

The Development and Growth of the Software Industry in Ireland: An Institutionalised Relationship Approach

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ABSTRACT

Ireland's software industry emerged in the 1970s and 1980s due to significant international developments and, more importantly, the industrial policy approach adopted in Ireland. The attraction of software Foreign Direct Investment (FDI) during these decades was followed by the emergence of an internationally competitive Irish software sector. A multitude of factors combine to explain the trajectory of software in Ireland: from developments related to globalisation and international trade, to policy makers' efforts to promote an industry where Ireland could forge a comparative advantage internationally. An analysis of industrial dynamics and institutionalised relationships furthers our understanding of significant developments in the industry in terms of interactions between firms, government and other stakeholders. This paper makes a novel contribution by analysing Ireland's software industry within the institutionalised relationship (IR) framework. The IR approach we employ focuses on the finance IR, the purchase IR, the employment IR, and the commercial IR. The adoption of the IR framework approach is particularly insightful in the Irish case as it facilitates a multifaceted analysis of the complex relationships that have moulded the Irish software industry. Such an approach also facilitates a study of the policy implications and policy prescriptions that are pertinent to the software sector.

KEY WORDS

Software sector, Ireland, multinational enterprises, indigenous, industrial dynamics, institutionalised relationships, profit switching transfer pricing, unionisation, national wage agreements, labour mobility

JEL classification: L; L6; L8; O

Introduction

Beginning in the late 1950s (Department of Finance, 1958), the Irish government embraced an outward-looking industrial strategy that led to Ireland's emergence as a significant home for foreign direct investment (FDI). As highlighted in several studies (e.g. Sands, 2005 and O'Riain, 1997), the Irish software industry has been a core element in explaining structural change and economic development. Ireland's strategy of industrialisation by invitation suggests a strong involvement of the state (of political actors) when compared with other EU economies; this implies the necessity to integrate political and economic dimensions when studying industrial development.

This paper identifies a methodology that differentiates itself from previous studies. Using Jullien and Smith's (2008) institutionalised relationship (IR) framework, this study extends the work of previous authors in seeking to identify dynamics evident in the software industry and its institutionalised relationships, including finance, purchase, employment and commercial IRs. The prime concern of the paper is to highlight relationships that have developed since the 1970s between foreign multinational enterprises (MNEs), indigenous firms, the state and other stakeholders and how these relationships have shaped the structure and evolution of the Irish software industry. The adoption of the IR framework to study the software industry is one major contribution of this paper. The paper connects the central actors (e.g. policy makers and unions) involved in the development and growth of the software industry and facilitates an analysis of the sector over a long timeframe.

The IR framework has key merits in that it (i) supports a holistic analysis of an industry and (ii) not only considers the process of globalisation in terms of software but

argues that globalisation can be seen as a “vector for the renewal of economic, social and political diversity” (Jullien and Smith, 2008. p. 1). In contrast to the traditional approach to globalisation, which discounts actors, the IR approach places actors at the centre of the globalisation process. Moreover, the IR approach highlights the ways social and political actors work to influence change in the inter and intra industry relationships which structure daily practice in industries.

There are several benefits to analysing Ireland’s software sector in the manner outlined above. Firstly, a summary of the major trends that have guided the industry provides a basis for subsequent in-depth analysis through the IR framework. Secondly, the rationale for the IR approach allows for a multifaceted analysis of the complex relationships that have moulded the Irish software industry over the last number of decades. In this way, the paper provides a novel approach to analysing the industry. Characterising an industry *vis-a-vis* its four IRs provides a useful and solid platform from which to generate studies such as that of the software industry which explicitly combine economic and political dimensions of an industry. As highlighted later, such an approach also facilitates a study of policy implications and potential policy prescriptions for particular sectors such as software and also for policy interventions more generally. Moreover, by conceptualising as IRs what neoclassical economists merely reduce to factors regulated by price, the IR approach operationalised here for the case of the software industry in Ireland, identifies why studying the social relationships through which an industry is regulated can prove insightful. Even if it is indeed the case that the regulation of an industry is ‘market driven’, the IR approach acknowledges that this occurs within a set of enduring relationships which always contain both political and functional dimensions. Such a holistic approach is far more insightful to the study of a dynamic industry such as Irish software. This approach is particularly useful

because it encourages deeper exploration as to the degree to which the software industry in Ireland has/has not been globalised. The issue of globalisation has a certain immediacy for actors in industries such as Irish software where it has a direct influence not only with respect to operational but also strategic issues.

Taking these observations forward, a key question this paper seeks to answer relates to what this novel approach (the IR approach) adds to our understanding of the development of the software industry in Ireland? Moreover, our analysis seeks to identify what such an approach contributes to our understanding in terms of policy implications for the software industry?

The remainder of the paper is organised as follows: Section 2 provides an analytical exposition of the IR framework; Section 3 suggests an overview of the major trends that have been witnessed in the software industry in Ireland over four decades; Section 4 employs the IR framework (comprising the finance, purchase, employment and commercial IRs) to analyse the Irish software industry in a holistic way; Section 5 looks at what the IR approach adds to our understanding of the development of the software industry in Ireland from a policy perspective and Section 6 presents conclusions.

The Institutionalised Relationship Approach

Finding its roots in the work of Imai and Itami (1984), the IR approach has been conceptualised by Jullien and Smith (2008) in order to capture and explore the ways in which complex actors relate to each other in their daily activities within and between industries. As

suggested previously, these actors are complex in the sense that they are not – as in standard neo-classical theory – reduced to being solely economic agents whose activities are simply regulated by market-determined prices. Such actors are politically and socially motivated, and the relationships that ultimately structure the various industries “stem from social and political compromises” (Jullien and Smith, 2008, p. 5). The IR approach, therefore, provides a useful framework for analysing production and exchange activities at the meso-economic level, a level of analysis overlooked in Imai and Itami’s work. Institutionalisation implies the delineation, implementation and consolidation of rules, and the stability of these rules guarantees the durable processes of production, marketing and competition. Production processes are sustainable through regulatory mechanisms determined at four different levels (sub-state; state; EU; and global), whereas different IRs can be regulated at different levels in the same industry. When regulatory processes (coercion or co-operation) fail to engender stable institutions, change will take place through de-institutionalisation and re-institutionalisation (i.e. new rules). The IR approach allows actors to choose whether to conform to existing institutions or distance themselves from them (termed “subscription” or “extraction” by Jullien and Smith, 2008). Moreover, as noted by Jullien and Smith (2008) the IR approach also facilitates a framework of analysis which helps to go beyond a sterile opposition between the ‘sectoral analysis’ largely promoted by industrial economists and statisticians versus the analysis of politico-administrative sectors largely promoted by political scientists. More specifically, the IR approach highlights that each industry possesses both functional and political elements which simultaneously play out within and across the four IRs. This is a key issue emanating from the IR literature which is applied in this present study.

