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Evolution of Ireland's Industrial, Science and Technology Policy

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Evolution of Ireland's Industrial, Science and Technology Policy

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ABSTRACT

There has been a concerted empirical research focus on industrial, science and technology policy from a large country perspective. Small economies and countries industrial, science and technology policy has been the focus of limited empirical research and attention. To address this imbalance the purpose of this monograph is examine the evolution of industrial, science and technology policy from a small country perspective. Taking Ireland a small open economy located on the peripheral of Europe that has made significant economic and industrial advances with consistent and evolving industrial, science and technology policies. In particular, we focus and examine the evolution of Irish industrial development, the develop of Irish industrial cluster with a distinct focus on the case of the medical technology cluster in the West of Ireland and Ireland's education research policy designed to build capacity and scientific capabilities. We conclude by discussing the challenges and implications of industrial science and technology from a small country perspective. We

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also reflect on the future industrial, science and technology policy considerations that Ireland as a small open economy needs to focus on in order to evolve, maintain and grow its international industrial, science and technology reputation and standing.

Keywords: science policy; technology policy; industrial policy: FDI; Ireland industrial clusters; regional development: education; research: research prioritization: technology transfer; corporation tax; cluster policy.

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1

Evolution of Irish Industrial Development

1.1 Introduction

The year 2022 will see the Republic of Ireland mark 100 years since the country was declared a Free State and became independent of British rule. Ireland, under its own authorship is a relatively new country. While much has been written and debated about the short, but interesting social and political history of this small country, its economic history has been relatively under explored. In this section we seek to outline the approach that successive Irish governments have taken to promoting industrial development in what is a relatively resource (in the 19th and 20th century appreciation) poor country that is situated in Europe's northwest periphery.

In short, the history of promoting industrial development is an evolution of how a country traversed some serious economic malaise; identified as the 'poor man of Europe' in the 1970s, 'an economic basket case' in the 1980s, through to the Celtic Tiger of the early 2000s. Economically Ireland has many accolades from home to nine of the top ten tech companies, the Silicon Isle, fourth largest Medtech cluster. As we will see the term origins is a contested one in the Irish industrial development story. The Irish case can only be really understood in the

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global context. Few, if any countries have pursed the open economy model as fervently as Ireland. For this reason, the country is a fascinating case study of the broader industrial and economic trends of the latter part of the 20th century and the beginning of the 21st.

Irish industrial development policy then becomes interesting in terms of how a small country can leverage the new resources of the 21st century. It is a story of dualisms. A story of two distinct approaches to developing industry across time and focus. It is an evolution story of how a state can act as an animateur in a small open economy environment. It is also an evolution story of how a state can actively pursue the liberalisation of an economy through the use of novel approaches to industrial development.

1.2 The Temporal Context

While the focus of this section will be on the approach taken in the latter half of the 20th century, it is important to understand how the policies pursued in the first half of the century inspired that which followed. After the declaration of the Free State in Ireland, the newly formed Government (Cuman Na Gael) pursued a policy of conservatism. The early years of the State were marred by a Civil War (opposing opinions on the partition, where the predominantly Protestant northeast of the island of Ireland remained under British rule). The Government in Dublin was concerned with suppressing rebellion from those opposing the creation of a new border on the island. As such, the pursuit of fiscal and economic conservatism in line with that which they inherited previous regime made sense. Referred to by some as a case of 'green washing,' which refers to the practice of painting over icons of British rule (i.e., red letterboxes with green paint), this approach to industrial policy was to continue to serve the British market primarily with agricultural produce and the industrialised produce of Ireland's biggest cities.

The year 1932 saw the election of Eamon DeValera's Fianna Fáil (a political party that represented those opposed to partition). The new government pursued a policy course that could best be described as economic nationalism. It was an important point of departure in the evolution the Irish industrial model. The following three decades

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would be marked by the pursuit of import substitution industrialisation. The reign of DeValera would also be marked by an economic war with Britain and the imposition of high tariffs on British produce and the uttering of the famous quote by the Irish Taoiseach 'burn everything British except for their coal'.

The rationale for economic nationalism was much more the latter than the former. The Fianna Fáil government valued cultural independence more highly than economic sustainability. It used economic and industrial policy to achieve independence by attempting to curtail the old colonial influence over branding and consumables. Foreign capital was heavily regulated over this period and domestic industries were highly protected. However, as well as growing an industrial base, the approach of the government was also to support agriculture. This matched the idealistic vision of an Ireland that connected to its land through its small holdings.

