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**Inward foreign investment and the clustering process: the case of the medical  
technology sector in Ireland**

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## **Abstract**

This paper investigates how, if at all, inward foreign investment can instigate a clustering process when such investment is initially attracted to a region as a result of targeted public policy rather than the existence of local sectoral capabilities. The case of the medical technology cluster in Galway on the west coast of Ireland is used to examine if FDI (foreign direct investment) can create a clustering effect in FDI-generated agglomerations. The study incorporates the collection of quantitative data from a postal questionnaire survey of the cluster member firms and qualitative data from semi-structured interviews with a sample of both indigenous and foreign-owned firms in the cluster. The empirical evidence shows that the presence of large foreign-owned MNCs (multinational corporations) results in local knowledge transfers and regional reputation effects, which together give rise to a clustering process. The research contests the view that there are generally limited local spillovers in FDI-generated clusters (De Propris and Driffield 2006) and contrary to other perspectives (Phelps 2008), it shows that external economies can be captured locally from FDI in such clusters.

**Keywords:** Regional industrial clusters, Foreign Direct Investment, Medical Technology

## 1 Introduction

Within the theoretical sphere of industrial clusters, districts and innovation systems, an abundance of research has been produced on regional cases of industrial agglomeration. In much of this case-based research, the development of industrial activity is shown to be embedded within an institutional structure that has a long history and tradition in the region. Such regions are characterised primarily for their collective learning capacity, inter-organisational co-operation, high innovative capacity and culture of entrepreneurship. As Yeung et al. (2006) point out many of the renowned industry clusters are characterised by “an endogenous and self-organized form of cluster development” (p.522). For example, the scientific and research history of the University of Cambridge placed it at the centre of innovation and growth of high technology firms in the Cambridge region (Rosenberg 2002). Silicon Valley is embedded in a history of entrepreneurial activity and spin-off firms that dates back to the early 1900s with the formation of a number of innovative enterprises (e.g. Hewlett Packard and Shockley Semiconductor). Likewise, the research on Third Italy within the genre of industrial districts shows the development of regional specialisations in sectors such as ceramics, racing cars, textiles and clothing. Such districts are characterised by co-operation between firms through established long-term links that are embedded within the locality’s social norms and cultural fabric. In this way, such regional industry agglomerations have developed organically from the ‘bottom-up’.

As regions become specialised in particular sectors foreign investors are attracted to these locations in order to tap into local capabilities and knowledge as well as participate in collective learning and collaborative activities (Porter 1990, p. 606). Particularly when MNCs engage in asset-augmenting investments, whereby the MNC wishes to “enhance its future wealth-creating capabilities in a cost-learning effective way” (Dunning 2000a, p.19), they locate to regions in order to access local knowledge spillovers (Narula and Zanfei 2005). Enright (1998) purports that MNCs can benefit from having a presence in clusters because the affiliate acts as ‘listening posts’, gathering industry and competitive knowledge and disseminating it within the corporation. According to Dunning (2000b), “although globalization is widening the options open to MNEs to locate in different countries, *within* countries there is a suggestion that at least some kinds of value-added activities – and particularly asset-augmenting activities – are becoming more concentrated, and are favouring sites which have a cluster of related firms” [emphasis in original] (p.34).

Consequently, the presence of FDI in industry agglomerations has led to empirical work on the effect that such investments can have on clusters. For example, it has been empirically evidenced that the presence of FDI in clusters can contribute to the advancement and dynamics of clusters (e.g. Enright 2000, Birkingshaw and Hood 2000). Birkingshaw and Hood (2000) found that subsidiaries in leading-edge clusters tend to be relatively autonomous and more embedded in the locality, thus the authors conclude that this adds to the dynamism of a cluster. Moreover, within the industrial district literature the presence of foreign-owned MNCs is shown to impact the structure of a district (Mariotti et al. 2008), which is traditionally defined by a group of inter-linked small and medium-sized enterprises. The presence of foreign-owned MNCs, however, is found to enhance the degree of internationalisation of domestic firms in terms of engaging in outward foreign investment (Mariotti et al. 2008).

