NIRSA Working Paper Series No 44 – January 2009

NIRSA
National Institute For Regional and Spatial Analysis
An Institiúid Náisiúnta um Anailís Réigiúnach agus Spásúil

NUI MAYNOOTH
Ollscoil na hÉireann Má Nuad

Ireland – Industrial Competitiveness in a Small Open Economy

John Cassidy
Frank Barry
Chris van Egeraat

John Hume Building, National University of Ireland, Maynooth,
Maynooth, Co Kildare, Ireland.
Áras John Hume, Ollscoil na hÉireann, Má Nuad,
Má Nuad, Co Chill Dara, Éire.
Tel: + 353 (0) 1 708 3350 Fax: + 353 (0) 1 7086456
Email: nirsa@nuim.ie Web: http://www.nuim.ie/nirsa

HEA
Higher Education Authority
An tÚdarás um Ard-Oideachas
Funded under the
Programme for Research
in Third Level Institutions (PRTLI),
administered by the HEA

NDP
NATIONAL DEVELOPMENT PLAN

Ireland – Industrial Competitiveness In a Small Open Economy

Authors[1]: John Cassidy, Frank Barry and Chris van Egeraat

Acknowledgement: The authors would like to thank many people who provide insightful comments and interviews on the sectors under discussion in this chapter, but particularly: Mr Tom Kennedy Director Overseas Direct Investment of Enterprise Ireland, Mr Ed Delaney Software Industry Consultant, and Ms. Michèle Quinn, Director, Irish Software Association.

Introduction

The Irish economy has boomed in recent years based on a strategy of attracting FDI, and has become a model economy particularly for EU accession countries. This chapter sets out to provide a deeper understanding of Ireland's success in the context of Porter's Diamond Model of national competitiveness. A number of analyses have been done in Ireland on the relevance of Porter's Diamond theory to national competitiveness. O'Connell, van Egeraat and Enright (1997) adopted a Porter Diamond analysis in examining clusters in the Irish dairy industry; O'Gorman, O'Malley and Mooney (1997) examined national competitive advantage through clusters in the Irish Software sector; and Clancy, O'Malley, O'Connell and van Egeraat (2001) similarly examined industry clusters in Ireland in relation to the software industry, the dairy industry and the popular music industry. These aforementioned papers summarise the determinants of national competitive advantage à la Porter and provide critiques of Porter's Diamond theory in the context of Ireland notably in regard to the important role of FDI in the Irish economy.

[1]Dr John Cassidy is a lecturer with the School of Business, University College Dublin, Ireland;
Professor Frank Barry is the Professor of International Business & Development, Trinity College Dublin, Ireland; and
Dr Chris van Egeraat is a research fellow with the National Institute for Regional and Spatial Analysis, National University of Ireland at Maynooth, Ireland.

Criticisms of Porter's model point to its lack of precision, its determinacy, its strong predictive ability and its irrefutability (Grant, 1991; Beije and Nuys, 1995, Davies et al, 1995). What unifies these analyses is the perception that Porter's model does not explain the success of small open economies such as Canada, Finland, New Zealand and Ireland where favourable domestic demand conditions are unlikely to prevail simultaneously and rivalry between domestic companies may not be significant (Rugman and D'Cruz, 1993; Bellak and Weiss, 1993; O'Donellan, 1994; and O'Donnell, 1997; Rugman and Verbeke, 2003). Porter (1990) sees the role of MNEs as potentially catalysing a cluster in the form of sophisticated customers or related industries. He does not perceive them as a driving force of competitiveness. A whole body of literature has emerged in recent years supporting the economic multiplier effect to be had from MNE location.

Porter's Diamond (1990, 1998) identifies four determinants of national competitiveness: factor conditions, demand conditions, related and supporting industries, and firm strategy, structure and rivalry. Both the role of government and that of chance are seen as additional variables which influence the four determinants. He argues that the process of clustering is critical to the success of this system.

In responding to the analytical template on competitiveness and small open economies outlined in the introduction, this chapter is an analysis of three of the most successful international industries in Ireland through the prism of Porter's diamond determinants. The industries highlighted are: the ITC Hardware sector, the ICT Software sector and the Pharmaceutical Sector. Section 1 profiles Ireland based on the Porter Diamond perspective and the international sectors chosen. Section 2 examines inward and outward FDI in Ireland with reference to the specific sectors. Section 3 examines the type of inward investments in Ireland and why they were attracted to Ireland as a location. Furthermore, the relative level of embeddedness of subsidiaries will be analysed based on Taggart's classification of decision making and integration of activities (Taggart, 1998). Section 4 will address outward direct investment from the aforementioned sectors and reasons for their chosen locations. Section 5 will examine the clustering effect and cluster formation in regard to the successful industries. Section 6 is an analysis of the role of government policy which has been a crucial

catalyst in the story of Irish economic success. The final section is synthesises, discusses and concludes the chapter.

Section 1: Ireland, Porter's Diamond and the ITC Hardware, the ICT Software, and the Pharmaceutical Sectors

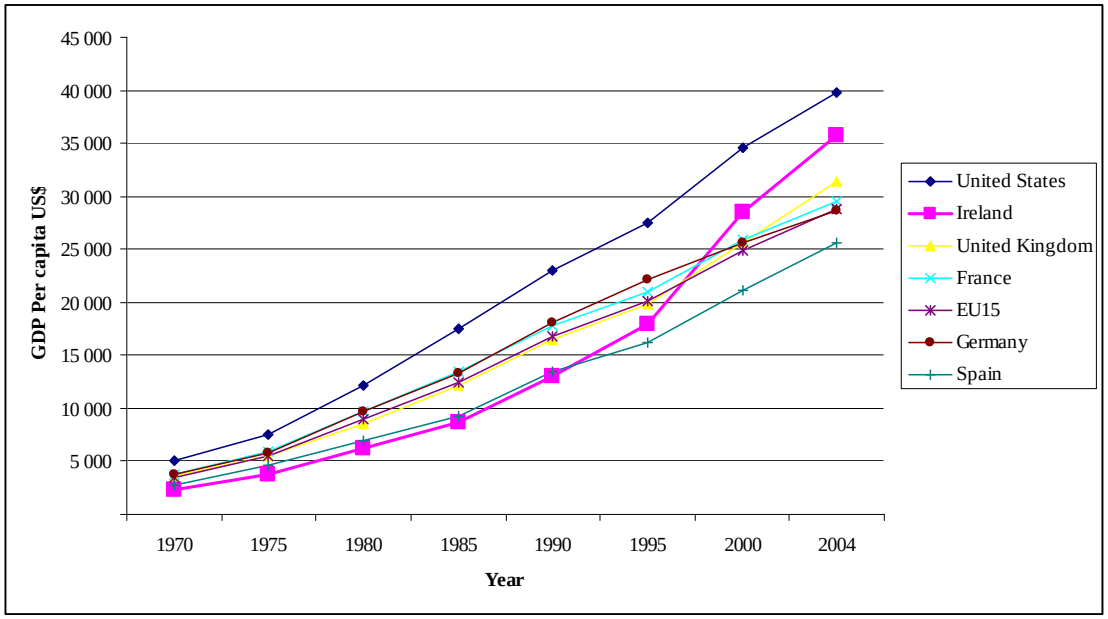
Section 1.1: Background

In recent years, the Irish economy has been characterised by high growth rates, low inflation, balance of payments surpluses and sound public finances, low unemployment, and has emerged as one of Europe's fastest growing economies. Figure 1 shows GDP per capita across selected countries 1970-2004. From 1994 to 2001, GDP at PPP grew at an annual rate of 9.7 per cent. The EU average for the corresponding period was 4.4 per cent. This contrasted with Ireland in the latter part of the 1980s when high unemployment, balance of payment deficits and emigration were the order of the day, presaging a potentially bleak economic future.

What caused this turn around? In an age of globalisation, judicious government policies in the realm of education, (attendantly) a young, highly skilled and relatively low cost workforce, the attraction of foreign direct investment, and sound macroeconomic management, provided the platform for an Irish economic resurrection. Partnership programmes between the Government, Trade Unions, and employers on the broad direction of economic and social policy were crucial. Whereas in the past emigration was the only choice for the young, in its stead, immigration notably from EU accession countries, has provided an added boost to Ireland's strong economic growth.

However, there are also some factors that are undermining Ireland's competitiveness. Increasing labour and utility costs (especially when compared to low-cost countries in Eastern Europe and Asia), high value of Euro notably *vis-à-vis* the Dollar, skilled labour shortages, and inadequate infrastructure (not least due to the unanticipated economic and population boom, and high property prices.

Figure 1: GDP Per Capita US$ Selected Countries 1970-2004 Current Prices, PPPs[2]



Source: OECD

The role of FDI (foreign direct investment) in Ireland's economic about-turn cannot be understated and the low corporate tax rates on foreign capital provided fertile ground for MNE subsidiaries to flourish in the Irish ecosystem. Globalisation through EU membership and that of the WTO, grant incentives, EU transfers, an educated workforce, competitive wage costs, an English speaking population and responsiveness of government policy to MNE skills requirements, all have made Ireland an attractive location for MNEs, notably US companies. Irish culture is characterised by flexibility, creativity and guile. Furthermore, it deals well with ambiguous and uncertain situations (Hofstede, 2007).

ITC Hardware, ITC Software and the Pharmaceutical Industries have proved to be of particular economic importance in the provision of skilled jobs (which is still a fundamental political and strategic policy issue - recent low unemployment levels notwithstanding), export earnings, and enmeshment in the virtuous circles of globally competitive networks. The success of the MNE sector contrasts with the indigenous

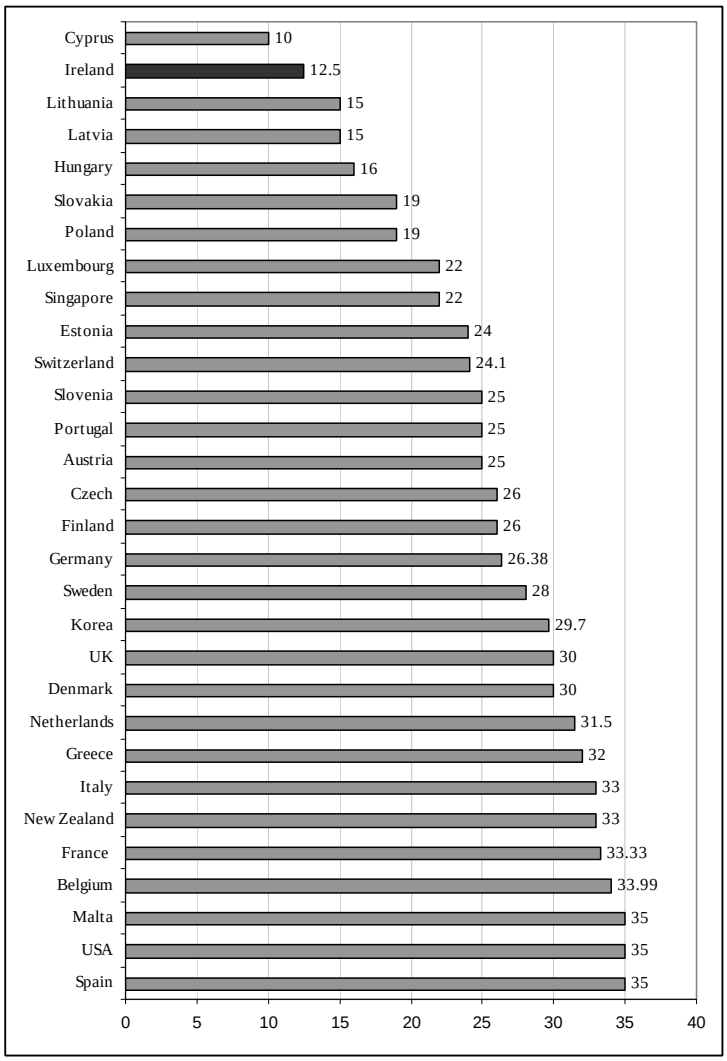
[2] GNP is often preferred to GDP given the distorting effect of MNEs through transfer pricing. In 2006, Ireland's Central Statistics Office reported GDP per capita of €40.648 and GNP per capita of €34848 – a differential of 16.6 per cent. Interestingly, in 2003, 2005 and 2006 GNP growth rates have superseded those of GDP due to strong domestic performance.

traditional sectors, which have lost competitiveness, particularly in manufacturing, as Ireland becomes an increasingly services driven economy. In recent years, the domestic sectors that have shown strong growth have been software, dairy, medical devices, and the popular music industry. Importantly in 2006, growth in exports from the indigenous sectors were higher than the multinational sector for the first time, reflecting the increasing dynamism of indigenous companies but also the competitiveness challenges facing MNEs located in Ireland due to increased operating costs, particularly in the ITC hardware sector.

Ireland's low corporate tax rate at 12.5 per cent is often articulated as being the main reasons for locating in Ireland by MNEs. Figure 2 shows the corporate tax rate across selected countries in 2005. There has been a downward trend in corporate tax rates 2004-2005 with Germany down from 38.29 per cent to 26.38 per cent, France down from 34.33 per cent to 33.33 per cent, Finland down from 29 per cent to 26 per cent, Italy down from 37.25 per cent to 33 per cent, and the USA down from 40 per cent to 35 per cent. In 2007, there is a movement afoot to homogenise corporate tax levels at EU level - which would impact adversely on Ireland's competitiveness.