This approach needs to be understood in its temporal and political context of a divided Europe in the 1930s. Nationalism would reach an obvious climax in 1939 with the outbreak of World War Two. Over the course of which the protectionist policies held sway. Ireland was benefiting from this period of regulation. New industries brought with it new employment and the start of the growth of urban settlements around the country. The Irish approach had become fashionable, its economic policies of protectionism and state investment earned the praise of John Maynard Keynes; 'If I were an Irishman I would find much to attract me in the economic outlook of your present government towards greater self-sufficiency' (quoted in Lysaght, 2013). However, by the 1950s underlying inefficiencies were becoming exposed.

Economic recession in the 1950s made obvious the fact that protectionism had run its course. Consumer choice alongside an industrial base that was being left behind by its European neighbours acted as the seeds for change. The new approach would constitute a 180 degree about turn in supporting the economy and industry. It fell to DeValera's son-in-law, Sean Lemass to institute it. What was instituted will be the focus of the remainder of this section. As an approach it was summarised by one government official as 'going so far down the road of liberalisation that Ireland would never find its way back'. The inception of the approach is

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traces back to the 1959 report simply entitled *Economic Development* written by one of Ireland's best known civil servants Whitaker (1958). As we shall see, an important document in its own right, but more-so, responsible for the instilling of an approach to industrial development that held sway through successive governments and regimes and one that today's Irish government is battling the European Courts to protect.

Ireland's foreign direct investment (FDI) model has been studied, and emulated by many other small countries around the world. Unique factors, accidents of time and geography are difficult to emulate. Before we trace the evolution in detail it is important to make clear the theoretical context in which it was forged.

1.3 The Theoretical Context

The coincidence of globalisation, technological diffusion and organisational transformation in Multinational Enterprises (MNEs) has caused a proliferation of industrial policies targeting FDI across the globe. The last 30 years have seen a significant reappraisal of exogenous-led development from the policy perspective. Along with the deregulation and liberalisation of markets and economies, international institutional contexts have altered in respect of the positive impacts of global flows of FDI. The World Investment Report (UNCTAD, 2008) showed that in 2007 absolute FDI surpassed the previous peak of 2000 to reach US$1,833 billion. The production of goods and services by nearly 80,000 MNEs and their 800,000 foreign affiliates accounted for an FDI stock in excess of $15 trillion in the same year. Recent figures show an increase to $1.9 trillion in 2016 (UNCTAD, 2017).

The multiplication of FDI flows that commenced in the 1990s was in large part spurred by cross-border mergers and acquisitions (M&As), reflecting the strategic choices of MNEs operating within increasingly complex modes of organisation. The developmental trajectories of firms up to the 1980s had been less complex. For the most part, the internationalisation of activities was limited to either sales or more basic assembly/manufacturing functions. The vogue was for higher value added activities to remain concentrated around the headquarter site/country in a hierarchical manner. This resulted in a mono-directional flow of

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information from the headquarters down to their overseas subsidiaries in a simplistic linear fashion (Phelps and Fuller, 2000).

Country perspectives have changed in line with this organisational restructuring and the original rationale for pursuing FDI has shifted. Under the hierarchical mode of regulation, FDI growth in specific countries was explained by country-level factors such as local demand and factor costs (Aliber, 1970; O'Hagan, 1995). FDI was seen as important to building up production capacity in the host country, while increased employment numbers (mainly production) was also alluring. Added to the direct employment impacts were opportunities to provide supporting services as well as sub-supplier linkages. The latter would prove to be one of the most oft cited reasons for inviting FDI as it would stimulate local production, which is perceived as more sustainable with longer-term positive impacts for the host economy (Havrane and Irsova, 2011; O'Sullivan, 2000).

Technology transfer was seen as a way to speed up economic development by facilitating the production of goods with higher value added content, by increasing exports and improving efficiency (see Collins and Grimes, 2011 on the relative success of Ireland's move up the value chain). The bulk of R&D carried out and patents issued reside with these large foreign-owned corporations. The knowledge and technologies possessed by these operations are fundamental to economic transformation (Hanousek *et al.*, 2011). Often these technological competencies cannot be obtained in the market place (e.g., via licensing); FDI may therefore be the fastest and most efficient way to access these competencies.