Going beyond Imai and Itami (1984), who consider three domains of analysis, the IR approach focuses on four domains: the finance IR, the purchase IR, the employment IR and the commercial IR. The finance IR deals with the institutions that manage capital; accountancy practices and all the laws dealing with the financial institutions, including the stock exchange, are of paramount importance here. The purchase IR relates to inter-firm relationships that encompass the procurement of raw materials and inputs (sub-suppliers) as well as processors. The employment IR relates to the rules, actors and expectations that mediate employer-employee relationships: these include labour laws as well as conciliatory practices falling under the heading of ‘industrial relations’. The commercial IR involves downstream actors through marketing and other selling activities. The latter domain connects production and wholesale activities to retail activities by mediating the different objectives and interests of the different actors involved. The merits of Jullien and Smith’s framework over the *Varieties of Capitalism* (VoC) approach (Hall and Soskice, 2001) are that (i) the VoC approach only envisages one form of industrial regulation (that existing at the level of the nation-state) and (ii) the VoC literature is virtually silent on the purchase IR; this dimension is simply appraised through broad inter-firm relations.

The importance placed by the IR approach on the meso-economic level implies looking at how industries in a particular country can be influenced by trends that have been shaped elsewhere. For example, the approach is well suited to analyse how global conceptions of firm control can be imposed upon a specific home industry. Consequently, the IR approach is most adequate to describe and analyse the phenomenon of globalisation and the impact of this phenomenon on industries in general. Given the openness of the Irish economy, this approach is therefore *a priori* ideal for studying industrial dynamics in Ireland. Moreover, the size of the economy (4.5 million people) provides another reason for using the

IR approach, which is centred on the political dimension of intra- and inter-industry economic relationships. With respect to the software industry in Ireland specifically, the issue of globalisation has certain immediacy for actors in the sector where it has a direct impact *vis-à-vis* both operational and strategic issues.

The study of specific industries through the prism of the IR approach has often been conducted at the level of a narrow geographical level, such as in the case of the Scottish fisheries industry (Carter, 2008) and foie gras industry (Jullien and Smith, 2008), which are embedded in a region or narrow territory (or *territoire*) corresponding to a small catchment area and are thus comparable to a small-sized country such as Ireland. The current paper tests this comparability. In these geographically confined spaces, cultural and geographical proximity between actors is likely to favour political interaction (Beccatini, 1991). Thus, however novel, in the case of the software industry in Ireland, the IR approach appears apt as a method of analysis.

Another reason for using this approach to study the software industry in Ireland stems from the fact that, to our knowledge, the IR framework has rarely been applied to relatively high-knowledge intensive industries. Indeed, the closest “high-tech” industry to be studied using the IR framework to date is the pharmaceutical industry (Montalban, 2008). This is further evidence of the how analysing the software industry by way of the IR approach is indeed novel.

In short, the real benefit of characterising an industry in terms of its four IRs is that it provides a firm starting block from which to develop studies that explicitly integrate both the political and economic dimensions of that industry and this approach, in turn, also supports the development of industry specific policies.

Before we apply the IR framework, the ensuing section will briefly review the main trends in the selected industry.

Major Trends in the Software Industry in Ireland

Several major trends are evident in Ireland's software industry since the 1970s¹. The domestic and international influences of these trends have combined to shape the structure of the industry over time. In the current analysis, these trends are summarised with respect to three topics: (i) the emergence and development of the industry in the 1970s and 1980s; (ii) the growth of the industry in the 1990s; and (iii) the dotcom recession and beyond.

Giarratana *et al.* (2005) and O'Malley and O'Gorman (2001) help to inform this approach by pointing to numerous waves of development in the Irish software industry. They cite the 1970s and early 1980s as periods when the first foreign software manufacturers entered Ireland; these firms were involved in low-value activities such as the mass production of packaged software. A second wave in the 1980s saw world-leading firms such as Microsoft, IBM and Oracle enter the country and undertake similarly low-value activities.

Van Egeraat and Jacobson (2004) note that the decision of Digital Equipment Corporation to establish a minicomputer manufacturing facility in Ireland in 1971, was a strong motivating factor in the decisions of many foreign computer hardware and software firms to locate their operations in Ireland in the 1970s (the so-called 'demonstration effect'). These operations were however, mainly assembly plants. Consequently, shrinking demand for minicomputers coupled with an economic crisis led to many of these plants shutting down operations in the early 1980s. A shift in Industrial Development Authority (IDA)² policy

focus from minicomputers to microcomputers in the early 1980s led to Apple arriving in Ireland to assemble PCs which subsequently led to the entry of many other computer manufacturing firms such as Intel. Increasing competition from branded microcomputer manufacturers and a shift of production to lower-wage economies led to significant plant closures and job losses in the Irish computer manufacturing industry between 1998 and 2002 (Van Egeraat and Jacobson, 2004).

Malerba and Nelson (2011) argue that in terms of the software industry, Ireland can be classified as one of the “first wave” of catch-up countries (implying a learning process) to emerge in the 1970s and 1980s (along with other countries, such as India and Israel). A third wave during the 1990s saw the entry of foreign firms such as Intel and Novell and the initiation of a much wider range of activities, including software development, localisation and customisation. Giarratana *et al.* (2005) highlight that the indigenous industry emerged in the 1990s but they do not characterise it as a specific wave of development. Given its importance to the development of the industry, this paper argues that it should be classified as such. Collins (2007) argues that the rise of a vibrant indigenous sector, linked directly or indirectly to the expansion of foreign firm activity, is a vital indicator that Ireland had reached a turning point in the 1990s. Because firms in the indigenous software industry are involved in a large range of activities, from product orientation to service provision, salient differences between foreign and indigenous firms are highlighted in this paper.

Using Giarratana *et al.*'s wave approach (2005), this paper amalgamates waves 1 and 2 in an analysis of the emergence and development of the industry. Wave 3 is combined with the development of the indigenous industry in the 1990s. Thereafter, the paper adds to the existing literature by identifying a final trend – the dotcom recession of 2001 and its effects

on the industry. Given the rather long timeframe analysed, this framework is useful and, in addition, lends itself to a more in-depth analysis of the industry in Section 4.

The Emergence and Development of the Software Industry in Ireland in the 1970s and 1980s

According to Buckley (2010), factors leading to the emergence of Ireland's software industry include both foreign and domestic developments, the latter within the remit of policy makers, the former characterised by the process of globalisation. Arora *et al.* (2004) and Collins (2007) highlight new technology, global growth in demand for information technology (IT) and a gradual shift towards global production networking as central explanatory factors for the success of the software industries of Ireland, Israel, Finland and India. Pointing to the export orientation of the industry, the authors stress the importance of US MNE outsourcing and Ireland's ability to take advantage of this phenomenon. In this regard, the important role played by policy makers in Ireland has been widely noted in the literature (Coe, 1999; Crone, 2002). This is an important aspect in terms of the IR approach where we see inter-firm and policy maker relationships positively influencing the industry. In some instances, these relationships cannot simply be explained using economic data therefore the IR approach is more useful in developing such an analysis.