Ireland, an island country, has limited natural resources apart from reasonably fertile land. By virtue of being an island off the North-western Eurasian landmass, Ireland has access to a continental shelf and its fishery resources. The Southern part of the island has particularly fertile land. The agricultural sector however is circumscribed by EU membership and the common agricultural policy (CAP). Politically, the agriculture lobby is strong in Ireland, as it is in France and Japan, and WTO demands for CAP reform are problematic. Nevertheless, a globally competitive dairy industry has emerged, and its cluster provides an interesting comparison to that of New Zealand. Counterintuitively, despite being an island country, the fisheries sector has not developed due to being de-prioritised on entry into the common market in 1973 in favour of agriculture and its greater political importance.

Figure 2: Corporate Tax Rate for Selected Countries 2005



Source: Deloitte & Touche Oct. 2005. Korea,
Note: New Zealand and Switzerland data based on KPMG Corporate Tax Rate Survey, 2004.

Much of Ireland's economic success of recent years has been predated to the prescience of the Lemass government in the 1960s with respect to education policy and its free market philosophy. Indeed, Ireland was one of the first European countries to grasp the economic importance of education for economic success (OECD, 2006). The historic achievements of ending mass unemployment and mass emigration could not have been realised without the dramatic increase in participation at second and third levels. High birth rates particularly in the 1970s and 1980s led to a high dependency ratio, which, while a short-term economic burden, would later translate into a pool of relatively low cost, educated and skilled employees.

Section 1.2: Porter's Diamond - the ITC hardware, the ITC Software and the Pharmaceutical Sectors

In examining the competitiveness of the selected sectors *vis-à-vis* Porters diamond, table 1 summarises the key points. In this section we will examine the ITC Hardware, Software Sectors and Pharmaceutical sectors. Given Ireland's low corporate tax regime, transfer pricing issues have arisen in recent years. Thus, rather than using production or exports to measure sustainable production, employment is generally agreed to represent a more accurate measure of a sector's presence in the economy than either production or exports.

Section 1.2.1: The ICT Hardware Sector

In Ireland, the ITC Hardware industry benefits from the availability of skilled and relatively low cost labour, though recent wage increases are creating a competitive challenge. High level skills are of more relevance in the manufacture of Intel microprocessors rather than the assembly of Dell computers, both of which have locations in Ireland and whose taxes and export earnings contribute disproportionately to the exchequer. Given the small population of Ireland (4.3 ml. 2006 est.), domestic demand is limited. Ireland has 2 per cent market share for the ICT hardware produced. In the context of domestic demand, the Irish state is an important customer, accounting for as much as 50 per cent of domestic demand for Dell products annually.

ITC hardware companies are located in Ireland as a platform for access to the EU market. They locate in Ireland to take advantage of low corporate tax rates[3], access to low-cost skilled and unskilled labour. ITC hardware companies in Ireland view their Irish operation as the parent operation for the EMEA region (Europe, Middle East and Africa),

Table 1: Porters Diamond - ITC Hardware, Software and Pharmaceutical Sectors.

Porters Diamond	Hardware Sector	Software Sector	Pharmaceutical Sector
Factor Conditions	Availability low-skilled, high skilled low cost labour. Good telecommunications and	High skilled relatively low cost labour; high percentage of tertiary level graduates. Low corporate taxes. MNE and Indigenous	Initially: low corporate tax and ample supply of both low-cost unskilled and suitably qualified labour (chemical engineers). Since

[3] Low corporate taxes in Ireland have led to the problem of transfer pricing where MNEs discount the value of what they are selling into industrial plants here in Ireland.

	physical infrastructure. Logistics. Low corporate taxes Also entitled to financial / other government supports	companies entitled to financial / other government supports. Software education and research Internet infrastructure, formerly competitive, now low broadband penetration. Wimax certification supported by Intel 2006	the 1990s, low corporation tax, qualified and increasingly specialised labour; fiscal and financial incentives for R&D activities through Science Foundation Ireland and an upgrading of the institutional research infrastructure through the Programme for Research in Third-Level Institutions, launched in 1998, and the Science Foundation Ireland, launched in 2000.
Demand Conditions	Global - Domestic Market very small 2%. Global integration through EU and WTO means that market is EMEA region following by USA and Asia.	Indigenous companies strong domestic demand but primarily international. Domestic customers in banking & financial services and process flow industries. MNEs, many of them trade with each other, many never sell to other MNEs in Ireland. Sophisticated demand: prevalence of MNEs - exacting standards; strong export competitiveness of indigenous sector.	Insignificant strategic importance of the Irish market has no impact on competitiveness of the Irish companies and means that Ireland is at a disadvantage compared to some of the larger markets in attracting FDI.
Relating & Supporting Industries	Limited local vertical manufacturing linkages. Strong logistics. Strong manufacturing culture.	Software development has linkages into the Irish ecosystem – Microsoft get graduates from universities / ITs, involved with Science Foundation Ireland for R&D grants. MNE ITC hardware, the MNE Telecom sector as well as other MNEs, and indigenous companies with large ITC depts. Most indigenous Irish IT software entrepreneurs work experience other indigenous software companies or MNEs.	Pharmaceutical plants in Ireland have very few local raw material supply linkages. Attraction of FDI is facilitated by a substantial number of multinational process engineering and construction management companies, increasingly specialised in pharmaceutical projects. (The competitive dairy processing and brewing sectors may be regarded as related industries)
Firms Strategy Structure and Rivalry	Globalisation strategies; access to EU market; competitors are in Ireland. Access to low tax base. Access to low-cost skill labour. Sector stagnating. No subsidiary-subsidiary rivalry in MNE sector.	Indigenous companies SME sized; have niche product specialisation, very export market focused. Small Irish market, influence of the state development agencies directing their export strategy. Technical competence is high but marketing expertise is perceived as low. No subsidiary-subsidiary rivalry in MNE sector – but strong amongst indigenous firms.	Strategy and Structure influenced by developments in main markets and new technologies. Much M&A activity on global level. Strategy determined at global HQ. Strategy of tax avoidance, supported by complex corporate structures and facilitated by Irish taxation policies, increases attractiveness of Ireland as location for manufacturing as well as R&D and other value added activities. Very little evidence of subsidiary-subsidiary rivalry playing any role in driving the efficiency/competitiveness of the sector in Ireland
Role of Government	Critical. IDA targeting of top MNEs. Government policy on ITC sector created relevant advanced factors in terms of skills and infrastructure. Proactive and Reactive to IT skill needs. Created a facilitative environment not least in regard to the low corporate tax base.	Critical. Provision of grants at start up, equity involvement by state agencies, employment grants. Provision of skilled employees through responsiveness of education system. Focused indigenous companies towards export market. Low corporate tax rate. Quality of IDA strategy. Upgrading of factor conditions and development of factor creating mechanisms (third level education and, recently, research and development infrastructure)	Critical. Low corporate tax rate. Since the 2000s, growing fiscal and financial incentives supporting R&D projects. Quality of the IDA actions and its strategy of targeting the pharmaceutical sector since the 1970s Upgrading of factor conditions and development of factor creating mechanisms (third level education and, recently, research and development infrastructure)
Role of Chance	Low due to proactive government policy in providing qualified personnel and good business environment not least lo tax.	Low due to proactive government policy in providing qualified personnel and good business environment not least lo tax.	Low. The low corporation tax rates and factor creating mechanisms were generally put in place specifically to attract the pharmaceutical companies.

with Asia sometimes included (EMEAA). Sourcing from domestic companies is limited (see section 5 on clustering). Logistics in the form of trucking companies are well developed. The targeting and pursuit of these ITC MNEs by the IDA coincided with their globalising strategies. It has been argued that Ireland's strength in manufacturing and logistics goes back to our colonial infrastructure. The UK is still a major export market and conduit for exports to other markets. In 2006, Intel exported goods to the value of €3bn. to / through the UK and onto other markets.

In terms of firm's strategy, structure and rivalry, there are no subsidiaries competing with each other. Subsidiaries are nodes in a global network. Dell imports finished Intel chips from the UK. English is the spoken language. Culturally, the Irish understand the US psychology and share mutual trust. Ireland ranks higher than the UK and US in uncertainty avoidance. Irish national culture is seen as an important determinant of competitiveness – it has flexibility, creativity and guile. Florida (2002) ranked Ireland number 1 in his global index on creativity.

Table 2: The relative importance of ITC Hardware employment in EU countries

	Computer Equipment	**Electronic components**
	Nace 3002	**Nace 321**
Belgium	0.21	0.79
Denmark	0.55	0.65
Germany	0.82	0.9
Spain	0.48	0.44
France	1.48	1.8
Ireland	10.42	3.77
Italy	0.48	0.69
Austria	0.15	1.75
Portugal	0.06	0.71
Finland	0.31	1.07
Sweden	0.46	0.79
United Kingdom	1.79	1.1
Of which: Scotland	7.9	3.05
Netherlands	1.54	0.54

Source: Eurostat New Cronos

Note: Data not available for Luxembourg and Greece

The role of the Irish government has been crucial in creating the fertile ground – 'the ecosystem' - for MNEs to flourish through the provision of low corporate tax rates and the availability and responsiveness of Irish governments to the needs of MNEs. The Irish government lobbies on behalf of MNEs - particularly US multinationals at EU level. The low corporate tax rate of 12.5 per cent is in place till 2015. It has been thought unlikely that the EU would remove it, as Ireland has proved itself an example of what the EU can achieve with its 'subsidiarity', in contrast to other EU countries. However, in 2007, EU tax homogenisation is high on the agenda.

The computer hardware sector, in the production data, consists of NACE 3002 Computers) and NACE 3210 (Electronic Components). In the year 2000, these sub-sectors accounted for 0.6 and 1 percent of EU manufacturing employment. The data in Table 2 report the importance of these sub-sectors in the various EU15 countries, relative to its overall importance in the EU.[4] Employment in both hardware segments is seen to be particularly important in two peripheral EU economies: Ireland and Scotland.[5] Table 3 shows the shares of individual countries in world exports of the two segments of the hardware industry, demonstrating the strength of Irish exports *vis-à-vis* larger European countries.[6]

Table 3: Country Shares in World ITC Hardware Exports

		Shares of world exports			
		SITC 752		**SITC 75997**	
		2000	1992	2000	1992
Europe	**France**	0.04	0.05	0.02	0.04
	Germany	0.05	0.07	0.04	0.05
	Ireland	0.05	0.02	0.06	0.05
	Italy	0.01	0.03	0.01	0.03
	Netherlands	0.08	0.04	0.05	0.05
	United Kingdom	0.08	0.09	0.04	0.07

Source: UN trade statistics.

Section 1.2.2: The ICT Software Sector

In 2003, Ireland was the largest exporter of software in the world (IMD, 2003) In attracting multinational investment in this sector to Ireland, IDA Ireland, the agency or one-stop-shop responsible for FDI focused on US companies which set up their European operations centres in the Dublin regions since the 1980s. Some examples of these companies are Microsoft, Oracle, Symantec and Oracle. Ireland has become the main European location for software localization. The indigenous software industry is dynamic in nature, characterized by small firms and aided by public and private equity. The multinational branch of the Irish software sector is primarily packaged

[4] Each cell therefore measures, for sector i and country j, $(L_{ij}/L_j)/(L_i/L_{EU})$.
[5] Thus while Scotland in 1997 had only 8 percent of UK manufacturing employment it had 27 percent of the UK's 63,000 jobs in Computers and Office Machinery. As a region of the UK rather than an independent state however, data on Scotland is harder to access than data on Ireland.
[6] Data for European countries are only included if they record levels greater than Ireland's in either of the years shown.

software or product companies. The indigenous companies in contrast with the MNE sector are characterised by a strong product niche with small product volumes and export orientation.

In terms of factor conditions, the quality of the labour force is very important with a very high percentage of tertiary level graduates (O'Gorman, O'Malley and Mooney, 1997). Low corporate taxes create the potential for greater access to profits depending on the financial structure of the company and parent subsidiary relationship. Indigenous companies are entitled to a range of financial and other supports from various government agencies from start up costs to employee pay. Infrastructure for software education and research is available at most of the universities, and notably the Tyndell Research Centre at University College Cork. In terms of competitive threats, telecommunication exchanges are still controlled by Eircom, the former state telecommunications company, resulting in slow broadband roll out and relatively low speeds in comparison to many other EU countries.

