge in foreign direct investment in the manufacturing sector, again partially driven by low tax and low wages but, increasingly, by the educated and skilled labour force. The subsequent rise in wage levels is now leading to a restructuring of the foreign manufacturing sector, characterised by the loss of employment in low-tech activities and an increasing concentration of employment in high-productivity, high-skill sectors.

Despite the higher quality of the foreign operations that are currently being attracted to Ireland, the future of the manufacturing sector is far from secure. Rising wage levels are likely to further erode the suitability of Ireland as a location for many manufacturing projects. This might be the inevitable consequence of economic upgrading. The question remains whether the pursuit of inward investment, whatever its qualities, is the best long-term approach to economic development in Ireland. Such investment remains contingent on remote decision making by people whose agendas may not always correspond with Ireland's development needs. However, it might be argued that this is part and parcel of an increasingly interdependent global economy and that the real long-term challenge for Ireland is to develop a policy climate conducive to the establishment in Ireland of the highest-value-added functions in 'global production networks' (Dicken et al., 2001), including the regional and global head offices of transnational firms.