The entry of foreign software MNEs was the major trend in the early stages of the development of Ireland's software industry. We largely concur with Barry and Bradley (1997, p. 21) when they contend that, given "...the high profile attached to the attraction of multinationals", such an approach may have led to some neglect of indigenous firms³.

The Expansion of the Irish Software Industry in the 1990s

The entry of many foreign MNEs produced significant growth within the Irish software industry throughout the 1990s. Central to this growth was the combination of international demand for software products and services and significant policy decisions taken by the Irish government. Table 1 provides an overview of the growth of the industry since the 1990s.

(INSERT TABLE 1)

Table 1 depicts major trends by distinguishing between indigenous and foreign-owned firms in relation to four indicators: employment in the industry; number of firms; sales revenue; and exports. The data related to software development should be seen as indicative of the industry as a whole although they do not represent all software activity over the period defined⁴. A number of features are worthy of note. Firstly, employment in the industry is quite evenly split between the MNE and indigenous sectors. This even split in employment numbers is not common in Ireland, where MNEs tend to dominate even over a comparable indigenous sector. Collins (2007) notes how both foreign and Irish software firms have almost equal shares in total employment in the sector. However, when account is taken of the fact that Irish firms outnumber MNEs, large variation in the numbers employed in individual operations is observed. Before the critical year of 2001, all data showed continued growth in all variables. Employment grew to over 30,000 in the industry; the number of firms increased from 365 in 1991 to 1,015 in 2001. As evidenced in Table 1, this growth was led by the indigenous sector. Indeed, the growth rate in the number of firms, sales and exports is higher for the indigenous sector than for the foreign-owned sector. Although the volume of overseas exports is significantly higher than in the indigenous sector⁵, the growth rate of indigenous exports (at nearly twice that of foreign exports) is significant. Indeed, in comparison to software-producing countries like Israel and India, O’Riain (1997) finds that Irish indigenous exports are internationally competitive. Thus, the salient trend apparent in the 1990s is the

emergence and growth of a dynamic indigenous Irish software sector. While the reasons for this growth are further explored in Section 4, this section concludes by outlining developments related to the dotcom recession in 2001 and the subsequent performance of the industry.

The Dotcom Recession and Beyond

The downturn in economic activity in the information and communications technology (ICT) industry in 2001 represented a significant contraction in relation to previous downturns in terms of the length of time needed for recovery (Forfás, 2008).

Table 1 illustrates how the software industry was affected by the severe downturn in ICT in 2001. With 5,000 jobs lost, both employment and the number of firms declined over the two years following the dotcom crash. Significantly, 115 firms were either closed or taken over between 2001 and 2003; all of these losses occurred in the indigenous sector. According to Breznitz (2010), this poor performance is to a large degree due to the lack of availability of funding specifically for indigenous start-up software firms. Breznitz highlights deficiencies in Enterprise Ireland⁶ at this time and in the agency's approach to providing support to new firms. In O'Riain's view (2010), changes in the ideology of state agencies became a severe hindrance to the development of new indigenous software firms. The nature of this change, according to O'Riain, related to a shift towards market managerialism and away from development network statism which resulted in a process which downplayed the potential of indigenous industry. Such firms (mainly SMEs) encountered barriers including the administrative burdens associated with regulatory compliance. These are interesting views in the context of the IR approach. This interaction between the state (through its business

development agencies) and firms appears to have shaped the software industry less positively than this interaction had done previously, at least for indigenous firms, at this time.

Figures for sales and exports suggest that indigenous and overseas firms were not equally affected by the downturn after 2001. Indigenous sales and exports boomed until 2002, with sales reaching €1.6bn, 85 per cent of which were exports. However, the following year saw a €400m contraction in sales and a fall in the share of exports from 85 per cent to 81 per cent, indicating a decline in international demand. Overseas sales in 2003 had increased by €2.3bn compared to 2001; export intensity related to these sales amounted to 98 per cent in 2003.

Although the lack of up-to-date data on the industry as a whole means that 2007 figures are not strictly comparable to previous data, data for a more recent period are useful as an indication of the medium-term trajectory of the industry following the 2001 contraction. In terms of sales and exports, Table 1 indicates performance similar to that of the industry in the 1990s, with strong growth evident across indicators for both foreign-owned and indigenous firms. In later years, foreign-owned firms once again dominate. In terms of growth, the indigenous sector appears to have performed quite well, arguably indicating a relatively quick recovery. However, exports as a percentage of sales in the indigenous sector fall far short of those of foreign-owned firms and of previous figures on the indigenous sector itself. This suggests that the performance of indigenous firms in the industry was led by domestic rather than foreign sales throughout this period. This is seen more clearly when compared with figures for exports as a percentage of sales for foreign MNE counterparts. Growth is evident in most indicators for both domestic and foreign firms, the only exception being exports as a percentage of sales, which fell slightly for indigenous firms post-2005 and

foreign firms post-2006. On the whole, the industry appears to have performed quite well over the period 2003 to 2007.

It may be possible to think of the Irish software industry as two distinct entities, with foreign and domestic firms operating largely in different spaces. A number of factors encourage this thinking. Firstly, Table 1 indicates that while the export intensity of both sectors is very high, the MNE sector consistently has exports as a percentage of sales in the mid to high 90 per cent. These figures confirm the fact that Ireland is very much a base for operations for MNEs; this is becoming more true for indigenous firms, whose exports as a percentage of sales have increased over time. Secondly, the foreign sector is dominated by product-oriented firms while the indigenous sector has a broader mix of activities. The volume of export activity in the foreign sector and the divergence in activities undertaken suggest that there may not be many significant links between the sectors. This may help to explain why the 2001 dotcom recession had a greater impact on the indigenous sector. This possibility raises a question: If there were more established business links between the foreign and domestic sectors, would indigenous firms have struggled as much as they did in the 2001 recession?

Evidence of an indigenous software recovery is also suggested by Enterprise Ireland in its annual reports from 2004 to 2009. In an attempt to support the industry, Enterprise Ireland established a “sectoral business unit” for software, services and emerging sectors⁷ (Enterprise Ireland, 2005, p. 9). In addition, export growth of 10.4 per cent and 9.1 per cent was recorded in 2004 and 2005 respectively (Enterprise Ireland, 2005, p. 10; Enterprise Ireland, 2006, p. 10). The year 2009 saw the sector remain competitive despite an overall fall in total export sales in Enterprise Ireland-supported companies.