Much of this research on the presence of FDI in and its contribution to clusters is based on existing industry agglomerations (Phelps 2008), that is, the attraction of FDI to leading clusters as well as the effect of FDI on clusters that are already in existence. Indeed, the presence of foreign investors in leading-edge and endogenously developed clusters, such as those described above, can be expected and the contribution or effect that such investment can have on these clusters has been a source of academic interest. However, in circumstances where public policy has exogenously attempted to create industry agglomerations through attracting FDI to a region, the contribution of such investment to the development of a clustering process is ambiguous. Although it may be the expectation of policymakers that such investment will lead to local economies and a clustering effect, there is limited research to either support or refute this. As Phelps (2008) states “[t]he literature that has dealt with FDI as an instigator of potential clustering processes, perhaps understandably, has remained obscure – focusing on the likes of failed attempts to produce growth poles or industrial complexes from scratch through FDI” (p. 461).

This paper aims to address this gap in the literature and poses the following research question: in agglomerations generated by FDI through a ‘top-down’ policy-approach, how, if at all, can such investment instigate a clustering process? A case study of an agglomeration of medical technology firms on the west coast of Ireland is used to investigate this research problem. The genesis of the agglomeration is rooted in conscious policy to attract large foreign investors in the sector to the region. Following this introduction, the second section of

the paper reviews the literature on industry clusters and the presence of FDI. The research methodology employed and the resulting empirical findings are detailed in the fourth and fifth sections consecutively. Finally, the sixth section discusses the findings within the context of the literature and subsequently, conclusions are drawn.

## **2 Industry clusters and inward foreign investment**

The presence and significance of foreign-owned MNCs in industry clusters has generated much interest by scholars over the past two decades (e.g. Dunning 1993, 1998, 2000a, 2000b, Young et al. 1994, Enright 2000, Birkinshaw 2000, De Propriis and Driffield 2006, Phelps 2008). Michael Porter's work on the competitiveness and innovativeness of industries (Porter 1990) has been criticised for focusing solely on the home-base of a nation in determining competitive advantage and ascribing a limited and an ambiguous role to inward FDI. According to Porter (1990) inward FDI is 'not entirely healthy' (p.671) and while in a later publication (Porter 1998a) it is acknowledged that FDI can contribute to the development of a cluster, it is suggested that this will occur only if foreign-owned firms 'make a permanent investment in achieving a significant local presence' (p.220). In recent years scholars have begun to attach more importance to FDI in industry clusters and have rejected this limited and rather stark view of the impact of FDI (e.g. Enright 2000, Dunning 2000a). In doing so, inward FDI has been predominantly studied from two different approaches, that is, the attraction of FDI to clusters and, conversely, the contribution that foreign investors can make to clusters as well as their effect on the structure and dynamics of clusters.

Authors have concluded that the significant presence of similar industry activity in a region will attract FDI (Pelegrín and Bolancé 2008, Bronzini 2007), as it is put forward that foreign-owned MNCs will benefit from local economies, such as access to resources, technological capabilities or knowledge spillovers (Dunning 2000a). Empirically, Ivarsson (1999) analysed the importance of internationally competitive clusters in Sweden as an attraction for FDI and found that over one half of foreign-owned firms in the country are located in clusters. Foreign affiliates within clusters were found to be more likely to engage in formal technological co-operations with firms in the host country than those affiliates not located in clusters. In corroborating with Dunning's (2000a) view this suggests that MNCs are drawn to clusters in order to tap into local technological capabilities. Similarly, Cantwell and Piscitello (2005) undertook quantitative analysis of the location of research activities by foreign-owned MNCs across regions in Germany, UK, Italy and France to examine the role of spillovers and

externalities in attracting these activities. The authors found that innovation tends to be geographically concentrated and that MNCs are responsive to agglomeration potential. The presence of both intra- and inter-industry spillovers, representing both specialisation and diversity externalities, were found to be important factors in attracting technological activities of MNCs.