Research of Blomström and Kokko (1996) and Wang (1992) showed international technology transfer through FDI emerging as an endogenised equilibrium phenomenon, resulting from the strategic interaction between subsidiaries of multinational corporations and host country firms. Beyond this, others point to offshoring and fine-slicing the value chain as a source of new talent, new knowledge, as well as cost cutting (Linares-Navarro *et al.*, 2014). The transfer of know-how and experience to indigenous managers employed in local subsidiaries is also cited as one of the benefits of attracting FDI (O'Riain, 1999). These factors, along with the rise of more complex international production systems and integrating global value-chains led to a questioning of the traditional

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theories of the firm and FDI motivations (Dunning, 1995; Giroud and Mirza, 2015; Rugman, 2000).

Changes in the organisational structure of MNEs have brought about a broader dispersal of value-added activities, including a more internationally dispersed generation of the MNE's specific advantages (Zanfei, 2005). Costa and Fillipov (2008) cite two main reasons for this. The first is the imperative to be innovative and able to quickly and effectively respond to the needs of local markets in order to sustain market positions. The second is to sustain competitive advantage: MNEs have been seeking to tap into localised tacit knowledge in locations all over the world. Costa and Fillipov (2008) argue that as a result of these advantages, the traditional view of MNEs as mere conduits of corporate strategy and passive recipients is outdated (ibid.).

In this regard, MNE networks have arguably moved from hierarchical to heterogenous and dynamic forms, thus changing the roles of units and opening up the opportunity to move up the value chain (Roth and Kostova, 2003). At the same time, competition against sister affiliates within the same corporation for maintaining and securing major roles, as well as for higher strategic status within the corporate network, has been one of the main challenges for the MNE subsidiary. Building on the work of Birkinshaw (1997), Birkinshaw and Hood (1998) and Holm *et al.* (2003), Costa and Fillipov (2008) cite studies which show that the likelihood of an overseas subsidiary catching opportunities is not dependent exclusively on assignments by its headquarters; in fact, it is more dependent on its own initiative. This claim can be grounded on theoretical strands as diverse as the resource-based view of firms, institutional theory and the social capital approach (Zanfei, 2005).

It can be argued that the organisational transformation of MNEs, along with a telecommunications 'revolution' and a positive policy framework, has seen MNEs move away from the hierarchical model to one that is more heterarchical/network based (Roth and Kostova, 2003). Such a model can be characterised by interdependencies between different units composing a corporation, where higher value added functions (services support, marketing, R&D etc.) are carried out by overseas affiliates. This dispersal of activities involves multi-directional information flows between different units of the corporate network across

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differing geographies. Thus, the structure of many MNEs has moved away from the linear formation where information and value trickle down from the top, towards a more complex, non-linear formation of networked co-dependent units (Costa and Fillipov, 2008).

Here the 'performance' firm is seen as one that derives 'its competitive advantage from product excellence and seeks locations which can offer qualified personnel and innovation-rich environments' (Schoenberger, 1991, in Amin and Tomaney, 1995, p. 202). Such firms are seen as operating in rapidly-changing segments of the market, with intense market pressures and changing technology driving the development of organisations and structures based on blurred boundaries across management, scientific and other functions, closer and more intense links with suppliers, and integrated manufacturing (Mytelkaf, 1991). The firm is also increasingly viewed as having a product-based rather than task-based approach to plants, with plants having responsibility for the development of a product and its marketing on a wider scale.

In this context, the plant works on a cooperative basis with other plants and with headquarters, with greater devolution of management and decision-making structures in a 'heterarchical' system of management (Cantwell, 1992; Ohmae, 1989). The latter is seen as bringing a range of attributes – including a wider range of functions, local decision-making authority, more extensive and superior local linkages and a more strategic position within the firm – which are likely to benefit regional host economies (Amin and Tomaney, 1995). Increasingly, literature has highlighted the superior performance of MNEs arising from linkages with other MNEs through knowledge creation and resource sharing and diffusion (Celo and Chacar, 2015). Mariotti *et al.* (2013) for example, find positive spillovers and transmission of knowledge are achieved through linkages between MNEs in the service sectors and local manufacturing firms.

Research explicitly concerned with Irish subsidiaries has highlighted some of the benefits as outlined above. Making use of case studies, Collins and Grimes (2008) show how operations located in Ireland leveraged control and autonomy through a process of what they term 'network anchoring'. Meanwhile, Hewitt-Dundas *et al.* (2005) argued that increased autonomy led to stronger local supply chain linkages. This

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built on earlier work by Roper and Hewitt-Dundas (1998) suggesting that supply chain relationships form the basis for joint innovation activity among Irish businesses.