Irish indigenous companies sell to a wide range of customers in Ireland notably banking & financial services and process flow industries such as pharmaceuticals, chemicals, drinks, dairy products and other foods (O'Gorman, O'Malley and Mooney, 1997). In regard to the multinational sector, on the one hand many of them trade with each other particularly in the initial stages after set up (O'Gorman, O'Malley and Mooney, 1997). On the other hand there are many who never sell to other MNEs in Ireland. The responses to Taggart's questionnaire later in this chapter suggest that the latter is definitely a more accurate assessment in 2007. The ITC Software sector in Ireland could be characterised as having sophisticated demand given the prevalence of MNEs and their accordingly exacting standards, as well as export competitiveness of the indigenous sector. There is some local demand but it is generally configured for the European market in localisation. With respect to the indigenous software companies, whilst dynamic, it should be noted that many are at the developmental stage – and tend to be taken over. They may exhibit promise but they are not profitable. Indigenous software companies that are more geared towards services provision tend to grow to be more profitable. Pure software companies get taken over quickly if they exhibit promise.

Regarding the existence of related and supporting industries, software development has linkages into the Irish ecosystem. Microsoft source graduates from universities and institutes of technology. The MNEs and indigenous companies are involved with Science Foundation Ireland which provides R&D funding. The policy of Forfas[7] is to create fertile ground for the creation and running of a cluster. It may be said that, in 1996, the multinational ITC hardware, the MNE telecommunications sector as well as other MNEs, and indigenous companies with large ITC departments exhibited the related and supporting industries element of Porters model (O'Gorman, O'Malley and Mooney, 1997). In terms of work experience, most indigenous Irish IT software entrepreneurs had worked with other indigenous software companies before starting up on their own, with around one third having worked with MNE software companies.

With respect to strategy, structure and rivalry, indigenous companies are SME in size and have a niche product specialisation, and are highly export market focused. The limiting size of the Irish market and the influence of the state development agencies in directing their export strategy is regarded as important (O'Gorman, O'Malley and Mooney, 1997). Technical competence is high but marketing expertise is perceived as low. Most indigenous companies say they encounter strong competition from other Irish companies of MNEs located in Ireland and they see this factor as contributing to Ireland's global competitiveness (O'Gorman, O'Malley and Mooney, 1997). Whilst there is strong competition there is also strong cooperation. One critical perspective is that Ireland in general and indigenous companies in particular lack marketing skills. Ireland is good at manufacturing. This is a problem for indigenous software companies bringing their product to market.

Table 4 reports the importance of computer software employment in EU countries, again measured relative to the EU average (this time taken relative to total employment in manufacturing and market services). Software employment records its highest proportionate shares in Sweden, the UK and Ireland. According to the OECD (2002), however, Ireland was the largest global exporter of software, driven by the substantial presence of foreign software giants, inter alia Microsoft, Lotus and Oracle.

[7] Forfás is Ireland´s national policy and advisory board for enterprise, trade, science, technology and innovation.

Table 4: The relative importance of computer software employment in EU countries

Country	Relative Share
Belgium	0.89
Denmark	1.25
Germany	0.61
Spain	0.62
France	1.05
Ireland	1.32
Italy	1.04
Netherlands	1.25
Austria	0.78
Portugal	0.27
Finland	1.25
Sweden	1.95
United Kingdom	1.47

Source: Barry and Curran (2004)

Section 1.2.3: The Pharmaceutical Sector

This section examines the pharmaceutical industry. Since its arrival in the 1950s the pharmaceutical sector has been characterised by virtually continuous growth. By 2004, the pharmaceutical industry had developed into one of the main industrial sectors in Ireland, employing nearly 24,000 people in 95 operations and Ireland has become an important global location for the pharmaceutical industry (Egeraat, 2006; Egeraat and Breathnach, 2007). The sector was the largest contributor of corporation tax in 2001 and by 2003 had become the largest export category in Ireland, accounting for 42 per cent of all manufactured goods exported (ICSTI, 2003). The main sub-sectors in Ireland are the production of active pharmaceutical ingredients (API) and the formulation of drug products.

The industry is dominated by foreign companies. In 2003, they accounted for 93 per cent of total employment in the sector, and virtually all employment in the API sub-sector. The indigenous companies are mainly active in the formulation of human and veterinary pharmaceuticals and, to a lesser extent, diagnostics products. Most indigenous operations remained relatively small. In 2006, thirteen of the top fifteen

global pharmaceutical companies have large-scale operations in Ireland (IDA Ireland, 2006). Six out of ten and twelve out of twenty-five of the world's top selling drugs are produced in Ireland. The products are often manufactured for global markets. Since the 1990s, a substantial number of foreign subsidiaries are supplementing their initial manufacturing activities with process R&D and other higher value added activities. The discussion of the competitiveness in the pharmaceutical industry below will focus on the foreign-owned segment, ignoring the recent development of a small number of internationally competitive indigenous companies.

The primary factor in the rapid expansion of the foreign-owned pharmaceutical sector has been the low rate of corporate tax. In addition, the main positive factor conditions included, initially, an ample reservoir of low-cost unskilled labour and a sufficient supply of suitably qualified labour (chemical engineers). Experience in the foreign-owned companies steadily increased the skill levels in the local labour force. In addition, in response to the needs of the sector, new and expanded third-level institution programmes increased the output of qualified and increasingly specialised staff. This labour has now become the main factor conditions influencing the competitiveness of the Irish pharmaceutical industry. In 2006, a reduction in the number of students pursuing science-related courses is a cause for apprehension at a policy level.

In relation to R&D, arguably more than in other sectors, the location of internationally mobile pharmaceutical R&D projects is strongly influenced by the country's technological system (Bartlett and Ghoshal, 1989). Ireland's technological system in the area of pharmaceuticals has been, and still is, of limited strategic importance for multinational companies. The Irish Government has started to address this disadvantage by upgrading the institutional research infrastructure, notably through the Programme for Research in Third-Level Institutions, launched in 1998, and projects arising from these programmes are starting to play a role in attracting internationally mobile R&D projects, notably in the area of process R&D.

In relation to market conditions, national policies of governments in strategic markets (inter alia USA, UK, France and Japan) on pharmaceutical pricing, reimbursement and health insurance can influence the location of manufacturing and R&D facilities

of multinational pharmaceutical companies on an international scale (Gambardella, et al., 2000; EFPIA, 1998; Lane and Probert, 2005). The insignificant strategic importance of the Irish market means that Ireland is at a disadvantage compared to some of the larger markets with appropriate policies. In addition, there is nothing to suggest that Irish customers are particularly demanding or sophisticated.

Pharmaceutical plants in Ireland have very few local raw material supply linkages that could positively impact on the competitiveness of the industry. The growth of the pharmaceutical industry did help to attract a substantial number of international process engineering and construction management companies to Ireland in the 1980s and 1990s (see also Kearny, 2003). Although it questionable whether these engineering companies positively influenced the competitiveness of the pharmaceutical companies, they did support the IDA in its efforts to attract pharmaceutical plants to Ireland

Strategies and structures are determined at global headquarters and mainly influenced by developments in main markets and the emergence of new technologies. The Irish subsidiaries have typically very little influence on the development of such global strategies. Ireland did however benefit strongly from the global strategies of the pharmaceutical companies. Their strategy of tax avoidance, supported by complex corporate structures and facilitated by Irish taxation policies, made Ireland very attractive as a location for manufacturing as well as R&D and other value added activities (Simpson, 2005; *The Irish Times*, 12 September 2006; Heinze, 2005). There is no evidence to suggest the existence of local subsidiary-subsidiary rivalry, nor evidence that it plays any role in driving the efficiency / competitiveness of the sector in Ireland.

Clearly the Irish Government has been instrumental in the development of the large grouping of pharmaceutical companies in Ireland in a number of ways. Companies have been primarily attracted by the low rate of corporation tax. In addition the government has worked towards the upgrading of factor conditions and development of factor creating mechanisms, notably third level education and, recently, research and development infrastructure. In the last few years (2000-2006), the Government has introduced new fiscal and financial incentives for establishing corporate R&D

functions – schemes that have been taken up by several companies. Finally, Ireland's success in attracting foreign investment projects since the early 1970s has been strongly supported by the IDA, widely acclaimed as one of the most sophisticated industrial development agencies in the world.

Table 5 reports the index for relative employment across the EU in the pharmaceuticals sector. As before, an index of 1.0 would indicate that pharmaceutical employment as a share of manufacturing was at the EU15 average. Ireland's index of 1.98, by contrast – the highest of any EU15 country, illustrates that the sector is almost twice as important in Ireland (in employment terms) than in the Western EU as a whole.

Table 5: An index of the relative significance of each EU country's Nace 244 employment, 2000.

	Relative Index of Nace 244 Employment
EU 15	2000
Belgium	1.52
Denmark	1.41
Germany	0.88
Greece	-
Spain	0.84
France	1.44
Ireland	1.98
Italy	0.87
Luxembourg	-
Netherlands	0.98
Austria	0.99
Portugal	0.45
Finland	0.8
Sweden	1.38
United Kingdom	0.94

Source: Eurostat Cronos

As in the case of the other sectors discussed above, Ireland's ranking in the export stakes is even stronger. In 2002, for example, it accounted for some 13 percent of total EU15 pharmaceutical exports.

Section 2: The Role of Inward and Outward Foreign Direct Investment in the ICT Hardware, the ICT Software and the Pharmaceutical Sectors.

Section 2.1 Inward and Outward FDI

This section is limited by a dearth a data broken down by sector. Ireland is the most FDI-intensive economy in the EU with around half its manufacturing workforce and a higher than average share of services workers employed by foreign-owned firms. Its FDI inflows have become increasingly high-tech in nature. Only 12 per cent of employment in foreign manufacturing firms in Ireland in 1974 was in sectors classified as high-tech by the OECD. The current figure comes to almost 60 percent. The sectors that account for the bulk of foreign-firm employment in Ireland are ICT Hardware, Pharma-chem, Medical Devices and Internationally Traded Services such as shared services and call centres.

Table 6 shows the picture of Irish inward and outward FDI stocks. FDI inward stock in Ireland in 1990 was $34bn. in 2000 it was $137bn. and in 2005 reached $211bn. Irish FDI outward stock was $17bn. in 1990, $28bn. in 2000 and $118bn. in 2005 (UNCTAD, 2006). FDI inward stock in 2005 represented an increase of 35 per cent on 2000. In contrast, FDI outward stock amounted to $118bn. – an increase of more than 322 per cent on the 2000 amount. However, a recently published revised estimate of Irish FDI in terms of assets and liabilities based on the directional principle, shows that in 2006, inward FDI stock was €118.9bn. and outward FDI stock was €93.6bn. (Central Statistics Office, 2007).[8]

Table 6: Ireland Inward and Outward FDI Stock, US$ Millions, Current Prices.

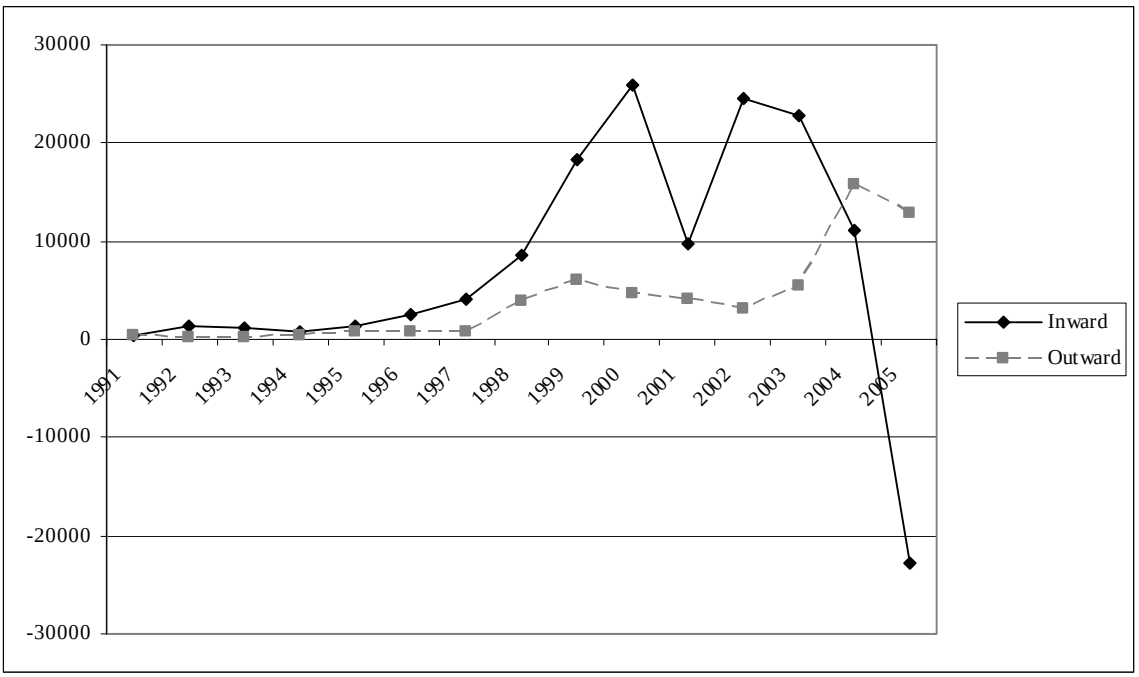
Year	Inward Stock	Outward Stock
1980	31281	NA
1990	33826	17204
2000	136921	27925
2005	211190	117909

Source: UNCTAD World Investment Reports 1998, 2004, 2005, 2006

[8] Following the recommendations of the IMF, ECB, Eurostat and OECD, Irish direct investment flows are recorded on a 'directional basis' rather than the more usual assets/liabilities basis. See CSO 2007, background notes, pp. 9-15.