In terms of employment, Enterprise Ireland (2009) highlights software as a key growth sector. Summarising employment in the ICT sector from 1996 to 2006, Forfás (2009) provides a breakdown of activities within the ICT sector that shows that the software and hardware industries dominate ICT employment. At the peak of software employment in 2001, over 30,000 people were employed in the industry; according to available figures, employment contracted to around 26,500 in 2003. Thereafter, employment began to rise again. By 2006, nearly 28,000 people were employed in the software industry, which represented by far the largest proportion of people employed in ICT in Ireland (Forfás, 2009, p. 47). Furthermore, Giblin (2011) indicates that employment in the industry continued to grow after 2008. Some recent estimates show that ICT services alone have accounted for more than half of the export growth since 2007, due increasingly to large firms such as Microsoft and to smaller firms in the games software area⁸.

While the sources of these employment figures vary, a persistent theme is that the industry appears to have recovered to 2001 levels by 2008/2009. Growth rates recorded in 2004 and 2005 indicate that export performance had begun to recover. It appears that the industry had not done much more than regain the position it lost during the dotcom recession in 2001, which only serves to magnify the severity of the 2001 contraction.

In summary, the major trends in the software industry since the 1970s are emergence and growth. Growth halted for one prolonged period in the 2000s with the indigenous sector affected more significantly than MNEs. From the mid-2000s onwards, the industry has recovered regaining many of the jobs that were lost at the beginning of the decade.

Why the software industry developed and changed the way it did, as we have outlined above, is examined in detail in the section that follows. We make use of the IR approach in order to explain the development of the industry. However, we do this not just in terms of

economic data related to the software industry but also by attempting to shed light on the meso-economic/political interactions and relationships that have facilitated development in software. More specifically, the analysis focuses on how relationships between firms, the state and other stakeholders through the IR framework lens, combined to alter the course of the industry since the 1970s.

Applying the Institutionalised Relationship Approach

To date, the IR framework has been applied to the European automobile industry (Jullien, 2008), the wine and pharmaceutical industries (Montalban, 2008), the Scottish fisheries industry (Carter, 2008), the French foie gras industry (Jullien and Smith, 2008) and the US defence industry (Moura, 2008). This section uses the IR framework to analyse the Irish software industry in more depth. As suggested previously, the Irish software industry provides an ideal laboratory to study the application of the IR approach. There are a number of reasons for this. Firstly, an analysis of industrial dynamics and institutionalised relationships furthers our understanding of significant developments in the software industry in terms of social and political interactions between firms, government and other stakeholders. Secondly, in utilising the IR approach, we find the ability to reflect on very different parts of the software industry within a common framework. Moreover, the IR approach facilitates this analysis over a reasonably long time frame. Thirdly, given the ways social and political actors work together to influence change in this industry, we can use the IR approach to better analyse these influences. Moreover, the software industry's attributes in terms of its positioning within a small open economy like Ireland's makes the Irish software industry more conducive to analysis within the IR framework.

The Finance IR

The finance IR relates to the institutions that structure how firms in an industry administer their finances, with a specific focus on capital investments and the management of operating costs (Jullien and Smith, 2008). In particular, accounting, banking and stock market laws are of key importance here. However, as aptly highlighted by Jullien and Smith (2008, p. 4), “Beyond such legislation ... each industry tends strongly to have developed its own set of standardised practices and patterns of power”. This is true of the software industry in Ireland. In this case, the finance IR facilitates an appraisal with reference to the differences in firm size and nationality, in addition to issues of financing, along the lines discussed previously. Because of such differences, issues of profit repatriation and transfer pricing based on an advantageous tax structure are discussed in relation to foreign MNEs, whereas venture capital and SME finance are discussed in relation to the indigenous sector. This approach is informed by Carmel (2003), who identifies domestic and foreign sources of capital applicable to software industries and as a result we see two different settings within which actors institutionalise their relationships. At the domestic level, these include government funding, venture capital, investment capital and equity offerings (i.e. both public (government) and private (market) sector IR settings). In relation to foreign finance, sources of capital include loans, venture capital, investment capital and equity offerings (i.e. a private (market) IR setting). This on-going dichotomy between the domestic and the foreign sectors, in the case of the Irish software industry, lends itself to analysis within the IR framework. The finance IR’s relevance to this analysis is in its ability as a framework to capture the dual aspects or relationships that exist on both sides of the industry in terms of domestic firms and foreign firms.

The data presented above indicate that the indigenous sector is dominated by a large number of SMEs. While access to finance is essential for the development of SMEs, evidence suggests that small firms generally have less access to formal sources of external finance than other firms (CSO, 2011; Credit Review Office, 2010; Forfás, 2011a). The case of software firms is, however, unclear. The Credit Review Office (2010) pinpoints skills deficiencies in the main Irish banks in relation to SME lending in general. The office also alludes to banks' difficulties in identifying the net worth of many SMEs. The combination of these factors may hinder firms from accessing the finance needed to sustain or expand their activities (or, in the worst-case scenario, to survive). The CSO (2011) confirms this possibility by providing statistical evidence of a decline in access to finance for SMEs in Ireland in the last number of years. However, the CSO's analysis suggests that the ICT sector (of which software is a pertinent part) is the least affected by declining access to finance. Unfortunately, the lack of disaggregation within the CSO (2011) data means that, with respect to software specifically, this point only relates to the broader ICT sector, thereby making this finding indicative rather than definite.

These data appear to confirm major trends that have become evident in the indigenous sector in recent years, as highlighted in Section 3. In particular, Table 1 seems to indicate a rather quick recovery in the software industry in the period after 2001. However, in 2009, Enterprise Ireland called for an increase in funding for indigenous software firms as a priority in coming years, which suggests that access to finance is, or at least has become an issue for the SME-dominated indigenous sector. The evidence here however, is somewhat mixed, since low entry barriers (such as financial capital requirements) in this industry may imply that finance is not such a critical factor for software firms. In terms of domestic software SMEs, the finance IR contributes to our understanding of the industry in terms of how the

relationships between firms, policy makers and financial institutions have changed over time. This change has seen small firms in the industry arguably finding it more difficult to access finance. This, in turn, has implications for firm growth and the possible restricting of Irish software firms size and may go some way towards explaining why the Irish software industry remains an SME dominated one.

A key aspect of the finance IR in relation to foreign firms in the software industry is the degree to which profit switching transfer pricing (PSTP) is notable in Ireland. Evidence of this practice, although only anecdotal at times, has been noted by various authors (O’Riain, 1997; Görg *et al.*, 2002; Barry and Bradley, 1997). Due to the sheer volume of MNE software activity in Ireland over the last number of decades (especially the manufacturing of packaged software), PSTP has been a recurring issue that distorts official figures presented in relation to foreign software MNEs. O’Riain (2004, p. 648) states that “parts of the software industry contribute to the ‘black hole’ of financial flows through Ireland which generate corporate tax for the national economy but have few other economic benefits”. In other words, Ireland’s role as a base for software MNE activity allows much of the profit generated by MNEs to be repatriated to the firms’ home locations.