Indeed, the global non-linear expansion of MNEs strongly links industrial policy, FDI and innovation policy. With innovation being recognised as a main driver of economic development, industrial progress has come to be evaluated by the ability to produce innovations. The emphasis has shifted from regulation and protectionism to issues related to the creation and diffusion of innovations. As competition for FDI intensifies around the world, there is a shift by governments to focus on securing quality rather than on the quantity of these investments, Guimòn and Filippov (2012) posit the need for a new policy mix approach in this regard. Consistently, there is a growing tendency to target FDI projects in relation to the business functions they comprise (e.g., sales, marketing, retail, assembling, manufacturing regional HQ and R&D). This policy trend has been reinforced by the organisational transformation of MNEs (Enderwick, 2005; UNCTAD, 2005).

However, regions and countries tend to shy away from specifically including FDI in their innovation policy: 'in general, innovation policy is designed so that the idiosyncrasies of local foreign-owned subsidiaries are ignored' (Costa and Fillipov, 2008: 384). Their reluctance is inconsistent with the conceptual basis of innovation policy indicated by the 'system of innovation' approach, which diverges from the linear approach and views the technical change process as one running from basic research to market, or from science to technology (Borrás, 2004; Edquist, 2004). In fact, the tendency to ignore foreign-owned subsidiaries runs counter to a holistic view of industrial policy.

In line with evolutionary theory (see Nelson and Winter, 1982), the system of innovation approach considers innovation as the result of a non-linear systemic process marked by interdependency between different actors fuelled by an array of formal and informal institutions (Edquist, 2004; Lundvall, 1999, 2010). Although firms are the locus, the definition of innovation systems tends to conceal the role of the actors in the system, mainly because there is no clear role assigned to them. Foreign firms are effectively neglected in innovation policy debate and practice. Yet they are part of a host country's innovation systems, and

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hold characteristics diverse from those of locally-owned firms (Costa and Fillipov, 2008).

While economic development, the main aim of inward FDI investment has not changed, there are considerable changes in the dynamics of FDI; drivers of FDI for instance now include "the attitudes of host countries regarding FDI's potential costs and benefits" (Alfaro, 2014: 25); developing countries compete more intensely among themselves for FDI investment through liberalisation of their FDI policies (Cooray *et al.*, 2014), through demanding improved infrastructure, reduced investment barriers and provision of generous incentives to invest (Kahouli and Maktouf, 2014). The Irish case, the dualistic approach to policy formation is particularly noted, as exemplified by the formation of two separate agencies to deal with each sector. The contribution of FDI to Ireland's industrial and economic makeup can be viewed from both the localist and the globalist perspective as either an unsustainable or unassailable policy approach. The contribution of FDI to Ireland's industrial and economic makeup can be viewed as successful in attracting many top US firms but equally criticised for depending on the inward investment from the United States (Casey, 2011).

In the contemporary European context, Scotland and Wales benefited from a disproportionate amount of FDI coming to the UK (Buckley, 2014; Terjesen and Acs, 2007) but Ireland can still be regarded as a top-mover in attracting FDI and devising liberal approaches to incentivising foreign investors. In the case of Ireland, for example, a 12.5% corporation tax rate, generous R&D tax credits, growing international tax treaties and full exchange of tax information contributes to a competitive corporate tax regime, central to industrial policy of attracting and retaining FDI (Department of Finance, 2013). Yet, Ireland's stance on incentivising foreign investment is the subject of debate far beyond its national borders (CSO, 2019), see Figure 1.1. Recent years have seen increased scrutiny on Ireland's tax regime from both Brussels and Washington, the former raising concerns over unfair competitive advantage, the latter over evading the more punitive US taxes (Görg and Strobl, 2015).

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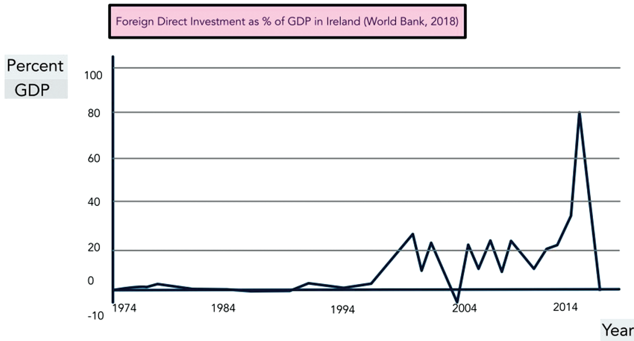

Figure 1.1: Foreign direct investment as a percent of GDP.