As figure 3 shows, in terms of flow, inward FDI flows peaked in 2000 at $26bn. FDI outflows peaked at $16bn. in 2004. The peak / trough cycle of inward FDI flows points to some underlying dynamics. Inward flows are disaggregated by the central statistics office in Ireland into equity investments, reinvested earnings and other capital (repayment of loans, pay-out of dividends, and tax repayment). Major outflows in the 'other capital' category of Euro 13bn. in 2004 and Euro 31.1bn. in 2005 account for the overall reduction in inward FDI flows into Ireland.

Figure 3: Ireland FDI Inflows & Outflows 1986-2005, US$ Millions, Current Prices.



Source: United Nations - UNCTAD World Investment Reports 1998, 2004, 2005, 2006

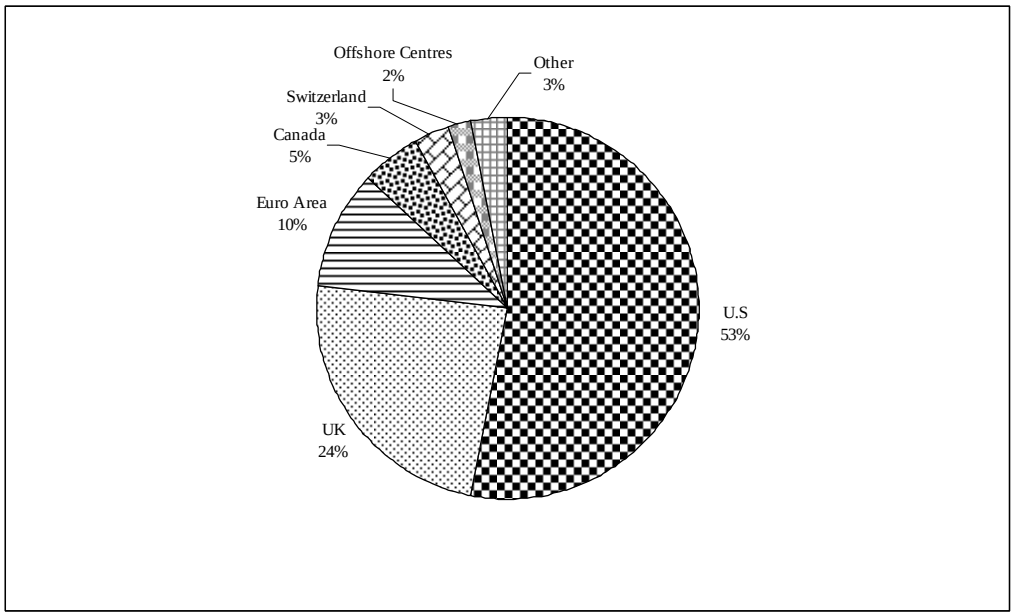
Note: The 1991 figure for inflows and outflows is generated from an average for the years 1986-1991 inclusive.

In 2005, Ireland's inward FDI stock as a percentage of GDP was the second highest in the EU after Belgium / Luxembourg at 105.7 per cent (UNCTAD, 2006). In regard to outward FDI stock as a percentage of GDP, Ireland moved from being the third lowest in the EU in the late 1990s after Greece, Portugal and Austria (Barry, Gorg and McDowell, 2003), to being the second highest at 105.7 percent after Belgium / Luxembourg.

Much inward FDI into Ireland comes via Netherlands holding companies. However, figure 4 shows 2001-2003 inward investment flows based on the ultimate ownership of FDI rather than proximate FDI flows. The U.S accounts for 53 per cent, the U.K. 23 per cent, and the Euro Area 11 per cent (Lane and Ruane, 2006).

Moreover, Barry, Gorg and McDowell (2002) note the importance of distinguishing inflows to the International Financial Services Centre (IFSC) Dublin and other sectors. The transfer of capital by foreign companies to their financial subsidiaries in the IFSC is accounted as inward direct investment. Most of these flows are reinvested in overseas assets and exit as portfolio outflows.[9]

Figure 4: Source of Origin of Inward Investment into Ireland 2001-2003



Source: Lane and Ruane (2006).

The US and the UK are the main destinations for Irish outward investment, with the US appearing to be more important. Central Statistics Office data shows that 70 per cent went to non-EU countries predominantly the US.

Though frequently at variance with each other, both UNCTAD and OECD data agree that Ireland's outward FDI stock relative to GDP is now above the EU15 average. In

[9] Exploiting the low corporate tax rate is an explanatory factor. This distortion has been addressed in recent years showing that outward flows matching inward. This supports Dunning's investment development path thesis (Barry, Gorg and McDowell, 2002).

2004, for the first time, the flow of outward direct investment (ODI) from Ireland exceeded gross FDI inflow. To take the analysis further requires information on both the geographic and sectoral destination of outflows. Let us consider the geographic destination first. The pre-eminence of the US and the UK as host locations is clear from table 6, which is derived from a database on overseas acquisitions by Irish companies. Over 70 percent of overseas acquisitions annually were made in the UK and US. Acquisitions in turn are thought to be the main vehicle by which Irish companies invest overseas (Forfás, 2001). Data for 2005 show that Irish companies spent €4.55bn. acquiring overseas assets. Irish Companies spent 130 per cent more on foreign acquisitions than was spent by overseas interests in acquiring Irish firms. Irish companies are increasingly looking internationally for opportunities. The international construction group CRH plc was particularly acquisitive primarily in the US. The UK in value terms was the most popular destination but more deals were done in the US (CFM Survey, 2005).

Table 6: Overseas Acquisitions by Irish Companies

Region	**1995**		**1996**		**1997**		**1998**	
	£000	%	£000	%	£000	%	£000	%
UK	453,350	67	979,140	42	484,190	24	1,028,000	39
US	64,550	10	999,300	43	1,300,060	66	891,000	33
ROW	157,650	23	371,100	15	197,996	10	743,000	28

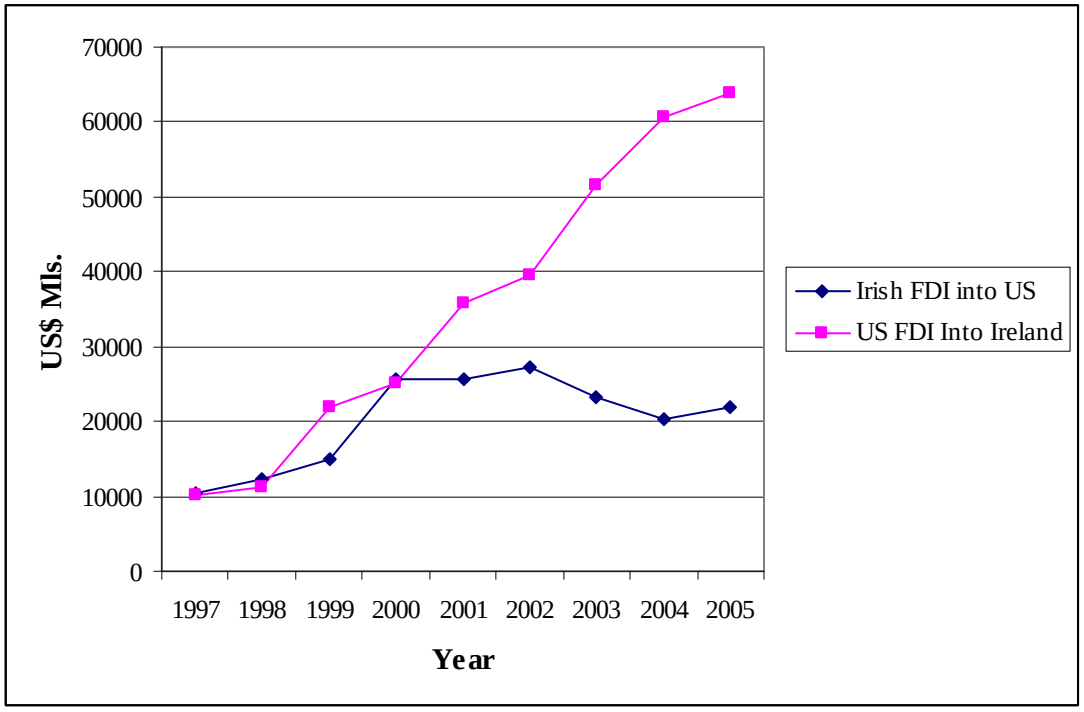
Source: CFM Capital Acquisitions Survey (various years)

Growth in the stock of Irish FDI in the UK is confirmed by UK Office of National Statistics data, which report numbers employed in foreign-owned firms in the UK manufacturing sector. In the first year these data were reported, 1981, Irish-owned firms employed 8,900 workers in the UK. By 1996 this had climbed to over 23,000, though it declined to 19,000 in 1997. The US appears to be even more important than the UK as a destination for Irish outward FDI. For the few years for which Irish Central Statistics Office data are available, around 70 percent of FDI outflows from Ireland went to non-EU countries, and primarily, it is thought, to the US. Given the scarcity of Irish source data on outward flows and given that the US is the most important source of FDI flows into Ireland, the bilateral Ireland-US FDI relationship

is worth studying based on the US Department of Commerce data on foreign-owned assets.

During the 1980s and 1990s Irish FDI in the US grew even more rapidly that US FDI in Ireland. By 1997, the stock levels were similar. This result is quite surprising, given the focus of academics and policy makers on Ireland as a host country for inward investment rather than as a base for outward investment. However as figure 5 shows, US inward FDI stock increased considerably from 2000 to 2005.

Figure 5: Bilateral Inward FDI Stock 1997-2005 – Ireland US Compared US$Mls. Current Prices



Source: US Bureau of Economic Analysis (5 Feb. 2006 at URL <http://bea.gov/bea/di1.htm>)

Table 7 compares the sectoral distribution of overseas acquisitions by Irish companies with that for all EU companies 1993-1999. Given the importance of the US as a location for Irish acquisitions the sectoral distribution of acquisitions by overseas companies within the US is also shown. The latter is seen to conform fairly closely to the distribution for all overseas acquisitions by EU companies. The sectoral distribution of Irish acquisitions differs substantially from both other series however.

Irish investment is notable in construction property, financial services, and food drink and agriculture and print paper and publishing.

Table 7: Cross-Border M&A Activity by sector, average annual share 1993-1999: (i) by EU firms, (ii) within the US and (iii) by Irish firms

Sector	Cross-border M&A purchases by EU firms	Cross-border M&A sales within the US	Cross-border M&A purchases by Irish firms
Food, Drink and Agribusiness	5.9	5.7	17.5
Print, paper and publishing	2.8	4.5	16.2
IT, Telecommunications and Electronics	5.1	7.8	4
Chemical and pharmac.	14.4	17	9.5
Other Manufacturing	24.2	20.5	5.8
Construction, property	1	1.8	22.2
Financial services	32.4	22.5	22.5
Services (consulting, retail, wholesale etc.)	14.3	20.2	2.3
Total			

Section 2.2 Contribution of ICT Hardware, the ICT Software and the Pharmaceutical Sectors in Porterian terms to Irish Economy

In section 1.2, there are a number of tables reporting employment data across the sectors ICT Hardware, the ICT Software and the Pharmaceutical Sectors (tables 2, 4 and 5 respectively). The key points articulated were that employment in both hardware segments is seen to be particularly important in two peripheral EU economies: Ireland and Scotland. Software employment records its highest proportionate shares in Sweden, the UK and Ireland with Ireland as the largest global exporter of software, driven by the substantial presence of foreign software giants inter alia Microsoft, Lotus and Oracle. In regard to the pharmaceuticals sector, the sector is almost twice as important in Ireland (in employment terms) than in the Western EU as a whole.

How has this investment contributed to building competitiveness viewed through Porter's Diamond? Would the competitive elements of Porter's model be there without this investment? From the perspective of resource based strategic thinking, Ireland has through receipt of a stock of inward investment across the three sectors chosen, built up a stock of resources. They have built up skills. Employees of MNE subsidiaries have gained experience in globally competitive sectors. The indigenous

medical devices industry has emerged. The indigenous software industry has also developed. Is there a connection between the development of these two indigenous sectors and the multinational sectors?

Section 3: Why Ireland, Decision Making and Integration of Activities

Section 3.1: Why Ireland

The key determinant of Ireland's success in attracting FDI is the low corporate tax rate of 12.5 per cent. EU membership allowed Ireland to become an export platform for MNE subsidiaries. Ireland, like the UK, is English-speaking with strong cultural links with the US, and both jurisdictions have become favourable locations for US FDI (Barry, 2001). The availability of the appropriate skills, the quality of the workforce, the quality of public infrastructure and efficiency of public administration and the expertise of the Industrial Development Agency (IDA) are also articulated by MNE executives as important advantages of Ireland as a location for FDI. One may sum up by saying that inward direct investment into Ireland has been efficiency seeking given that low corporate tax rates generates more profit.