In this regard, the finance IR highlights a recurring theme in the above discussion: software MNEs in Ireland appear to be little more than export vehicles. In terms of investment opportunities for foreign software MNEs, Ireland is arguably seen as a base of activity and a place to make large profits with little pressure from the Irish state to reinvest those profits in Ireland.

The finance IR contributes to our understanding of the industry by allowing us to *inter-alia* account of the role of policy makers in continuing to facilitate MNE activity and

FDI that has, at times, limited economic contribution to the Irish economy outside of employment benefits.

The Purchase IR

The purchase IR relates to the establishment of rules and norms through inter-firm relations that mediate production in a given industry (Jullien and Smith, 2008). More specifically, as outlined by Jullien and Smith (2008, p. 4), “This is the relationship through which rules and norms are established regarding producers of raw materials and processors ...”. The establishment of such rules and norms in the software industry in Ireland can be seen in the interactions between foreign and domestic software companies and indeed it is in the interaction between foreign and domestic firms that we see the main setting for the purchaser IR. One way the risk connected with the dominant footloose MNEs can be minimised is by embedding them in the host economy through the creation of linkages. Examining the case of networking activities in the Shannon region of Ireland, Andreosso-O’Callaghan and Lenihan outline that although the networking activities with respect to production linkages are dominated by backward linkages, a substantial difference exists between Irish and foreign firms in terms of forward linkages. More specifically, they find that “a substantially higher proportion of foreign firms (23%) sell intermediate products to other firms, when compared with Irish firms (15%)” (2008, p. 574). The authors take this to suggest that foreign firms are more integrated than their Irish firm counterparts in international systems of production, given that forward networking activities are more prominent among foreign-owned firms. As shown by Green *et al.* (2001), large ICT operations (such as Digital in the 1990s) primarily and solely in research linkages with local actors. The significance of this IR to the overall analysis relates to the purchase, not only of “raw materials or processes” but also, in the case of the Irish software industry, the purchase of, or setting up of new domestic Irish software

businesses. In utilising the purchase IR to analyse the development of the industry in this way, we gain a deeper understanding of the software industry in Ireland more generally.

O’Riain (1997) notes that Irish managers of MNE software companies initially encouraged a local base of vendors, including firms within the printing industry, to expand and seek increasing amounts of outsourced work from the software sector. As a result, new Irish spin-off software firms⁹ were formed to take advantage of the opportunities flowing from the MNE sector. Giblin (2011) traces the emergence of the Galway software cluster to the closure of a foreign computer hardware manufacturer, Digital Equipment Corporation (Digital) in Galway in 1993. The development of the software cluster in Galway was further aided largely by the success of an indigenous software firm, Toucan, as well as the emergence of business start-ups using managerial skills in Digital (Giblin, 2011).

The evidence suggests that, for a number of reasons, the purchase IR is more influenced by foreign-owned than domestic firms in the software industry. Firstly, the foreign sector established itself in Ireland before the indigenous sector. Secondly, evidence suggests that the foreign sector played a significant part in fostering product and service quality which was subsequently transferred to domestic firms through labour mobility and firm spin offs. O’Malley and O’Gorman (2001) support this view, arguing that foreign firms’ high standards positively influenced indigenous suppliers in terms of quality and standard. O’Riain (1997) adds that new suppliers tended to import into their businesses the practices evident in larger foreign MNEs.

The Employment IR

According to Jullien and Smith, the employment IR relates to issues surrounding relationships between employees and employers and how these relationships have changed

over time. More specifically, the employment IR "... is the configuration of rules across actors and expectations through which employer-employee relations are mediated" (2008, p. 4). In terms of how the various actors come together to institutionalise their relationships through political and social compromise within the employer IR, this relationship is institutionalised in terms of the State and its employment laws and regulations. This IR takes account of the mediation role of the state and, in Ireland's case, of supra-national organisations such as the EU. The employment IR includes employment law, including training initiatives, and concerns itself with issues of industrial relations. As we have outlined previously, one of the central benefits associated with the software industry in Ireland relates to employment generated by both foreign and domestic firms. This focus on jobs, training and policy makers' role in incentivising this particular aspect is a significant factor in the relevance of the employment IR to this analysis.

Ireland's employment legislation has been heavily influenced by the EU¹⁰, whose directives have filtered through to state legislation since Ireland joined the EEC in 1973. Notable examples include the Equal Status Act 2000, the Equality Act 2004 (which sought to implement the EU Race Directive) and the Civil Law (Miscellaneous Provisions) Act 2008, which sought to implement the Gender Goods and Services Directive 2004¹¹. These examples position the EU as a key influencer in the employment IR.

The significant factors influencing the employment IR are broadly based and, in the Irish case, apply across many industries. Bearing this in mind, the current discussion focuses solely on the software industry. Three central factors are discussed: unionisation, national wage agreements (NWAs) and labour mobility in the industry.

Gunnigle *et al.* (2005) argue that the employment IR in Ireland can be shaped by two phases: (i) an initial recognition of unions by firms and state agencies, notably IDA Ireland,

and their participation in collective bargaining within the NWA framework; and (ii) a subsequent shift by state agencies to a union-neutral status with knock-on effects for foreign (especially US) MNEs' dealings with unionisation. Importation is a significant aspect of the employment IR due to the reactionary Reaganite attitude to unionisation in the US and the subsequent realisation by Irish government officials that they would have to follow suit if they wanted to compete effectively for FDI. Given the rather large presence of US software companies in Ireland, the importation of the employment IR is notable in the case of software MNEs in the country. In addition, the employment IR provides further evidence of the facilitatory political and enterprise environment that evolved to attract and retain such firms.

The indigenous software sector also avoided unionised employment but for different reasons than those of their foreign counterparts. Wallace (2003) finds that smaller firms are less likely to be unionised because of significant diseconomies of scale for unions. Essentially, smaller firms are less likely to be unionised because managers have the capacity to deal with issues on a one-to-one basis. This finding applies to the indigenous software sector in Ireland because it is populated to a large degree by SMEs and is reinforced by the voluntary nature of the collective bargaining process in Ireland and the lack of a legislative framework, which would give Irish unions more power.

In light of the above, it appears that foreign software MNEs have driven initial development and subsequent alterations in the employment IR, while policy work in the background has supported the foreign software MNE sector.

However, questions have recently arisen as to the benefits to foreign software MNEs of avoiding unionisation and the collective bargaining system. A study conducted by McGuinness *et al.* finds 'that average labour costs were higher in firms implementing individual agreements and business-level bargaining, and that the NWA exerted a largely

neutral influence on labour costs, relative to the base case of a mixed wage bargaining system' (2010, p. 612). Thus, foreign software MNEs may not have benefited from their dominance of the employment IR with respect to unionisation.

In the current paper, we argue that the employment IR improves our understanding of the software industry through bringing together, and into focus, a number of different forces and relationships that have combined to influence the trajectory of the industry in Ireland in terms of employment.