In terms of the contribution that FDI can make to clusters, research has shown that the presence of FDI can enhance the degree of internationalisation of local firms (Mariotti et al. 2008) and can connect clusters in different locations (Oliver et al. 2008). In addition, empirical work has evidenced how FDI can impact cluster advancement (Peters 2000, Best 2001, Birkinshaw 2000) as well as cluster dynamics (Enright 2000), particularly through the transfer of technology (Enright 2000, Thompson 2002, Padilla-Perez 2008) or enhancing the perception and reputation of a cluster (Birkinshaw 2000). However, the degree of contribution often has conditions attached, which relate to the characteristics of the industry cluster. From an econometric analysis of productivity spillovers from inward foreign investment in the UK, De Propris and Driffield (2006) report that such gains for domestic firms are found to occur when a cluster already exists. Similarly, Padilla-Perez (2008) concludes that technology transfer from FDI can impact a region but rather than being an 'automatic' occurrence, certain regional characteristics should be present, such as high local capabilities, universities engaging in industry-related research and specialised labour. Further indication of the need for an existing local specialisation to be in place in order for FDI to contribute is found in the research by Mariotti et al. (2008) which shows that the presence of foreign-owned MNCs will enhance the internationalisation of local firms when these domestic firms in a district have already initiated an internationalisation process (Mariotti et al. 2008).

Alternatively, other scholars have argued that the characteristics of the foreign investors themselves are also important in determining their contribution to a local cluster (Young et al. 1994, Malmberg and Solvell 2002). The proposed characteristics include; the export-orientation of the firm, the employment of skilled workers, the development of an R&D facility, the responsibility for leading products and marketing and sales functions (Young et al. 1994) as well as the ownership of valuable competencies and the assignment of strong mandates by the parent company (Malmberg and Solvell 2002). In general, when the inward investment is characterised by higher value-added activities, the argument is put forth that

such investment is more likely to make a stronger positive contribution to the development and dynamics of a cluster.

In addition to the positive contribution that FDI can make to clusters, some negative effects have also been discussed in the literature (e.g. Mariotti et al 2008, De Propris and Driffield 2006, Aitken and Harrison 1999). These adverse effects are not unique to industry clusters but more accurately relate to MNCs entering a host economy in general. In particular, foreign investors can create a ‘crowding-out’, ‘competition’ or ‘market-stealing’ effect whereby market share is captured from local firms (Mariotti et al 2008 p.722, De Propris and Driffield 2006 p. 279, Aitken and Harrison 1999). In the context of an industrial cluster, this may result in its demise (Mariotti et al 2008) or conversely the increased competition may enhance the efficiency of the cluster in the long term (De Propris and Driffield 2006). De Propris and Driffield (2006) empirically show that within clusters, the competition effect of new foreign investment can result in a loss of productivity for domestic firms but that this is offset by the spillover gains that occur from foreign to local firms. However, in non-cluster cases there are no spillover gains and the ‘crowding-out’ effect dominates (De Propris and Driffield 2006). Therefore, the research suggests that even though there can be adverse effects to inward FDI entering clusters, this is compensated by the positive contribution that is captured.