Section 3.2: Decision-making and Integration of Activities of Subsidiaries

This section is a series of interviews utilising Taggart's questionnaire (Taggart, 1998) as a template to ascertain the decision-making capacities and relative level of integration of subsidiaries in Ireland. The overall perception is that there are fundamental problems in regard to the utility value of the Taggart questionnaire. It does not seem to be relevant for many Irish MNE subsidiaries. There appears to be confusion *vis-à-vis* manufacturing and sales. Taggart's methodology is more applicable to the UK where there is a large home market, different subsidiaries, and also a sales and marketing wing. In Ireland, there are very few marketing activities at subsidiaries. MNEs that have located in Ireland and are supported by the IDA, have very little to do with market area, product range, advertising. These are generally parent functions. The IDA identifies their companies as being involved in value chain activity rather than full business. Further problems with the questionnaire are that the left side does not always correspond with the right and that the questions themselves

belie a lack of understanding of the underlying complexity of subsidiary – parent relationship. Furthermore, the role of political globalisation in the form of FTAs (free trade agreements), the WTO, and the European Union all provide a context within which subsidiaries operate.

Porter defines a subsidiary as a displaced activity. The role of the parent is to configure and coordinate these activities. The MNE is a series of functions or activities, and the Irish subsidiary has to be viewed in this context. The subsidiary as such does not sell, but rather its output is part of its role as a node in a network. The subsidiary may serve three markets: internal, local and global markets. The subsidiary is not about autonomy but systemic influence as part of node in a network. The subsidiary may become independent of parent but not of the market place. In general terms, Irish MNE subsidiaries serve the parent market, not the end market, exceptions notwithstanding. Unilever in Ireland owns Birdseye peas, which is focused on sales to the local market, with nothing exported back to the parent. Pepsi manufactures only but sells nothing locally. In sum, these questions are of relevance to fully integrated subsidiaries such as Guinness (subsidiary of Diageo) which has manufacturing and sales and marketing in one subsidiary, but are the exception in Ireland.

Section 3.2.1: The ITC Hardware Sector Based on Taggart Classification

Whilst government officials and employees of ITC hardware MNE subsidiaries based in Ireland would like to believe that that MNEs are embedded in Ireland, global competitiveness is the barometer and rising operating costs the threat. Decisions are made by the parent not the subsidiary irrespective of the level of embeddedness in the local economy, as table 8 shows.

In regard to integration of activities between subsidiary and parent, the central role of the parent in providing the international linkages for the subsidiary continues to obtain. In Ireland, the subsidiaries of Dell, Intel and Microsoft do not relate directly with each other. They relate at parent level in the US. In Ireland the relationship is primarily as a lobbying force to ensure that government policy is facilitative of the business environment. Most importantly, they lobby the government to act on their behalf at EU level, as previously noted.

Table 8: Taggart Decision Making Classification - ITC Hardware Sector

	5 Years ago	Today
Market Area	2	2
Product Range	2	2
Advertising	2	3
R&D	1	1
Product Capacity	1	2
Manufacturing Technology	1	1

Product specifications are developed and coordinated by subsidiaries to serve many of parent's markets. The subsidiaries sell a substantial part of their output to customers of other group subsidiaries globally. It is a complex picture however. For example, Dell produces three products in Limerick. If customisation were demanded, the product would come from the distribution centre in Central Europe. One could say that 80 per cent comes from Dell Ireland and 20 per cent elsewhere. If we focus on the 80 per cent then we can say that the customers of this subsidiary are specific to this subsidiary and number 5 is true, rather than number 1, which bucks the trend.

Question (d) of Taggart's questionnaire contains three questions. Technology development is indeed carried out in many locations throughout the MNE. But each location does not specialise in a specific technical area and / or product line. The output is not shared by all subsidiaries. We are dealing with complicated markets. There is a lot of government intervention, not least in the form of taxes. Toyota for example has a limited quota for the European market. Specifications are accordingly different by market. So who makes the decisions: the companies and / or the EU? In 2006, Intel wanted to expand its Irish plant. The Irish government, to facilitate this process, wanted to give €50ml to Intel for a €3bl investment. This was rejected. The EU gives strong support for AMD – Intel's EU-based competitor. Recently, €546 ml was given to AMD a German company by the EU. The key point is that the European computer industry has been impacted adversely by US companies platforming in Ireland.

There is substantial movement of semi-finished and finished goods between the different subsidiaries globally. Whilst formerly, production planning was centralised

at HQ, today it remains the responsibility of the subsidiary with HQ providing broad guidelines, hence rated 4/5 in table 9.

Table 9: Taggart on Integration - ITC Hardware Sector

	a	b	c	d	e	f
5 years ago	1	1	1	1	1	1
Today	1	1	1	1	1	4/5

Section 3.2.2: The ITC Software based on Taggart Classification

The example of Motorola and the closure of its software development centre in Cork in January 2007 provide an insight. Subsidiary management knew of this decision just 24 hours before. The operation was at the high end of software development, yet the parent decided to close due to the poor performance of its global cellular networks division. In this case the competitiveness of the subsidiary was challenged by loss of economic competitiveness in Ireland due to higher operating costs, and the competitive advantage of India (The Irish Times, 3 Feb. 2007).

Software development resembles manufacturing. The subsidiaries operate as nodes in an international network. Table 10 outlines the response to the decision-making category. As mentioned above, MNE subsidiaries in Ireland have very little to do with market area, product range, advertising. These are generally parent functions.

Table 10: Taggart Decision Making Classification - ITC Software

	5 Years ago	Today
Market Area	1 (NA)	1 (NA)
Product Range	1 / 2 (NA)	2
Advertising	NA	NA
R&D	2 - 3	2 - 3
Product Capacity	3	3
Process Technology	3 - 4	3 - 4

Note: NA means not applicable

Rather than R&D, the term innovation is perhaps apposite. There is a problem in defining R&D in software. Software is made in collaboration with the parent. In the case of process R&D, the subsidiary has lots of control. However the product is for

the parent primarily. If Microsoft is examined, it is a collection of activities or functions, i.e., software development, logistics and financial accounting.

Production capacity and manufacturing technology is more related to subsidiary activity in Ireland. In regard to production capacity, whilst in the early days of Microsoft Ireland, all operational decisions were taken in the USA, this is no longer the case today. In the case of software, operations technology is the more appropriate term rather than manufacturing technology. Process technology is high at 3-4. It has changed over a 15 year period, but not over a five year period.

The objective of the IDA has been international access to networks and to ensure that the global company configures more in Ireland rather than elsewhere. The key issue is embeddedness in the system, and accordingly systemic influence and inter-dependence, rather than geographical embeddedness and local autonomy. Ireland has become a good location to configure activities. MNE subsidiaries configure in Ireland; they do not embed.

SAP, the German Software company, has a number of subsidiaries in Ireland. They are a collection of different activities and they independently report to their parent – never to each other. There is no connection between SAP subsidiaries. In contrast, Sage, a UK software accounting firm is based in Ireland for Irish market. It has strongly geographical markets.

One key issue in software development is the concept of mandate. Companies compete to get business, i.e., mandates. They want to win the parent's mandate and bring business here to Ireland – but all software companies will compete internationally for the software mandate. In Ireland, there are no sales involved, so questions relating to subsidiary sales are irrelevant. The mandate is won, and done on behalf of the parent. Eriksson has a series of centres of excellence, with each centre bidding for technology development.

There is a substantial movement of semi-finished and finished goods between different subsidiaries. This characterises nearly all of the subsidiary software sector in Ireland. Sage, the UK software accounting firm as mentioned above, is the exception.

Rather than the term production planning, operations planning is the appropriate terminology in Software. Whilst the newer ones are managed centrally by HQ, the older ones have more responsibility. Operations planning is done annually by the parent. Yet at a local level, the subsidiary deals with weekly and monthly targets. These may be more – or less - than anticipated. The Irish units thus operate month to month. They work to make sure the month / week demand is right. Many find that production demand is more than planned. So it may be said that 1 measures strategic planning of parent whilst 5 relates to operations.

Table 11: Taggart on Integration - ITC SOFTWARE

	a	b	c	d	e	f
5 years ago	1	1	NA	1	1	1
Today	1	1	NA	1	1	1

Note: NA means not applicable

Section 3.2.3: The Pharmaceutical Sector Based on Taggart Classification

Global pharmaceutical companies generally have separate subsidiaries for production and sales and marketing. The production facilities generally have limited decision-making freedom. This is largely a consequence of the highly regulated nature of the industry. Before a product may be manufactured or sold the company needs to go through a long registration procedure in each of the nations where it wants to sell its products. This registration includes all details of the clinical trials and the clinical trial documents specifying the pilot plants, product characteristics and, importantly, manufacturing process technology. These clinical trials are the most expensive part of the whole development cycle. Products are generally developed at corporate R&D facilities in the home countries. Process development is the responsibility of the chemical development groups at HQ with the support of the pilot plants (which may be in Ireland). The highly regulated nature and the financial risks involved means that it is a strongly controlled process. By the time the product is transferred to the commercial manufacturing plant in Ireland, most of the important decisions have been taken - unless the Irish subsidiary was initially involved in the pilot plant production. Even then, their decision-making is far from autonomous. The local plant is typically

only allowed to make suggestions which are then decided on by the corporate development units.

The production subsidiaries market is either the downstream sister plant or the marketing subsidiaries. In both cases they have little or no decision-making power, although top management of the subsidiary is generally part of the global commissions or boards. In those cases, the local manager can have an input. This is the same in regard to product range. Advertising is not relevant. R&D is discussed above. In the few cases where they are involved in process development, it is at most a 2. Production capacity is all decided on a global basis, with some input by the local subsidiary. Manufacturing technology is highly regulated and specified by the license, as already stated. In regard to sales and marketing subsidiaries, the markets for products are decided upon at a very early stage. However, regional marketing groups generally sit on corporate boards and in this way have the opportunity to have their input.

In sum, in terms of decision making some companies will have increased their process technology – but decision making is still with the parent. The sector is highly centralised. There has been an upgrading of activities. There is definitely more high value-added activities taking place. In this sector however changes cannot be captured in a five year period.

As mentioned above the Pharmaceutical sector in Ireland is divided into two main sub-sectors: the production of active pharmaceutical ingredients (API) and the formulation of drug products. API provides linkages with other global parts of companies. On the formulation side, local markets are not served. For example, Wyeth's subsidiary market is Europe, N. America and Japan. HQ manufacturing decisions are made to provide international linkages for this subsidiary and this has become increasingly so.

Table 12: Taggart on Decision Making Pharmaceutical Sector

	Production		**Sales & Marketing**	
	5 Years ago	**Today**	**5 Years ago**	**Today**
Market Area	2	2	1	1
Product Range	2	2	2	2

Advertising	NA	NA	3	3
R&D	2	2	NA	NA
Product Capacity	2	2	NA	NA
Process Technology	2	2	NA	NA

The pharmaceutical sector serves many markets. Product specifications are developed and coordinated. Various plants produce different products to serve different markets. Products are developed in many subsidiaries with specific roles in Ireland with respect to process development. Irish subsidiaries play an increasing role in process development

In relation to table 12, production planning is managed at HQs. Whilst 2/2 is the overall score, for the larger MNEs 1/1 is more accurate. The answer is not an average because of the nature of the sector. Production is managed by the parent. The parent's activities in Ireland take advantage of the low corporate tax rate which attracts not just manufacturing but also R&D. This sector has marketing in Ireland, but not sales as it involves costs. Marketing contributes to value-added.

Table 13: Taggart on Integration of Activities Pharmaceutical Sector

	a	**b**	**c**	**d**	**e**	**f**
5 years ago	2	3	3	2	2	1
Today	1	3	3	2	2	1

A number of problems have been highlighted with respect to the use of Taggart's questionnaire in regard to the Irish MNE subsidiary sector. Subsidiaries are not autonomous but are rather embedded as nodes in global networks. However there are some key points that can be made.

With respect to Decision-making, in the ITC hardware sector, the role of the subsidiary is at its lowest in R&D, Product Capacity and Manufacturing Technology. It is more evolved in Market Area, Product Range and Advertising. In ITC Software, many of the questions are not applicable due to the nature of the sector, notably in regard to advertising. However R&D and process technology are quite high. In Pharmaceuticals, Production and Sales & Marketing are differentiated at the outset and answers relate individually. In Production there is very limited local decision-making and no advertising. In Sales & Marketing, R&D, Product Capacity and

Process Technology decision-making is not applicable. Advertising is notable and to a lesser extent Product Range.

As regards Integration of Activities in table 13, the ITC hardware sector shows strong levels of integration with the exception of production planning which is strongly the responsibility of the subsidiary. In ITC Software also demonstrates strong levels of global network integration with (c) not being applicable. In Pharmaceuticals, the role of the parent is less pronounced. The subsidiary seems more autonomous particularly in regard to production specifications and global sales to other subsidiaries. However in the critical areas of manufacturing decisions and production planning, it is HQ that makes the decisions.

Section 4: The reasons for the choice of particular locations of outward foreign direct investment that permitted (at least partly), to strengthen/help sustain the domestic production and employment-base.