1.4 Industrial Policy in Ireland – Ahead of the Curve?

For 60 years Ireland has been honing an industrial policy with a significant focus on attracting inward investment, particularly from the US and primarily focused on high technology sectors including ICT and pharmaceutical/health sciences. Indeed, owing to the relative length of the exogenous focus by Irish policy makers, the country has been noted by some as a 'first mover' in the attraction of FDI (Gal, 2008). Through a targeted industrial policy aided by industrial development agencies the Irish state was instrumental in creating a very hospitable climate for foreign investment. O'Riain (2004a) sees the agencies of the national state as central in the attraction of FDI and the creation of Ireland as an entrepot region, and highlights the power of the Industrial Development Agency (IDA) within the national state system through its role as 'hunter and gatherer' of FDI.

Since its inception in 1959, the IDA under its various guises has been recognised as the most successful marketing agency in the country. Coming out of an economic liberalisation climate induced by the Whitaker Report published one year previously; the goal of this organisation has been the pursuit of industrial investment through the use of grants and subsidies and even policy alterations. The success of the agency, with its offices strategically located in the major global markets, has been emulated by many developing economies. For O'Riain (2004b), the fact that the agency owns a significant amount of industrial space

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symbolizes a 'hyper-politicisation' of state territory as it became an object of political/state action.

For all the good work, in terms of attracting businesses to Ireland with rent subsidies and grants, of the IDA, with its explicit focus on high-tech industries, the introduction of the 10% corporation tax in 1981 as an incentive to foreign investors cannot be underestimated. In response to criticism from the EU regarding unfair favouritism the government set a new tax rate of 12.5% that came into effect for all trading sectors on 31st December 2002. Although the new rate is an increase, it appears rather miniscule when compared to rates of 28%, 31% and 49% in the UK, Netherlands and Germany respectively (Deloitte and Touche, 2002). While it remains controversial, many see the corporation tax as one of the biggest incentives to locate in Ireland.

The Telesis Report (1982) carried out by external reviewers followed by the Culliton Report (Culliton, 1992) chaired by an Irish business leader, resulted in the radical separation of the remits of inward investment and indigenous enterprise, with IDA Ireland focusing on the FDI sector and Enterprise Ireland in charge of Irish-owned and predominantly SME business. This separation of significant areas of responsibility partly reflected the growing concern with the neglect of the indigenous sector and the on-going fears associated with Ireland's heavy reliance on inward investment. The period since these reports has witnessed significant improvements in both sectors coinciding with the Celtic Tiger phenomenon.

One of the most striking, yet rarely referred to remarks in the Culliton Report was the suggestion that 'nationality of ownership' may not be such a significant factor in Ireland's economic development model. This may well prove to be quite a prescient remark, considering the subsequent evolution of Ireland's technology sector. The separation of agency responsibilities, while making sense in terms of addressing recognised weaknesses in the development model to that point in time, may nevertheless turn out to have been a problematic decision in terms of the subsequent nature of developments. With the continuing dominance of the foreign-owned component of the technology sector (dominated by a small number of large-sized employers accounting for a significant part of the total export revenue) and the rather small-scale

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Irish-owned sector (predominantly in software) there are major policy challenges in terms of bringing about any significant level of integration between these two sectors.

The separation of the agencies, however, may have also formed obstacles towards creating any meaningful form of integration. Within the increasing global economy, there may well be many logical reasons why expectations of any significant levels of integration between the sectors are unreasonable. The separation of agency areas of responsibility, however, may well have contributed towards a form of schizophrenia in the policy arena in how we think about these sectors. A growing trend towards territoriality between the agencies also appears to have emerged, which may have resulted in a greater degree of political competition between them for scarce resources rather than a spirit of collaboration necessary for a more effective development programme (O'Riain, 2004b).

There are various issues that arise here, including the problem of lack of integration. Part of the strategy was to target sectors for FDI which would not compete with indigenous companies. This could not be avoided completely, as the indigenous sector evolved. Because of the high tech nature of FDI sectors, Irish companies had difficulty creating linkages or becoming suppliers. In some cases other foreign-owned subsidiaries established operations to supply lead companies. In the more recent period there has been a significant shift from 'local embeddedness' of activities because of global procurement, with increasing pressure on foreign operations in Ireland to leverage the competitive advantage of lower cost locations.