However, much of this empirical-based research on the positive contribution of FDI relates to *existing* clusters (Phelps 2008). Therefore, the predominant arguments calling for a more critical reflection centre on the type and stability of clusters formed on the back of FDI and the degree to which foreign investors in FDI-dominated clusters will contribute to the local milieu (De Propris and Driffield 2006, Phelps 2008). Even though there are studies of FDI resulting in the formation of clusters (e.g. O’Gorman and Kautonen 2004, Jacobson and Mottiar 1999, Ó’Riain 1997), the issue of the stability of such clusters and whether they are indeed clusters in a real sense is contested. De Propris and Driffield (2006) argue that “FDI-generated clusters can be fragile and have often proved unable to provide a sustainable development for localities” (p. 287). This is due, it is argued, to a lack of embeddedness by the foreign investor with often limited local spillovers and when linkages do occur in the form of subcontracting relationships with local suppliers the result is often a ‘monopsonistic cluster’, where “survival depends on the MNE” (De Propris and Driffield 2006, p.281). Phelps (2008) supports this view and contends that there are few examples in Europe of robust clusters being developed around MNCs. In addition, the case is made that the external

economies produced in FDI-dominated clusters, such as a specialised labour market and knowledge flows, are claimed to be shared predominantly among the foreign investors themselves as such clusters inherently lack a strong indigenous base (Phelps 2008). Furthermore, Birkingshaw and Hood (2000) empirically showed that clusters with high levels of foreign ownership tend to contain affiliates with less autonomy and weaker capabilities and as a result the cluster itself is less dynamic. However, clusters that develop from a strong indigenous base of local capabilities can attract foreign investment in order to tap into local knowledge (De Propriis and Driffield 2006, Dunning 2000a, Enright 1998). In turn, domestic firms are found to gain from such foreign investment in the cluster (De Propriis and Driffield 2006). Therefore, it is concluded that to capture external economies from FDI, such investment must enter existing clusters driven by indigenous firms (Phelps 2008 and De Propriis and Driffield 2006) and cluster policy should not be focused on generating clusters through the FDI mechanism.