The emergence of overseas direct investment (ODI) as a new and rapidly growing phenomenon in Ireland has drawn attention to the international literature on home-country effects of FDI. Most of that literature identifies the effects as positive on balance. Blomström et al. (1997), for example, in a study on US firms, find that increased foreign production raises labour-productivity and expands headquarters services and high-skill employment in the home base, while Desai et al. (2005) find that higher capital expenditures on the part of foreign affiliates of US MNCs are associated with higher parent-company investments in the US. The implication drawn from this is that firms combine home production with foreign production to generate final output at lower cost than would be possible without ODI. This makes each stage of the production process more profitable and ultimately raises production in both locations, suggesting that home-country production and ODI are complements rather than substitutes.

Brainard and Riker (1997a, b) provide some contrary evidence however. While they find that the relationship between parent-firm employment in the US and US-affiliate employment in lower-wage economies is one of complementarity, affiliate employment in other high-wage economies appears to be to some extent substitutable

for US employment. Braconier and Ekholm (2000) report a similar finding for Swedish MNCs. Such substitutability can arise if the FDI displaces exports from the firm's home base, in contrast to the type of FDI entailed in the offshoring of the labour-intensive segments of the production process.

In the Irish case however, even though most of ODI is directed towards developed countries, it does not typically entail the displacement of Irish exports. As Barry, Görg and McDowell (2003) point out, many of the largest Irish MNCs, which are thought to be responsible for the bulk of ODI, are in largely non-traded sectors. Of the top 10 companies, as listed by Forfás (2000), Allied Irish Banks, Bank of Ireland and Irish Life are in financial retail services; Independent Newspapers is a media company; CRH (Cement Roadstone Holdings) and the Smurfit Group are in construction and packaging materials respectively. The only way these companies can expand on world markets is through FDI. This leaves only food companies Kerry and Greencore, glassware company Waterford Wedgewood and pharma company élan operating in internationally-traded sectors in which FDI might possibly substitute for exports.

Even if home and host-country employment were substitutes rather than complements however, so long as the Irish economy remains at full employment the gains from ODI are likely to dominate the losses from any job displacement even in the short term.

Finally, it was pointed out that though Ireland tends to be associated globally with the strength of its FDI inflows, outward FDI has grown rapidly over the course of the "Celtic Tiger" boom and in 2004, for the first time, outflows exceeded FDI inflows. This raises a new set of issues for Irish policymakers. The most difficult issues arise however (a) when outward FDI acts as a substitute for exports, and (b) when unemployment prevails so that there are high adjustment costs associated with job displacement. Ireland faces neither of these difficult issues at present.

Section 5 Clustering benefits of the domestic production and employment in the three successful industries studied.

This section will initially consider the concept of cluster from a theoretical perspective, and then move on to examine whether MNE subsidiaries exist spatially in clusters in Ireland. The Rugman-Verbeke classification of clusters will also be explored to ascertain to what degree if any it may characterise the spatial behaviour of MNEs in Ireland.

The term 'cluster' has a multitude of meanings in the literature and it is useful to discuss some of the competing definitions at this stage. The most basic definition is of an industry or group of industries whose size within a region has been influenced by the playing out of Marshallian 'external economies'. These agglomeration-generating factors include technology spillovers, input-output linkages and thick markets for specialised factors of production. 'Bandwagon' or demonstration effects, whereby the location decisions of market leaders influence those of other firms in the sector, can have similar effects. Much of what Porter has written on clusters was articulated in the form of industrial districts by Marshall (Marshall, 1919), Piore and Sabel (1984), Becattini (1990).

Enright (2000) defines more complex phenomena that fall within the broad Marshallian perspective. A '*working cluster*', for example, exhibits "dense patterns of interactions among local firms that differ quantitatively and qualitatively from the interactions that the firms have with those not located in the cluster". He has in mind here the type of networking – involving cooperation in risk and innovation sharing and market stabilisation – that prevails between competitor firms in Italian industrial districts. A region that contains not just a set of related industries but complete or nearly complete supply chains, furthermore, he defines as a '*deep cluster'*.

Markusen (1996) criticises the focus of this literature on local networks of domestically-owned SMEs (small and medium enterprises), arguing that multinational firms can frequently shape and anchor successful industrial districts, that external networks are frequently as important as networks within the region, and that the external relationships in which firms, workers and public-sector institutions and agencies are embedded condition the ability of the location to retain economic activity. In contrast to the Marshallian or Italian-type industrial district, she identifies several other patterns of successful industrial regions. One is the hub-and-spoke

district, whose structure is dominated by one or several large vertically-integrated firms surrounded by their suppliers. Another is the state-anchored industrial district, whose structure is dominated by large government institutions surrounded by their suppliers and customers. A third, of particular interest in the Irish case, is the satellite industrial platform, based on large externally-owned firms. Markusen points out that these can entail quite sophisticated operations, with the Research Triangle Park in North Carolina standing out as a prime example.

Amsden and Chu (2003), in a book on Taiwan, point to the important role that the public authorities often play in successful late industrialising regions, both in network development and, less controversially, in ensuring that the appropriate conditions are in place for agglomeration processes to take hold. Consistent with this, the notion of organisational learning within the Irish public-sector bureaucracy – meaning the ability of the public administration system to extract, accumulate and use effectively the insights that become available to it – is a crucial element in the Irish story.

Rugman and Verbeke (2003) developed a two-stage framework to organisationally classify clusters with MNEs involved in local or trans-border clusters. Stage 1 is the geographical cluster which may be domestic and symmetrical (Marshall, 1919; Porter, 1990; e.g. the Italian Ceramic industry), domestic and asymmetrical (old economy and one industry, e.g., steel), trans-border and symmetrical (SMEs with competitive international linkages, e.g., New Zealand Dairy Industry) and trans-border and asymmetrical (flagship companies, e.g., Toyota). This latter category is 'core firms involved in purposive behaviour to optimise the value-added of clustering interactions and international linkages are crucial to the cluster's success. This latter category, Toyota as a flagship company with its high value added supplier network, serves as model and platform for the next stage. Stage 2 moves on from the cluster in geographical terms and characterises it with respect to value-added. Institutionalisation and Mutual Adaptation are the two different logics that may characterise a cluster, and they may range in scope from narrow to broad. The Toyota supplier cluster is characterised as narrow in institutionalisation scope in contrast to the (broader) flagship company concept with a greater variety of participants, such as local institutions and governments. The next cluster category is where 'flexible' adaptable MNEs are involved in R&D. And the final cluster category is where MNEs

are so deeply embedded in host country that their subsidiary specific advantages may not be transferable back to the home country cluster.

To see where the concept of the cluster fits in the Irish economy, a number of examples would be appropriate. Hochtberger, White and Grimes (2004) present some interesting case studies of three foreign firms engaged in software development in Ireland – Hewlett-Packard, Electronic Data Systems and IBM – which are summarised below.

Hewlett-Packard (HP) employs around 4,000 people across three locations in Ireland, with its European Software Centre located in the west coast city of Galway. The various Irish divisions do not report into each other. They do not really have anything to do with each other, although they coordinate their efforts from the public relations point of view. Linkages are strong however with local third-level educational establishments, particularly in terms of research carried out at the Digital Enterprise Research Unit of the National University of Ireland, Galway, and through a graduate recruitment programme and involvement in curriculum development at local Institutes of Technology.

US computer-services firm Electronic Data Systems (EDS) first established an Irish presence in 1990. As the Irish affiliate performed well in its dealings with a number of EDS' most significant clients, the company came to appreciate more and more the skills that the Irish workforce offered and the Irish affiliate was allowed extend its scope towards greater process development. Interestingly, while EDS will often work together with competitors on particular projects, these relationships emerge at the global corporate level rather than arising from the clustering of IT MNCs in Ireland.

IBM had been manufacturing in Ireland since 1960 but most of its Irish workforce over the course of the 1990s came to be employed in services. Around one-third of their staff works in its sales and support centre for the EMEA region, while most of the remainder are employed on its technology campus outside Dublin. With the boom of the 1990s, the Irish subsidiary has become more involved in services provision in Ireland. The Irish IT agglomeration is found to benefit IBM in an unusual way. According to the research interview of Hochtberger et al. (2004) the agglomeration

means that Ireland is in some sense a microcosm of the global arena. The interviewee suggested that competing against other global firms in the Irish marketplace provides IBM with a close-up of other firms' global strategies, from which the entire corporation can learn.

The above examples are close to some of the findings of in section 3 based on Taggart classification on decision-making and integration of activities in essence being limited in Ireland. The importance of linkages with universities is also reported. But they also capture Markusen's ideas on the import of external networks and the satellite industrial platform, based on large externally-owned firms similar to the Research Triangle Park in North Carolina. IBM's experience of strong local competition in services in Ireland harks back to Porter's diamond in regard to competition and rivalry.

Other examples suggest greater embeddedness. O Riain (2004) notes that many Irish subsidiaries have been able to develop more sophisticated operations through what he terms corporate "intrapreneuralism". Intrapreneuralism is easier in more diverse parent corporations, such as Microsoft and Lotus, which can concentrate on a relatively small number of strategic software packages. Their software development operations are highly concentrated and the opportunities for building up capabilities around complex implementation, systems integration or sales support are limited. In contrast, there are significantly greater opportunities in companies such as Digital, Amdahl, IBM, Siemens, Nixdorf, and Philips, which sell hardware and software in a variety of bundles, or in telecommunications companies such as Ericsson or ATT/Lucent Technologies, which have both hardware and software operations.

Despite the competitive attrition forcing ITC hardware to look east, many Irish-based ITC hardware companies have adjusted and carved out their own niche (Barry and Egeraat, 2005). Apple for example shifted their focus from manufacturing to services. In this case, an Irish management team made a proposal to HQ, who concurred. Furthermore, when Intel decided to consolidate its cartridge assembly operation to its plants in the Philippines and Puerto Rico, the Irish plant was refitted to produce a higher level wafer (Barry and Curran, 2004). Indeed, Intel decided to build its Fab 24 fabrication facility in Ireland utilising the most advanced 300 millimetre

semiconductor manufacturing technology – as well as implementing a new IT innovation centre represents (Barry and Curran, 2004). This is viewed as a strong statement of internet with respect to Intel's long term position in Ireland.

So then, in geographical terms, how clustered are the three chosen sectors in Ireland? It should be noted first that economic activity in Ireland is much more clustered around the capital city, Dublin, than is the case in most of the rest of Europe. Hardware is even more tightly clustered around Dublin than is economic activity in general and software substantially more so.

A common way to measure the extent of sectoral clustering is to compare a region's share of a particular manufacturing sector to its share of total manufacturing employment, and its share of software employment relative to its share of all market services. The Greater Dublin region accounts for around 40 percent of all industrial employment and industrial establishments in the state. It also accounts for about 50 percent of hardware employment and hardware firms. There are other smaller hardware clusters around second-tier cities such as Galway in the west and Limerick / Shannon in the mid-west.[10] Software, on the other hand, is almost completely clustered around the Greater Dublin region which, while accounting for 40 percent of aggregate services employment, accounts for a full 80 percent of the country's employment in software.

Pharmaceuticals, by contrast, are primarily clustered around Cork in the south-west and County Dublin. This region accounts for 25 percent of pharmaceutical employment compared to only 15 percent of total industrial employment in the country (Egeraat, 2006). This high level of concentration is sometimes attributed to the operation of agglomeration economies, notably Marshall's triad of localisation economies, rather the concentration of the drug substance industry in the two particular urban centres. Rather, it has been largely driven by government intervention, especially environmental and regional planning policy, and the related spatially selective provision of well-serviced industrial sites and infrastructure. This is not to say that companies do not benefit from agglomeration economies. The point is that agglomeration advantages have not been the main factor driving the spatial

[10] For an analysis of the emergence of an ICT cluster in Galway, see Green et al. (2001).

concentration. Agglomeration economies are mainly of the urbanisation type, relating particularly to the availability of labour supplies, although limited localisation economies have recently been developing in the form of engineering services, tailored college courses and the supply of specialised qualified labour.

ITC Hardware in general has a different geography to that of auto-manufacturing or traditional industries. Proximity and agglomeration do not seem to characterise this industry. Dell is headquartered at Cupertino, Ca., USA. There does not appear to be a cluster there as defined by Rugman and Verbeke (2003). A detailed survey of personal computer companies in the US found little evidence of clustering either (Angel and Engstrom, 1995). The industry is characterised by high price competitiveness and outsourcing. It is not the nature of this industry to agglomerate. Dell in Limerick has very limited local sourcing (e.g., cardboard boxes and packing). Dell sources most of its product from Asia. Cost reduction is critical. The Dell subsidiary focuses on keeping operating costs (OPEX) at 10 per cent maximum. It may be said that Dell has a low-value-added cluster in Limerick. With respect to the ITC Hardware sector in general, R&D levels and linkages with research institutes or universities are limited. The Tyndel Research Centre at University College Cork does some research for Intel in the field of materials.