Despite the on-going concern to help Irish companies exploit the presence of multinational companies in the country, there has been a growing tension between this objective and the need for multinational companies to become more involved in global procurement to ensure the sustainability of their local operations.

The evolution of policy as outlined in Table 1.1 reveals a growing tendency to emphasise the role of indigenous companies in the Irish economy, despite their rather minor role within the technology sector. More recently there has also been a growing emphasis on the role of innovation, with the widespread use in policy documents of terms such

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Table 1.1: Policy evolution in Ireland

Name/Date	Description	Rational	Outcome
Whitaker Report (1958)	Introduction of the main elements of current Irish industrial policy. Creating and export-oriented industrial base via removal of tariff barriers. Introduction of capital grants and tax concessions to induce foreign investments.	Move away from the protectionist policies that had been in place. A shift from an emphasis on indigenous industry and industrialisation by import substitution.	Lay the foundations for current make up of Irish industry. Marking the initial step towards a focus on an exogenous-led development model. In essence paving the way for Ireland's membership of GATT and the EU (1973).
IDA Act (1959)	In direct response to the above, the state sponsored Authority to encourage exporting of manufactured goods. Its original remit was to issue grants to export oriented companies, foreign and domestic.	To supplement the Irish entrepreneurial initiative, upgrade Irish industrial skills (training of managers and workers) and contribute to the development of the indigenous industrial sector through profit reinvestment and the establishment of supply linkages with domestic companies.	The IDA in its current guise deals solely with foreign investors. It has become recognised as one of the world leaders/first movers of industry attraction. Today it supports close to 1,000 companies with average annual salaries of €44,000 that account for 93% of the value of Irish high tech exports.

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Table 1.1: Continued.

Name/Date	Description	Rational	Outcome
Telesis (1982)	Review of Irish industry that criticised the perceived over-emphasis on foreign-owned industry.	Argued against what it viewed as short-termism of the FDI approach. Recommended the identification and support of 'winners' in Irish industry.	White Paper on industrial policy, 1984. A more 'equitable' corporate tax concession across all industry, foreign and domestic of 10%. Linkages programmes. Establishment of the Irish Science and Technology Board.
Linkages Programmes (various)	Carried out through bodies like Forbairt and the IDA, these programmes exploit linkages between indigenous operations and newly arriving foreign owned subsidiaries of multinationals.	See above.	Limited success. Breathnach and Kelly (1999) show that from 2,667 indigenous firms, only 174 were sub-suppliers, the majority of which were low level plastics and packaging manufacturers.

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Table 1.1: Continued.

Name/Date	Description	Rational	Outcome
Culliton (1992)	Another industrial review that recommended a broader approach to industrial policy. Highlighted the structural problems that affected the industrial sector including taxation, infrastructure, education and training.	Explicit focus of two separate agencies on indigenous and foreign firms. Resulting in the formation of Enterprise Ireland (focused on the former). The needs of the two were recognised as distinct and an agency dealing with each was deemed efficient.	First focus on R&D and improvement of industrial training as well as the promotion and use of best-practice technology in the Irish economy. Government response was 'conservative' (O'Sullivan, 2000).
Building Ireland's knowledge economy (2000-)	An interdepartmental steering group building on previous reports by the science council sought to bring together industrial policy in line with the Lisbon Agenda. National Development Plan sets Science Foundation Ireland (SFI) in motion.	By 2010 Ireland to be internationally renowned for the excellence of its research and be at the forefront in generating and using new knowledge for economic and social progress, within and innovation driven economy.	Explicit focus on R&D and building knowledge economy competencies. The linearity of the policy stance is noted in the 2003 document entitled Ireland's knowledge economy. R&D focus is more concerned with indigenous than foreign companies.

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Table 1.1: Continued.

Name/Date	Description	Rational	Outcome
Ahead of the Curve (2004)	Reflects on the disconnection between foreign and indigenous sectors. Identified a lack of an overall coherence particularly in terms of the future of the FDI model in Ireland.	Highlights SCM and R&D as areas of future focus, highlights weakness in Sales and Marketing.	Some recognition of the evolution of MNEs, but no defined place for foreign operations in national innovation policy. Emphasis on R&D of indigenous industries.
Innovation in Ireland (2008)	A policy statement that maps innovative progress to date along with identifying future trends.	Mapping innovation in Irish industry. Comparison with international standards and the identification of ten key policy areas that underpin the Government's approach to innovation in support of the knowledge economy and enterprise.	While highlighting some positive trends in R&D figures the 40 page report makes one mention of FDI and the IDA. The report reflects a policy stance that sees innovation as solely the domain of Irish institutions and indigenous companies.