A final note of importance in the Irish case is the perceived degree of labour mobility in the industry. The labour mobility channel is the one through which spin-off effects flowed from the foreign sector to the indigenous sector (Buckley, 2010). As noted by Giarratana *et al.* (2005) in relation to the closure of Digital Equipment Corporation in Galway in 1993, two factors have been highly influential in relation to labour mobility: (i) the technical and managerial expertise gained by Irish employees in foreign MNEs, and (ii) the increased skill levels gained from intensive training within these MNEs. Irish indigenous start-ups derived more benefit from the transfer of skills than did start-ups in comparable software industries (e.g. Israel and India). In addition, state investment in education (courses related to software) can arguably be viewed as central to Ireland's software story (Collins, 2007; Begley *et al.*, 2005). Considering this investment in conjunction with the further training provided by foreign software MNEs and the labour mobility spin-off channel helps to explain why Ireland has excelled in this industry, both domestically and internationally.

It can be argued that within the employment IR, a flexible labour market is evident and has developed more and more over time. In terms of the foreign MNE sector, this flexibility manifested itself through non-unionised workers and was imported by the strong

contingent of US firms who set up in Ireland while being facilitated by policy makers. Irish software firms, because of their small size, also add to the flexibility of this labour market.

The Commercial IR

The commercial IR relates to the institutional structuring of the sale and marketing of goods and services in a given industry. As outlined by Jullien and Smith (2008, p. 4), “Typically, this IR mediates the objectives and interests of producers ... or wholesalers ... on the one hand, and retailers ... on the other”. In the case of software in Ireland, we identify the institutional framework that facilitates and mediates the interests of the firms operating in the industry and selling into predominantly international markets. The relevance of the commercial IR is particularly pertinent in the case of the Irish software industry in terms of the sale of software goods and services and the associated production and retail chain that exists in Ireland. This is related to the phenomenon of very large software multinational enterprises using Ireland as a base for large scale exporting activity. It is this phenomenon that makes the commercial IR a significant dimension of analysis in this paper. There are interesting social and political compromises at the heart of this IR in terms of the framework laid down by the State in attracting foreign software MNEs to Ireland in order to use the country as a base for exporting activity.

The high export-orientation of the software industry in Ireland is noticeable among foreign firms to the extent that the sale and marketing of products and services is largely aimed at an international market. The international exposure of the software industry mirrors a general trend found in other knowledge-based goods and services produced in Ireland. As argued by Jacobson and Andreosso (1990), the entry of Ireland in the Common Market helped to transform the country into an attractive production platform from which firms could

export in a large tariff-free market¹². In addition, Heeks and Nicholson (2002) stress that the entry of software global leaders had positive reputational effects. This is evidenced by the volume of software FDI throughout the 1980s and 1990s. This shows the extent to which the global dimension is intrinsically connected with the Irish software industry. Ireland has been seen as an optimal location for MNEs willing to disintegrate their production process at a global level.

As alluded to previously, policy makers have had an important role in the development of the Irish software industry specifically by attracting foreign firms, which gives them an important role in this IR. EEC membership and Ireland's corporate tax structure incentivising export-related manufacturing activity were attractive elements to foreign firms¹³. The entry of firms producing packaged software is a notable example in this regard. Within this strategy, there appears to be a cognisance on the part of policy makers to facilitate, sometimes potentially excessively, the attraction of FDI in the form of foreign MNEs who employ local people but in some instances contribute little else to the local or national economy.

The incentives created an environment that took into account a variety of issues, such as innovation strategy, research and development strategy, investments in education, competitiveness, and a favourable taxation regime (Innovation Taskforce, 2010). A multitude of policy documents¹⁴ that emphasised and re-emphasised Ireland's incentive structure were produced by state agencies (Forfás, the IDA and Enterprise Ireland) and government departments (the Department of An Taoiseach and the Department of Enterprise, Trade and Innovation) and by interest groups such as the Irish Business and Employers Confederation (IBEC) and ICT Ireland.

In his categorisation of the case of Ireland as a flexible developmental state in relation to the software industry, O’Riain (2000) portrays a hands-off, facilitatory approach by the state to the development of the industry. We argue here that the state did more than simply facilitate firms in setting up and operating in Ireland. Government policy stipulated that members of the business community be invited to join advisory groups of government departments and state agencies tasked with developing strategic policy reports and programmes. An example of this is the membership list of the Innovation Taskforce (2010), which includes the Vice President of Hewlett Packard, the Investment Director of Intel, the Senior Vice President of Cisco Systems and the former CEO of Iona Technologies. This approach positions the private sector at the centre of policy-making and allows it to influence policy: firms can put pressure on policy makers to accommodate their needs. Ireland’s “privatisation of industrial policy” is evident in many documents that stress pro-business aims such as increased cost competitiveness, retention of the corporation tax structure and government investment in infrastructure (Innovation Taskforce, 2010). While the implementation of such policies is ultimately left with policy makers, the relationship appears to be heavily influenced, if not dominated, by firms in the industry (especially foreign MNEs, whose executives outnumber those of indigenous firms on advisory panels).

The fact that foreign firms dominate the commercial IR in the Irish software industry is not without risks. One important risk is the over-reliance on software FDI (Gunnigle and McGuire, 2001), which has implications for a sector accounting for an increasing share of current economic growth. FDI is also arguably more mobile than domestic investment and therefore more prone to divestment/relocation (Görg and Strobl, 2002). Job losses in foreign manufacturing plants over the recent recession show that an over-reliance on FDI falls short in terms of delivering sustainable long-run economic growth (Andreosso-O’Callaghan and

Lenihan, 2011; Forfás, 2010). As we have highlighted above, this was potentially the case in the aftermath of the dotcom recession where arguably, indigenous software firms were neglected in policy terms. There is no doubting that success in attracting high-quality FDI was coupled with a vulnerability to strategic decision-making by MNEs headquartered outside of Ireland. A high-profile example of this occurred when the Canadian software firm Corel closed down in 2000; at that point the corporate desire for closure outweighed the benefits of the strong local links built up by the firm.

Ultimately, the commercial IR contributes to our understanding of the Irish software industry on a number of levels. It not only lends itself to the identification of foreign firms as very dominant in the industry, but it also allows us to highlight that the interactions between firms and policy makers have been favourable to foreign firms in terms of facilitating an environment where they could flourish, an environment that may not have been created to the same extent for domestic software firms.

In summary, Table 2 provides a synoptic presentation of the different actors involved in the four IRs.