Clusters are characterised as having a set of related industries – to the point of having a deep supply chain. How evolved are the set of related industries and supply linkages of MNE subsidiaries in Ireland? Enterprise Ireland, a sister agency of the IDA, was tasked with the development of indigenous industry. It established national linkage programmes to further integrate foreign enterprises into the Irish economy and provides best practice in this area (Battat, Frank, and Shen, 1996). The proportion of materials sourced locally by foreign MNCs in sectors other than food and electronics, for example, increased from 17 percent in 1985 to 23 percent in 2000, while in electronics (the key sector targeted), as mentioned earlier, the increase was from 10 percent to 30 percent (Gorg and Ruane, 2001).

A recent survey of 12 pharmaceutical operations in Ireland (including ten subsidiaries of multinational operations) found that on average only 2 percent of the value of the raw material inputs were manufactured in Ireland (van Egeraat, 2006). Nine of the ten

foreign-owned pharmaceutical plants used no locally produced raw materials whatsoever. The only item that is typically sourced locally is packaging. On average, 65 per cent of the value of the packaging inputs is manufactured in Ireland. However, the same survey found that the pharmaceutical companies in Ireland have forged important local linkages with engineering companies (including many subsidiaries of large multinational companies). Figures on the proportions of engineering services sourced in Ireland were not collected and absolute figures are, off course, a reflection of the size of the operation. However, to give an indication, the larger companies can spend tens of millions of Euros per year on locally provided engineering services (excluding capital expenditure).[11]

Rugman and Verbeke (2003) provide a more evolved classification of clusters based on the Toyota supplier cluster in Japan and the concept of the flagship company. To what degree can we say that the Rugman-Verbeke (2003) classification has resonance in explaining the agglomerative tendencies or lack thereof of MNE subsidiaries based in Ireland? Irish MNE subsidiaries are not characterised as having a strong supply base, like Toyota. Subsidiary R&D and innovation is still at a low level. Whilst there are *in situ* flagship companies, they have few local suppliers. Where subsidiaries are perceived to be deeply embedded ultimately they are dependent on their parent. Whilst the subsidiary itself may be highly competitive, ultimately the perceive health of the parent will impinge on the subsidiaries. Gateway closed its Irish operation in 2000. The Irish plant was efficient, but the company was unable to compete and pulled out of the European market. (Egeraat and Jacobson, 2004)

ITC Hardware in general has a different geography to that of auto-manufacturing or traditional industries. Proximity and agglomeration do not seem to characterise this industry. Dell is headquartered at Cupertino, Ca., USA. There does not appear to be a cluster there as defined by Rugman and Verbeke (2003). A detailed survey of personal computer companies in the US found little evidence of clustering either (Angel and Engstrom, 1995). The industry is characterised by high price competitiveness and outsourcing. It is not the nature of this industry to agglomerate.

[11] For further information on the low level of linkages in Irish MNE manufacturing, see Egeraat, C. van and Jacobson, D. 2006, Egeraat, C. van and Jacobson, D., 2005 and Egeraat, C. van and Jacobson, D., 2004.

The examples given in this section demonstrate some elements of clustering dynamics in Ireland of MNE subsidiaries. Geographical concentration tends to take place in the main urban centres with the role of government policy – notably in the arena of planning and the environment being an important catalyst. Local sourcing of materials has increased in recent years in the ITC sector. But it would be difficult to suggest that there is an emergent cluster phenomenon a la Porter in Ireland. The examples given suggest a more nuanced dynamic. MNE subsidiaries in Ireland have strong external networks and configurations with the parent company primarily making the decisions. The ITC hardware sector is highly competitive and increasingly looking eastwards for operating costs reductions. Irish companies to remain competitive have had to move up the value chain from manufacturing to services provision. Increasing linkages are taking place with tertiary level institutions by incumbent subsidiaries but notably MNE newcomers, with government policies and moneys in place to attract R&D pursuing MNEs. Markusen's satellite industrial platform and the Research Triangle Park in North Carolina seem to provide a deeper understanding of the concept of cluster in Ireland.

Does Rugman and Verbeke (2003) classification of clusters provide any deeper understanding of the underlying dynamics and organisation of clusters in Ireland? Irish MNE subsidiaries are not characterised as having a strong supply base, like Toyota. Subsidiary R&D and innovation is still at a relatively low level. Where subsidiaries are perceived to be deeply embedded ultimately they are dependent on their parent, as the example of Gateway above showed.

Section 6: The Impact of Government Policy on the ICT Hardware, the ICT Software and the Pharmaceutical Sectors.

Section 6.1

The role of government and government institutions has been at the heart of Ireland's success in attracting FDI. Ireland was one of the first countries globally to adopt an FDI-based development strategy. Its vehicle, the IDA, is widely recognised as one of the most effective investment promotion agencies in the world and operates at the

level of 'best practices' (Loewendahl, 2001).[12] (Its modus operandi is described by former Irish Finance Minister and EU Commissioner Ray MacSharry and long-serving Managing Director of the IDA Padraic White, in MacSharry and White (2000).

The agency first identifies and then targets, partly interactively, the high-growth sectors and sub-sectors that are thought to provide a good fit for Ireland's resources and development aims. Having attracted several computer and components firms in the 1970s, for example, and being favourably impressed by their performance *in situ*, the IDA launched a campaign in the early 1980s to develop Ireland as a major European location for electronics and computer software. Most MNEs that came to Ireland (inter alia Dell and Intel) were targeted. However, it was a chance encounter that led Apple to locate in Ireland.

The agency's next step involves approaching the strongest companies in these niche areas with a view to persuading them to locate in Ireland. Intel, for example, was pursued by the IDA for over a decade before deciding in 1989 to open a European plant, with Ireland ultimately emerging as the favoured location.[13]

After maintaining contacts for more than two decades with IBM – a company which had traditionally shied away from export-platform activity – the IDA, partly on the basis of the success of the Software Development Centre that the company had set up in Ireland to meet its in-house development needs, eventually persuaded them that such a move could be beneficial, leading to the opening of an export plant in Ireland.

The sectors successfully targeted by the IDA all had relatively high skill intensities, medium as opposed to high plant-level economies of scale and relatively low transport costs, making them suitable for relocation to high-skill peripheral regions; Midelfart *et al.* (2000). Targeting by the IDA helped capture these sectors for Ireland

[12] See e.g. Loewendahl (2001).
[13] The story is told of how, at a late stage, the company became paralysed by fears that engineers with the requisite experience could not be found in Ireland. The IDA commissioned interviews with over 300 Irish engineers, working mainly in the US, who had the appropriate experience, and was able to report to Intel that over 80 percent of them expressed a willingness to return to Ireland if offered a good career opportunity with a quality company. The IDA actually presented Intel with their hardcopy CVs to express their availability and readiness to move.

rather than having them go elsewhere, and the agency played a crucial role in advertising Ireland's advantages, in convincing potential investors that apparent difficulties could be overcome, and in capturing the important "flagship projects" that appear to have been of importance in cluster development.

Crucially, however, experience and track record have given the IDA a degree of bureaucratic clout unusual for an investment promotion agency, allowing it to extend its influence into areas not traditionally recognised as lying within the industrial policy remit. By bringing the concerns of industrialists forcefully to government, for example, it played a major role in forcing through the modernisation of the country's telecommunications infrastructure in the late 1970s and early 1980s, which allowed Ireland develop a head start in attracting the then newly offshoring IT-enabled services sectors.

When it noticed in the late 1970s a looming disparity between electronics graduate outflows and its own demand projections, it was able to secure rapid government action to institute one-year conversion courses to furnish science graduates with electronics qualifications. A huge expansion in the capacity of electrical engineering courses in the state followed, positioning the country well to profit from the subsequent explosion in the global software sector.

Enterprise Ireland also has a relatively strong involvement in venture capital. It is thought to account for 11 percent of the funds under management in Ireland compared to an average public-sector involvement of 7 percent across the rest of Europe. More recently, the development agencies have been to the fore in pushing for and overseeing the implementation of a new public emphasis on science, technology and innovation, once convergence on average Western European living standards had been achieved and the threat of increased corporation-tax competition from Central and Eastern Europe emerged.[14]

[14] The development agencies comprise the IDA, Enterprise Ireland (the support body for indigenous industry) and Forfás, the national policy and advisory board for enterprise, trade, science, technology and innovation.

Recognition of the importance of these issues was heralded by the release in 1996 of the first-ever Irish Government White Paper on Science, Technology and Innovation. It is underlined by the five-fold increase in investment in these areas under the current National Development Plan, by the funding by Science Foundation Ireland (SFI) of five joint partnerships between third level research institutions and industry, and by the introduction of a 20 percent tax credit for incremental R&D in the Finance Act of 2004. Within ICT alone, the last few years have registered a number of significant developments under this new strategy, with companies such as Bell Labs, Hewlett-Packard and Intel establishing research institutes in partnership with various of the state's universities. Similarly in the pharmaceutical sector, investment of $2bn. by Wyeth's in 2006 has been notable, particularly its interface with the Conway Institute of University College Dublin.

Conclusion

This chapter has been an analysis of three of the most successful international industries in Ireland through the prism of Porter's diamond determinants. The industries highlighted were: the ITC Hardware sector, the ICT Software sector and the Pharmaceutical Sector. Section 1 profiled Ireland based on a Porter Diamond perspective and the international sectors chosen. All sectors benefited from the fertile business environment in Ireland, namely, low corporate tax rate, EU membership, English-speaking environment with strong cultural connections with the USA, good business environment, relatively flexible labour market, quality of public infrastructure, efficiency of public administration, availability of appropriate skills and the expertise of the IDA. In all sectors, demand was global rather than local. The ITC Hardware sectors had relatively limited supplier linkages and the Pharmaceutical sector even less – but services linkages were important. The ITC Software exhibited stronger linkages with the tertiary educational sector and with Science Foundation Ireland through R&D. In regard to firm strategy, structure and rivalry, globalisation, access to low tax base, and (formerly) relatively low cost skill base characterised the ITC Hardware sector. In Software, there was strong competition amongst domestic SMEs but none between MNE subsidiaries. In the Pharmaceutical sector, strategy was determined at global HQ, but Ireland has become attractive for R&D due to government incentives. There was little evidence of rivalry between subsidiaries. The

role of government was crucial in all sectors and notably that of the IDA. The role of chance was limited due the low tax environment and proactive IDA courtship. When employment data was examined, the selected sectors had the highest pan-EU share.

Section 2 noted that whilst Ireland's inward stock was nearly twice that of its outward stock, outward flows have been strong in recent years. Yet data was contradictory highlighting the complex nature of Irish FDI and transfer pricing, and seemed to suggest that Irish inward and outward stock may be approaching par. The importance of the US as a source of inward FDI and also a destination for outward FDI was noteworthy. Overall, the picture painted shows Ireland is well advanced on Dunning's investment development path.

Section 3 showed that inward FDI into Ireland was efficiency seeking. An analysis of decision-making and integration activities across the selected sectors showed local decision-making was quite limited and that activities were quite integrated, though less so in Pharmaceuticals. Ultimately Taggart's questionnaire appeared inappropriate methodologically and more geared towards UK-type subsidiaries where there is a large home market. Irish companies are involved in value chain activities. Embeddedness *per se* is not the IDA policy goal – rather systemic influence. The IDA objective has been that the global company configures more in Ireland than elsewhere. The Irish subsidiary is not autonomous and does not seek autonomy in the Taggart sense. It is embedded only as a node in a global network.

Section 4 in examining outward direct investment noted that disaggregated data was unavailable. Where acquisitions data were available, they corresponded with Irish companies in traditional sectors such as construction, packaging and food. Some software companies have begun to invest internationally such as Riverdeep and Iona. In the other sectors, there is still limited outward FDI, suggesting outward direct investment does not appear to be displacing exports which could have a knock on affect on unemployment levels.

Section 5 showed that MNE presence as well as a government FDI-oriented strategy with strong regional and environmental planning objectives proved to be the crucial ingredients of cluster development in Ireland, which is at variance to Porter's concept

of cluster dynamics. Furthermore, unlike in Rugman and Verbeke (2003), purposeful cluster-development or cluster-exploiting behaviour on the part of MNEs was not involved. The nature of the Irish clusters, based on the Taggart framework in the previous section, would suggest that in ITC hardware and ITC software sectors, subsidiaries are nodes in global networks deferring to the decisions of the parent, rather than being independent actors. Nevertheless, the systemic influence of MNE subsidiaries in Ireland in the parent's decision-making process should not be overlooked.

Section 6 looked at the impact of government in general and the IDA in particular on the selected sectors. Without the prescience of government policy and the policy of the IDA to target selected companies in selected sectors over a number of years, the FDI-led success story that is the Irish economy today would never have happened.

Ireland is a small open economy. Whilst the Irish economy has reached and overtaken EU relative levels of wealth, Ireland's competitiveness as a location for mobile direct investment is particularly dependent on a low corporate tax rate and ready access to skilled workers competitively priced labour. As the axis of the EU moves eastwards, and as emerging markets such as China and India become attractive for FDI at lower factor costs and at all levels of the value chain, challenges aplenty confront Ireland's global competitiveness.

Bibliography

Amsden, A., and W. Chu (2003) *Beyond Late Development: Taiwan's Upgrading Policies*, Cambridge, Mass.: MIT Press.