Sources: Whitaker (1958); Industrial Development Agency (1998, 2002, 2008); O'Hagan (1995); Breathnach and Kelly (1999); IDSG (2005); Enterprise Strategy Group (2004); Collins (2007); Department of Enterprise Trade and Employment (2008).

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as ‘knowledge economy’, ‘innovation’ and ‘research and development’, suggesting to some extent an approach based on linear development.

Building Ireland’s Knowledge Economy (DJEI, 2004) set about promoting knowledge-based activity through the establishment of Science Foundation Ireland (SFI). Built on the American National Science Foundation experience, SFI received initial government backing of €675 million through the National Development Plan (2000–2006), with the objective of fostering research links between companies and universities (Grimes and Collins, 2009). At least 20% of overall funding of joint projects came from MNEs, with future plans for greater SME involvement. Although the initiative, to date, has had some success with collaborations between academia and research departments of MNEs, the involvement of SMEs has been less successful. One of the main obstacles to this is the underdeveloped framework for dealing with intellectual property issues (Breznitz, 2007; Keane and Garvey, 2006).

The review of Irish industrial policy, *Ahead of the Curve* (Department of Enterprise Trade and Employment, 2008), while presenting a very useful analysis of the recent period of development, reflects this disconnection between the FDI and indigenous sectors. While identifying very important lines for future development, it identifies a lack of coherence in terms of the future of the FDI model in Ireland. In relation to the ICT sector, the report suggests that this sector must move from its current areas of strength in production, logistics and hardware/software integration capabilities to become a significant node in the global ICT chain capable of producing supply chain solutions (Enterprise Strategy Group, 2004).

A more recent policy document restates the importance of innovation in the Irish economy: ‘In short, our ambition is to put innovation at the core of our policies and strategies for the future, so that Ireland becomes a leader in innovation’ (Department of Enterprise Trade and Employment, 2008: 1). The document refers to the State’s Strategy for Science Technology and Innovation and the €8.3 billion committed to improving Ireland’s innovative potential. Its sole reference to foreign-owned firms relates to their contribution to business expenditure on R&D. Opportunities for bridging the foreign-indigenous divide such as knowledge transfer, networks and clusters are ignored, while the

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only references to these policy instruments apply to Irish-owned SMEs working with universities and agencies such as Enterprise Ireland and Intertrade Ireland. The influence of European Commission influence is reflected in the frequent references to the Lisbon Strategy and the focus on SME collaboration (see Collins and Pontikakis, 2006).

Despite the dominant role played by FDI in the Irish economy for many decades, Irish industrial policy documents appear to be downplaying that role to some extent in favour of the need to promote indigenous development. The Forfás report on the future of the services sector, for example, while acknowledging the continuing importance of FDI in this sector, places considerable emphasis on the domestic service economy and also on the need to internationalise Irish companies (Forfás, 2008).

Table 1.1 gives an overview of Irish industrial policy since the late 1950s. As is made clear, a general appreciation is that Ireland from the 1990s increased its focus on growing a sustainable indigenous industrial base. The historical context of the 1950s is important: up to the end of that decade Ireland had pursued a highly protectionist industrial policy of import substitution industrialisation for over 20 years. Economic liberalisation in the form of the *First Programme for Economic Expansion* (or 'Whitaker report' (Department of Finance, 1958)) could be seen as a direct backlash to politically motivated economic traditionalism. Irish industrial policy fervently pursued liberalisation for the following three decades. Yet attempts have been made in the past couple of decades to shift the focus towards the indigenous part of the economy beginning primarily with the *Task Force on Small Business Report* in 1994 and most recently by the *Action Plans for Jobs* (2012a, 2013, 2014, 2015a).