(INSERT TABLE 2)

Within the commercial IR, we see evidence of a potential over-reliance on foreign MNEs in the software industry. This could be in part attributed to the placing of the foreign companies needs as a priority over indigenous firms, especially in the period after 2001. Interestingly, this may have manifested itself through an unbalanced representation at the policy-making table where foreign company executives have had more of a voice than their

indigenous counterparts. The purchase IR suggests that benefits in terms of linkages between indigenous and foreign firms were fostered initially by foreign firms but subsequently transferred to domestic firms. This can be seen in the context of purchasing skills and expertise that were transferred to domestic firms through the movement of skilled workers from foreign firms. The finance IR tells us two stories, firstly, it tells us that SMEs need, but struggle to, access the required finance to expand. Research in the area suggests that a lack of skills in the banking sector, in terms of SME lending, may have hindered the development of smaller software firms. Conversely, larger software companies do not share the same issues. Our focus for these firms is on how they deal, in the Irish context, with the profits that they make and the rationale for using Ireland in their operations. This aspect of the finance IR is deeply rooted in Irish economic policy through Ireland's low tax policy. This is one implication of the policy environment that has been created in Ireland with regard to the software industry. We extend on other policy implications below.

Prior to detailing the implications for policy, it is useful at this point to briefly situate the Irish related IR in an international context. This is usefully outlined in terms of the six configurations for the software sector inside the OECD as detailed by an ICaTSEM (2011) report. Within this, Ireland is placed alongside the United Kingdom and Sweden in terms of a cluster related to sector specialisation and exporter profile. Among the other categories one may note for example, exporter profile (Austria, Germany and Netherlands; R&D orientated (Denmark, Finland and Norway); low specialisation, low competitiveness and low exports (Portugal, Spain, Italy, Greece, Poland, Slovakia, Czech Republic and Hungary); and domestic orientated (Japan, Belgium and France). Each categorisation plays host to a different set of logics for the development of the software industry, and the diversity of

capitalisms evident within each jurisdiction means that the institutionalised relationships evident in the various groupings also vary.

Implications for Policy

In light of the two preceding sections, an interesting question to ask at this stage is the following: what does the IR approach add to our understanding of the development of the software industry in Ireland in terms of policy implications? One of the key insights provided by using the IR lens to analyse an industry (in this case the Irish software industry) is that it highlights that one of the central characteristics of designing and implementing public policy which impacts upon industries is the ‘multi-level’ or ‘multi-layered’ nature of this process. In other words, some IRs are still essentially regulated nationally, whereas others tend to be dominated by sub-state, supranational or global scaling. The implications of this are that policy options and interventions (if deemed appropriate) need to be operated at different territorial levels.

Turning specifically to the Irish software industry, as already outlined in the paper, the key role played by policy makers in Ireland with respect to this sector has been widely acknowledged in the literature (Coe, 1999; Crone, 2002). Some authors such as Buckley (2010) have highlighted that policy has a key role to play with respect to the emergence of the software sector in Ireland in the first instance, especially with regards to the attraction of foreign-owned software firms. One of the issues that has come to the fore from our study here of the four IRs is that we have (in a similar vein to Bailey *et al.*, 2012 and Andreosso-O’Callaghan and Lenihan, 2011) brought into question a policy in Ireland which may have overly concerned itself with a focus on FDI to the somewhat neglect of indigenous (largely SME) firms. In looking to the future, policy makers in Ireland who intervene with respect to

the software sector should perhaps be more cognisant of the balance of ownership mix (indigenous versus foreign-owned firms) in a particular sector.

Regarding the specific IRs, our analysis has clearly demonstrated that policy makers have been at the centre of the commercial, employment and finance IRs. Take state investment in education for example, such investment as argued by many authors (e.g. Begley *et al.*, 2005 and Collins, 2007) has been central to Ireland's software story. In concluding this section, it is important to highlight that without doubt policy (and its associated interventions) has a key role to play with respect to all four IRs. The IR approach demonstrates that the software industry in Ireland (like many other industries in Ireland and elsewhere) possesses both functional and political elements which simultaneously play out within the four IRs. Moreover, the relationships between the four IRs often emanate from social and political compromises (thus highlighting yet again the central role of policy) which in all likelihood will vary from one polity or timeframe to another. From a policy perspective, it is helpful to not only view IRs as the constraints on economic action but also to view them as the very conditions for such action. If one views them in this way, the likely role and implications for policy are immense and potentially very powerful.

Conclusion

With an analysis of major trends in the Irish software industry since the 1970s, this study has attempted to fill a lacuna in the existing literature by applying the IR framework to a relatively high-tech industry. The paper contributes to our understanding of the development of the software industry by discussing the significant relationships that exist between firms,

the state and other stakeholders in the industry as they relate to the employment, commercial, finance and purchase IRs. More specifically, the paper has shown how interactions between these various actors, or lack of interactions, within each specific IR, have influenced the trajectory of the industry at various points in time. A prime example of this is highlighted with regard to the potential lack of support for indigenous software companies after the dotcom recession. From a theoretical perspective, the approach employed in the current paper departs from the neo-classical firm perspective (where the firm is in a space less environment and the only relations are buying and selling transactions between different economic agents) and from neo-classical grounded frameworks (such as for example the structure-conduct-performance paradigm) to a more holistic framework where institutions (economic but also political and social) engage in a plethora of interactions with each other. The IR approach produces a holistic analysis while emphasising the role of actors in their daily activities, motivated politically and socially as well as economically.

The benefits of the IR approach as aptly summarised by Jullien and Smith (2008) are threefold as follows: the IR approach enables a precise identification of the arena within which reproduction and change of IRs occur and highlights the overlaps that are likely to occur between these IRs; the IR approach provides insights into the hierarchy of each IR and how this may be challenged during times of change, the causes of which can and must be identified. Finally, the IR approach emphasises that the construction and evolution of IRs entails private, collective and public actors in constant processes of institutional co-production.

This novel approach has informed our understanding of the software industry by providing an alternative angle of analysis with which to explain economic changes within an industry over a long period of time. Explaining such changes can be challenging from the

point of view of traditional analysis. However, the IR approach provides a means by which such an analysis can be detailed in a manner that can not only be understood, but can also provide useful input to the policy debate. Furthermore, the implementation of the IR approach in this paper suggests that there are novel approaches available to researchers that can be used to analyse economic developments/phenomenon in a more holistic way.

The findings suggest that while foreign MNEs have dominated the software landscape in Ireland during the period under investigation, this dominance is not as pronounced as in the manufacturing sector as a whole. Influencing factors include the incentives provided for these firms and the facilitory approach taken by the Irish state. From as early as the 1970s, software FDI flowed into Ireland because the country was seen as a cost-effective base for export activities. The benefits to Ireland included significant employment creation and the upgrading of its technological base.

The application of an IR perspective shows that foreign-owned firms tend to dominate the commercial, purchase and financial IRs, although the influence of such firms is rather mitigated in the latter case because of the relatively modest financial entry barriers, which are typical of the software industry. The employment IR has also tended to be shaped by foreign firms in this industry. As Ireland refocuses its economic effort on export-led growth, the indigenous software sector seems to have a significant part to play. What this study also demonstrates is that from a policy perspective more could have been done to support the indigenous software sector, especially in 2001, when many firms ceased to exist. Equally, more needs to be done in the future, in particular in terms of rebalancing the sources of growth between overseas and indigenous sectors and of promoting small, innovative and high-quality firms, which, as seen above, are a feature of the Irish indigenous software industry.