Angel, D. and Engstrom, J. (1995) 'Manufacturing systems and technological change: the US personal computer industry', *Economic Geography*, 71(1), pp 79-102.

Barry, F., and D. Curran (2004) 'Enlargement and the European Geography of the Information Technology Sector', *World Economy*, 27, 6, 901-922.

Barry, F., and C. Van Egeraat (2005) 'The Eastward Shift of Computer Hardware Production: How Ireland Adjusted', *National Institute for Regional and Spatial Analysis Working Paper 27*, National University of Ireland-Maynooth.

Barry, F., H. Görg and A. McDowell (2003) 'Outward FDI and the Investment Development Path of a Late-Industrialising Economy: Evidence from Ireland', *Regional Studies*, 37, 4, 341-349, 2003.

Barry, Frank, 2004 'The Emergence of Ireland's ICT Clusters', *ERINA-Scott Seminar*, Belfast, Nov. 26. 2004.

Bartlett and Ghoshal, 1989, *Managing Across Borders: The Transnational Solution*, Boston MA: Harvard Business School Press.

Becattini, G. (1990). 'The Marshallian industrial district as a socio-economic notion' *In Industrial districts and Inter-firm co-operation in Italy*, eds Becattini, G., Pyke, F., & Sengenberger, W. Geneva: International Institute for Labour Studies, pp. 37-52.

Beije, P.R., and Nuys, H.O., (eds) (1995) *The Dutch Diamond: The Usefulness of Porter in Analysing Small Countries*, Leuven-Apendoorn: De Garant.

Bellak, C. J. and Weiss, A. (1993) 'A Note on the Austrian Diamond', *Management International Review*, 33: 109-118.

Battat, J., Frank, I., Shen, X. (1996), 'Suppliers to Multinationals: Linkage Programs to Strengthen Local Companies in Developing Countries', *Foreign Investment Advisory Service, The World Bank*, Washington, DC, Vol. occasional paper no. 6.

Blomström, M., G. Fors and R.E. Lipsey (1997): 'Foreign Direct Investment and Employment: Home Country Experience in the United States and Sweden', *Economic Journal*, 107, pp. 1787-1797.

Braconier, H., and K. Ekholm (2000) 'Swedish Multinationals and Competition from High- and Low-Wage Locations', *Review of International Economics*, 8, 3, 448-461.

Brainard, S., and D. Riker (1997a) 'Are US Multinationals Exporting US Jobs', NBER Working Paper 5958.

Brainard, S., and D. Riker (1997b) 'US Multinationals and Competition from Low-Wage Countries', NBER Working Paper 5959.

Central Statistics Office, 2007. 'International Investment Position 31 December 2006', Background Notes pp. 9-15, published 12 October 2007, Date of Access: 27 October 2007, <URL> http://www.cso.ie/releasespublications/documents/economy/current/iip.pdf

CFM Capital 2005 'Acquisitions Survey', Viewed 27 October 2007, URL <http://www.cfmcapital.com/brochures/CFMcapital_Survey_2005.pdf >

Clancy, P., O'Malley, E., O'Connoll, L. and Egeraat, C. van (1997) 'Culliton's Clusters: Still the Way to Go?' in Sustaining Competitive Advantage, Dublin: National Economic and Social Council, pp. 15-47.

Clancy, P., O'Malley, E., O'Connoll, L. and Egeraat, C. van (1997) 'Clusters in Ireland: An Application of Porter's Model of National Competitive Advantage to Three Sectors' (report prepared for the National Economic and Social Council). Dublin: NESC.

Clancy, P., O'Malley, E., O'Connoll, L. and Egeraat, C. van (2001) 'Industry Clusters in Ireland: An Application of Porter's Model of National Competitive Advantage to Three Sectors', European Planning Studies, Vol. 9, No. 1, pp. 7-28.
Davies, H., Whitla, P., Kwok, P., and Polyu, H.K. (1995) The Analysis of East Asia Competiiveness: Lessons from Hong Kong Experience, Hong Kong: Hong Kong Polytechnic University & Lingnan College Hong Kong.
Desai, M., C. Foley and J. Hines (2005) 'Foreign Direct Investment and the Domestic Capital Stock', NBER Working Paper 11075.
EFPIA (European Federation of Pharmaceutical Industries and Associations) (1998), Development of the EU Single Market in Pharmaceuticals: The Pharmaceutical Industry's Agenda. Positioning Paper, Brussels: EFPIA.
EFPIA - European Federation of Pharmaceutical Industries and Associations. 27 October 2007 at URL < http://www.efpia.eu/>
Egeraat, C. van (2006) 'The Pharmaceutical Industry in Ireland: Agglomeration, Localisation, or Simply Spatial Concentration' NIRSA Working Paper 28, National Institute for Regional and Spatial Analysis, National University of Ireland, Maynooth, Ireland (2006).
Egeraat, C. van, and Breatnacht, P. (2007), 'The Manufacturing Sector' in Understanding Contemporary Ireland, eds. R. Kitchin and B. Bartley, Pluto Press, 2007, pp. 125-146.
Egeraat, C. van and Jacobson, D. (2004) 'The Rise and Demise of the Irish and Scottish Computer Hardware Industry', European Planning Studies, 12(6).
Egeraat, C. van and Jacobson, D. (2005) 'Geography of Linkages in the Irish and Scottish Computer Hardware Industry: the Role of Logistics', *Economic Geography*, Vol.81, No. 3, pp. 283-303.
Egeraat, C. van and Jacobson, D. (2006) 'The Geography of Linkages in the Irish and Scottish Computer Hardware Industry: the Role of Information Exchange', *Journal of Economic and Social Geography*, 97(4), pp. 45-18.
Egeraat, C. van, and O'Malley, E. (1999) 'Porter's Industry Clusters in Irish Indigenous Industry', *ESRI Working Paper*. Dublin: The Economic and Social Research Institute.
Enright, M.J. (2000) 'Survey on the Characterization of Regional Clusters: Initial Results', *Working Paper, Institute of Economic Policy and Business Strategy*, University of Hong Kong.
Florida, Richard 2002. *The Rise of the Creative Class: And How It's Transforming Work, Leisure, Community and Everyday Life*, New York: Basic Books.
Forfás 2000) *International Trade and Investment Report*; Dublin: Forfás.
Forfas, 2001. *Statement on Outward Direct Investment,* Government Publications, (Online) Available (30 Jan.2007) at: http://www.forfas.ie/publications/show/pub179.html
Forfas, *Annual Competitiveness Report 2006, Volume 1: Benchmarking Ireland's Performance*, Irish Government Publications. (Online) Available at (30 Jan.2007): http://www.forfas.ie/publications/show/pub243.html
Gambardella, A., Orsenigo, L. and Pammolli, F. (2000), Global Competitiveness in Pharmaceuticals: A European Perspective, Brussels: Enterprise Directorate-General of the European Commission.
Görg, H. and Ruane, F., 2001. 'Multinational Companies and Linkages: Panel-Data Evidence for the Irish Electronics Sector', *International Journal of the Economics of Business*, Taylor and Francis Journals, vol. 8(1), pages 1-18, February

Grant, R.M., 1991. 'Porter's' "Competitive Advantage of Nations": An Assessment', *Strategic Management Journal*, 12:535-548.
Green, R., J. Cunningham, I. Giblin, M. Moroney and L. Smyth (2001): 'The Boundaryless Cluster: Information and Communications Technology in Ireland, in Innovative Clusters: Drivers of National Innovation Systems', *OECD*, Paris 2001.
Heinze, W (2005), "U.S. Proposes New Tax Regulations for Valuation of Intangibles", I/P Updates, 31 August 2005. www.ip.updates.com
Hoechtberger, K.; White, M. and Grimes, S. 2004. 'The Evolution of Multinational Computer Services Affiliates in Ireland,' *CISC Working Paper* No. 13, National University of Ireland Galway.
Hofstede, Geerte, *Geert Hofstede Cultural Dimensions*, viewed 24 October, 2007, <URL http://www.geert-hofstede.com/>
ICSTI – The Irish Council for Science, Technology & Innovation, 28 October 2007 at URL http://www.forfas.ie/icsti/.
Industrial Development Agency (IDA) Ireland, *Annual Report 2006*, Viewed 27 October 2007, Available at URL < http://www.idaireland.com>
IMD World Competitiveness Yearbook 2003, Institute for Management. Development, Lausanne, Switzerland.
Kearny, B. 2003. 'Engineers ready to serve the world', *Pharmaceutical Engineering*, January/February, pp. 63 – 66.
Lane, C. and J. Probert (2005), 'The external sourcing of technological knowledge by US pharmaceutical companies: strategic goals and inter-organisational relationships', unpublished manuscript, ITEC Working Paper 05-13, Cambridge: University of Cambridge. 28 October 2007 at URL <http://www.itec.doshisha-u.jp/Rpaper/2005/LaneProbert-05-13-itecwp.pdf>
Lane and Ruane, 2006, 'Globalisation and the Irish Economy', No. 1. March 2006, *Institute for International Integration Studies*, Occasional Paper Series, Trinity College Dublin, 27 October 2007 at URL
< http://www.tcd.ie/iiis/documents/seminar%20papers/IIISGlobalisationIrishEconomy.pdf>
Lane, P.R, F Ruane 2006. 'Globalisation and the Irish Economy', *Institute for International Integration Studies* Occasional Paper, No. 1, March 2006
Loewendahl, H. (2001) 'A Framework for FDI Promotion', *Transnational Corporations* 10(1): 1-42.
MacSharry, R. and White, P. (2000) *The Making of the Celtic Tiger: The Inside Story of Ireland's Booming Economy*, Mercier Press: Dublin.
Markusen, A. (1996) 'Sticky Places in Slippery Space: A Typology of Industrial Districts', *Economic Geography*, 72 (3), 293-313.
Marshall, A. (1919). *Industry and Trade*. London: Macmillan.
Midelfart K. and Tvedt, K. 2000. 'International trade, technological development, and agglomeration', *Review of International Economics*. Oxford: Feb 2000.Vol.8, Iss. 1; pg. 149.
O'Connell, L., Egeraat, C. van, and Enright, P. (1997) 'Clusters in Ireland: The Irish Dairy Processing Industry: An Application of Porter's Cluster Analysis', Research Series, no. 1, *Dublin: National Economic and Social Council.*
OECD, 2002. *OECD Information Technology Outlook ICT and the information economy 2002*. Paris 2002.
OECD, 2006. *Higher Education in Ireland*, Review of National Policies for Education, Paris.

O'Gorman, Colm, Eoin O'Malley and John Mooney, 1997. 'The Irish indigenous software industry: An application of Porter's cluster analysis', *Dublin: National Economic and Social Council (NESC).*
O'Donnell, R. (1997) 'International Competitiveness in the Context of Peripheral Regions', in B. Fynes and S. Ennis (eds) *Competing from the Periphery*, Dublin: Studies in Irish Management.
O'Donnellan, N. (1994) 'The Presence of Porter's Sectoral Clustering in Irish Manufacturing', Economic and Social Review 25: 221-232.
O'Malley, E., and Egeraat, C. van (2000). 'Industry Clusters and Irish Indigenous Manufacturing: Limits of the Porter View', Economic and Social Review, 31(1), pp. 55-79.
Ó Riain, S., 2004. The Politics of High Tech Growth: Developmental Network States in the Global Economy, Cambridge University Press.
Pharmachemical Ireland p 8Piore, M., & Sabel, C.F. (1984). *The Second Industrial Divide*. New York: Basic Books
Porter, Michael, 1990. *The Competitive Advantage of Nations*, London: McMillan Press.
Porter, Michael, 1998. *The Competitive Advantage of Nations*, Basingstoke: McMillan Press.
Rugman, A., and D'Cruz, J., 1993. 'The 'Double Diamond' Model of International Competitiveness: The Canadian Experience', *Management International Review*, Vol. 33 (special issue), pp. 17-39.
Rugman A, and Verbeke, A. 2003. 'Multinational Enterprises and Clusters: An Organising Framework', *Multinational International Review*, Special Issue, 3, p. 151-169. URL <http://www.kelley.iu.edu/rugman/>
Simpson, G. (2005), "Irish Unit Lets Microsoft Cut Taxes in U.S. and Europe". Post-Gazette.COM., 7 November 2005. www.post-gazette.com/pg/05311/602213.stm
Taggart, James H., 1998. 'Strategy Shifts in MNC Subsidiaries', *Strategic Management Journal*, Vol. 19, pp. 663-681.
The Irish Times (2006), "GlaxoSmithKline pays $3.1bn in tax settlement", The Irish Times, 12 September 2006.
The Irish Times (2007) 'Motorola trouble is a warning, but the tech sector is not doomed', 3 Feb. 2007, viewed 27 October, 2007 at (Subscription only) at URL:
<http://www.ireland.com/newspaper/finance/2007/0203/1170363459166.html>).
United Nations (UNCTAD – United Nations Conference on Trade and Development) World Investment Reports 1998, 2004, 2005, 2006. 27 October 2007 at URL<http://www.worldinvestmentreport.org >
US Bureau of Economic Analysis, FDI Data, 5 Feb. 2006 at URL <http://bea.gov/bea/di1.htm>)