Action Plans for Jobs were a direct response to the increase in unemployment that came about as the result of the economic collapse in 2008. In their analysis of the tech sector Collins and Grimes (2011) characterised it as easily divisible in two: foreign-owned and Irish-owned companies. They also highlighted the significant gap between the two. The indigenous group is distinguished by small operations, averaging 10 employees per firm, whereas the average employee for the foreign-owned group lies at around 175 per firm. The sector accounted for 16% of the total value-added for industry and services in 2011. In identifying the evolution of the sector, they cited Research and development (R&D)

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where over half the expenditure on business R&D was by companies in the technology sector. The maturation of the sector in Ireland is also borne out by productivity figures, with the major companies in the sector revealing slippage in recent years. Thus the sector can be described as one that has moved from low to high specialisation. With it, companies have moved from being characterised as labour intensive to knowledge intensive, focusing on markets with higher barriers to entry (Collins and Grimes, 2008, 2011).

This trend was intensified over the period of economic recession from 2008 to 2015. The sector suffered major job losses. Yet, Collins and Grimes also highlight that over a period of deep recession, Irish based tech companies also recruited in significant numbers. Jobs that were lost relative to jobs gained were distinguished by their value added nature. Ireland gaining in higher end services and losing is lower value manufacturing type jobs.

1.5 Considerations of This Evolution

The Irish technology sector consists of two subsectors divided along the arbitrary lines of nationality. Both can be deemed successful in their own rights, but it is the foreign owned sector that contributes most to the extraordinary statistical trajectories that have marked the Irish case over the past 15 years.

The case of Ireland is relevant for many countries and can justifiably be termed a test-bed for the globalisation experiment. Not only does the sheer presence of foreign investors warrant this claim, but so too does the longevity of their presences and their transformation and adaption to different global and organisational conditions. This puts Irish policy makers in the somewhat unenviable position of being first movers with regard to forming a truly unified industrial policy that looks beyond the nationhood of firms.

To do this requires a deep understanding of the emerging structures and strategies of the MNEs. There is a need to identify and categorise the ongoing transitions in the foreign-owned sector in Ireland, and the relative shifting of Irish operations within the global matrix of their respective corporations. The ESG's *Ahead of the Curve* went

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some way towards this, but without updating it stands the risk of becoming extraneous. As these Irish affiliates evolve and as more control is leveraged, inevitably these operations become more relevant to their local economies. Research within the indigenous sector shows how much easier it is for an indigenous SME to engage with foreign-owned subsidiary, the greater its level of autonomy (McKeon *et al.*, 2004).

Despite the IDA's relative success in continuing to attract new waves of FDI in the technology sector, it often appears as if this is primarily a process of substitution, seeking to replace functions and investments which are no longer competitive in Ireland by higher skilled activities. Obviously, this must be part of the policy thrust, but the longer term objective of creating a sustainable economic model must also be specified. To some extent, this is implied in the more recent push for a knowledge-based economy, and the concerted attempt to attract greater levels of R&D investment from both existing and new investors. The recent shift in the overall profile of inward investment in Ireland towards a more significant involvement in services also suggest the need to develop a broader approach towards promoting innovation beyond R&D. Policymakers need to articulate more clearly the comparative advantage of Ireland in relation to the services sector, which includes the increasing range of functions being acquired by multinational subsidiaries in Ireland in their servicing of international and global markets.

Policy has a long way to go before it can exploit the full benefits of these engagements such is the nature of the entrenched animosity towards foreign investors, not just in Ireland but beyond. The GATT-WTO principle of national treatment fuels this antagonism where foreign-owned firms are seen as outsiders, or threats to the domestic market (Costa and Fillipov, 2008; Kokko and Blomström, 1995). More relevant to the Irish case is the inherent mistrust of the EU towards multinationals. Industrial and innovative policy reflected in documents such as those of the Lisbon Strategy reflect an ideology behind the broader European experiment which places the emphasis on SMEs rather than multinationals, with little or no mention of non-European operations.

Across the world national policies to promote entrepreneurship (technology entrepreneurship in particular) are concentrated on domestic

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small and medium firms (Edquist, 2004; Hemphill, 2005). For Ireland to lead the way in terms of lessening the gap, policy measures would need to promote intrapreneurship among mangers of foreign-owned subsidiaries. This has to involve developing their abilities to identify and benefit from opportunities within the corporation network that can improve their subsidiary status. Previous work explicitly related to the Irish case has already highlighted cases of best practice of organisational transformation in the technology industry and beyond (O'Riain, 2004a; Van Egeraat, 2006).

Looking beyond the nationality of firms will require a significant step regarding entrenched policy thinking. In a time of economic uncertainty Irish policy needs reappraisal, to ensure a sustainable outcome as a competitive knowledge economy the country needs to lead the way in combining the facets of disparate sectors.

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