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Notes

1. The industry belongs to the NACE categories 62 and 72, with problems of continuity in the series in the case of Ireland.
2. The IDA is the state agency responsible for the attraction of FDI to Ireland.
3. Barry and Bradley (1997) make their point with regard to the general industrial development strategy in Ireland; our point here is that the same can be argued for the software industry.
4. The data for more recent years relate specifically to NACE 72 from the NACE Rev 1 industry classifications. The data in this table were collected by Forfás from surveys of firms assisted by agencies such as the IDA, Enterprise Ireland, Údarás na Gaeltachta (the regional authority responsible for the economic, social and cultural development of the Gaeltacht – the Irish-language-speaking regions in Ireland) and Shannon Development (a government-owned regional development organisation dedicated to promoting and developing the Shannon region of Ireland). With the closure of the National Software Directorate, changes in collection methodology over the last years under review invite a note of caution: some data may not be directly comparable. Where data do not explicitly relate to the software industry, this will be noted.
5. We must consider that transfer pricing practices tend to inflate MNCs' sales from Ireland. As noted by Arora and Gambardella (2005, p. 28), "MNCs in Ireland have employment

levels comparable to that of the indigenous firms . . . while their sales are over 8 times as much. Since they mostly localise their products in Ireland, not design them, this gap must arise mainly from accounting reasons, not superior value added”.

6. Enterprise Ireland is the government organisation responsible for the development and growth of Irish enterprises in world markets.
7. Unfortunately, figures for software alone are not available here; this analysis is therefore somewhat constrained.
8. See the article by C. Gurdgiev, *The Sunday Times*, 10 November 2013, Business Section.
9. Examples in this regard include Banta Global (BG), Turnkey and Softrams (O’Riain, 1997).
10. This EU influence is in line with other industries studied by various authors in “Industries and Globalization: The Political Causality of Difference”, an edited book by Jullien and Smith (2008).
11. Council Directive 2000/43/EC of 29 June 2000 implemented the principle of equal treatment between persons irrespective of racial or ethnic origin; Council Directive 2004/113/EC of 13 December 2004 implemented the principle of equal treatment between women and men in the access to and supply of goods and services.
12. Walsh (2003) notes that in the 1980s and 1990s, a gradual refinement of policies led to a sophisticated targeting of overseas investment and a switch to subsidiaries of “high tech” industries, including computer software and electronic engineering.
13. Ireland’s strategy of embracing FDI began in the late 1950s. Central to this was the introduction of a *de facto* zero per cent corporation tax on manufacturing exports (Barry

and Bradley, 1997). This was replaced in the 1980s by a 10 per cent “preferential” corporation tax rate applied to profits from manufacturing industry and internationally traded services.

14. For example, see Building Ireland’s Smart Economy: A Framework for Sustainable Economic Renewal (Department of Taoiseach, 2008); Strategy for Science, Technology and Innovation 2006-2013 (Irish Government, 2006); IBEC/ICT Ireland, Smart Schools = Smart Economy: Report of the ICT in Schools Joint Advisory Group to the Minister for Education and Science (2011); and Forfás, Statement on Competitiveness Priorities (2011b).

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Table 1. The software industry since the 1990s

| | 1991 | 2001 | 1991/2001 (%) | 2002 | 2007 | 2002/2007 (%) |
|-----------------------------|----------------------------|--------|--------------------|--------|--------|------------------|
| <i>Employment</i> | | | | | | |
| Indigenous | 3,801 | - | - | - | 10,337 | - |
| Overseas | 3,992 | - | - | - | 13,928 | - |
| Total | 7,793 | 31,065 | 298 | 28,386 | 24,265 | - 14.5 |
| <i>No of firms</i> | | | | | | |
| Indigenous | 291 | 875 | 200 | 750 | Na | - |
| Overseas | 74 | 140 | 89 | 143 | Na | - |
| Total | 365 | 1,015 | 178 | 893 | Na | - |
| <i>Sales revenue (€bn)</i> | | | | | | |
| | <i>(IRPunts millions)*</i> | | | | | |
| Indigenous | 0.18 | 1.53 | +88.2 | 1.6 | 1.56 | -2.5 |
| Overseas | 1.91 | 11.57 | +83.5478 | 12.3 | 20.72 | +68.5 |
| Total | 2.09 | 13.1 | +85.8 (avg) | 13.9 | 22.28 | +60.3 |
| <i>Exports (% of sales)</i> | | | | | | |
| Indigenous | 40.6 | 81 | | 85 | 66 | |
| Overseas | 97.9 | 95 | | 95 | 97 | |
| Total | 93.0 | 94 | | 94 | 81.5 | |

Sources: For statistical information related to the sub-period 1991-1997, the figures are adapted from O'Malley and O'Gorman (2001). For more recent data, see Employment (Forfás, 2008); Sales (Arora and Gambardella, 2005) and Number of Firms, Sales, Exports and Exports (% of Sales) (Buckley, 2005).

Note: Due to data limitation, a breakdown of employment and firms between the Irish and overseas sectors could not always be provided. * Conversion using £IR/EUR of 1.21

Table 2. The 4 IRs in the Irish software industry – Actors and motivations

| | Actors | Motivations |
|------------|--|--|
| Finance | <ul style="list-style-type: none"> (i) MNEs (ii) Indigenous firms (iii) State (iv) Financial Institutions | <p>Large dichotomy between (i) and (ii)</p> <ul style="list-style-type: none"> (i) Profit repatriation; transfer pricing (ii) Face barriers to access to finance (iii) Provides financial and fiscal incentives; particularly to MNEs (iv) Marginal role |
| Purchase | <ul style="list-style-type: none"> (i) MNEs (ii) Indigenous firms (spin-offs) (iii) Clusters (Galway cluster for example) (iv) State | <ul style="list-style-type: none"> (i) Fully integrated in the global system of production; foster product and service quality (ii) Development of an indigenous software entrepreneurship culture (iv) Marginal role of state agencies (except for (iii)) |
| Employment | <ul style="list-style-type: none"> (i) Employers (ii) Employees (iii) State | <ul style="list-style-type: none"> (i) Dominant; key role of MNEs in the transfer of skills (ii) Avoidance of Unions (iii) State as a Mediator; conciliatory role; subservient to MNEs |
| Commercial | <ul style="list-style-type: none"> (i) MNEs (ii) Indigenous firms (iii) State | <ul style="list-style-type: none"> (i) Dominant in terms of exports; disintegration of MNEs' production process at the global level (iii) Support (mostly in favour of foreign firms) |