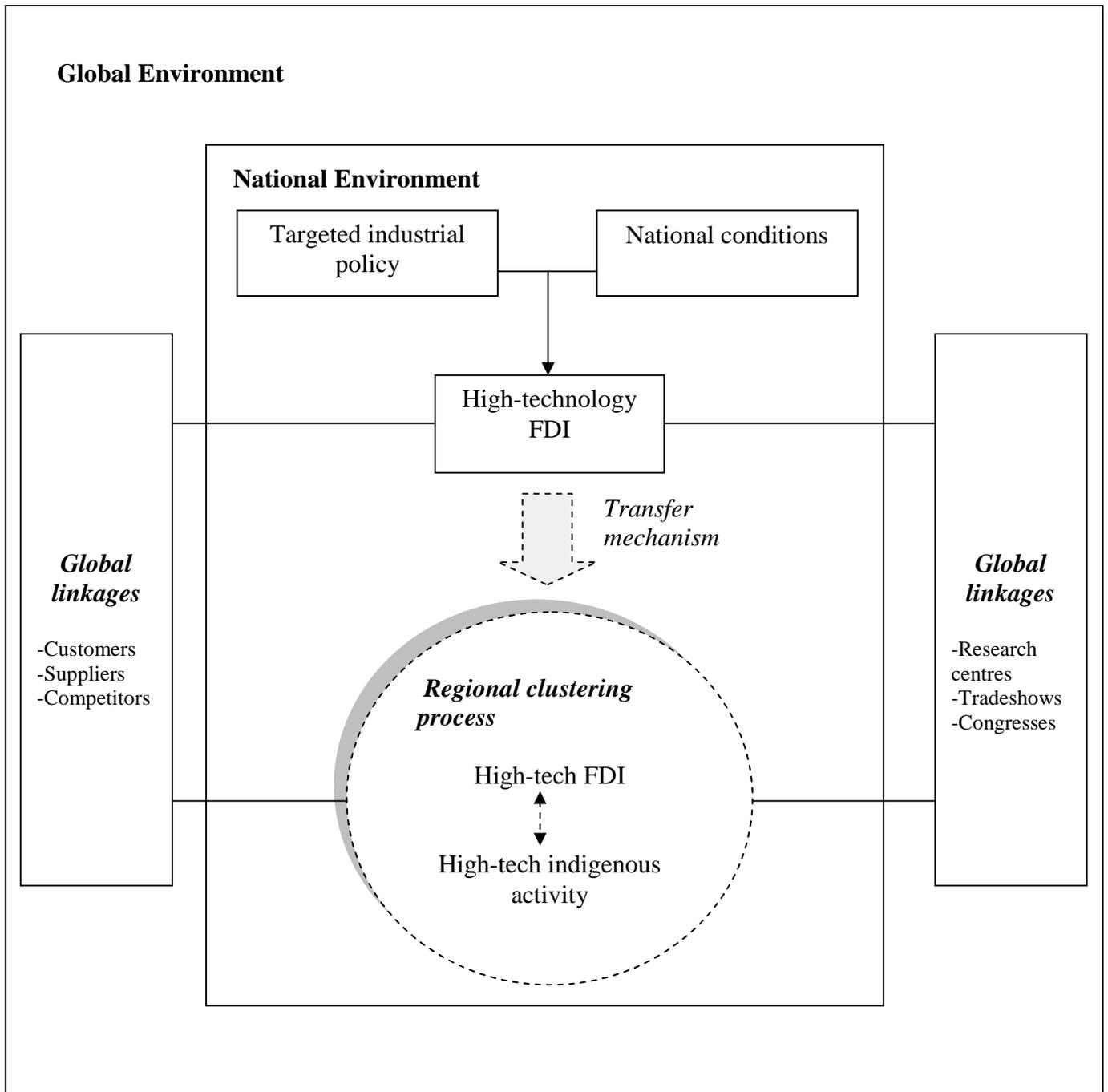
Drawing such conclusions may be premature, however, given that, as Phelps (2008) professes the research on FDI as an initiator of regional clustering remains ‘obscure’ (p.461). The purpose of this article is to examine how, if at all, inward foreign investment can instigate a clustering process when it is attracted to a region as a result of targeted public policy rather than the existence of local sectoral capabilities. The conceptual framework of Figure 1 illustrates this scenario. Within the national environment a combination of targeted industrial policy (e.g. corporate tax incentives) and certain national conditions (e.g. the cost and availability of labour and political stability) can attract foreign investment in particular sectors. In an attempt to build and reap the gains from a ‘knowledge-based’ economy, the development of high-technology sectors has been the predominant intention of policymakers across developed and developing countries globally. The grey area in the literature pertains to how foreign investment under such circumstances can lead to a regional clustering process. This is depicted by the circle in Figure 1, which shows the potential development of an indigenous sector. Previous studies that have investigated the development of clusters from FDI have primarily shown the growth of an indigenous group of suppliers around the foreign investors (e.g. Jacobson and Mottiar 1999), which it has been suggested leads to a ‘monopsonistic cluster’ with limited local spillovers and where external economies occur they mainly benefit the foreign investors themselves (De Propriis and Driffield 2006, Phelps 2008). This viewpoint is tested here by examining if and how a transfer mechanism can occur from FDI that results in the creation of a clustering process which goes beyond that of a

supply-based system. Finally, given that the foreign investors are initially attracted to the host economy due to public policy initiatives rather than that the intent of tapping into local capabilities or a local market it can be expected that such investment organisations will engage in global linkages. Therefore, Figure 1 illustrates a link between FDI in the host nation and the global environment in terms of networks with customers, suppliers, competitors, research centres and congresses abroad. The extent to which such international linkages impinge on the development of a clustering process locally is questioned and will be examined. This conceptual framework was applied to an empirical case study of a high-technology agglomeration in Ireland and the following section outlines the specific methodology employed.

### **3 Research methodology**

The research agenda lends itself most appropriately to a case study approach “which focuses on understanding the dynamics present within single settings” (Eisenhardt 1989, p.534). The approach is used to investigate certain contemporary phenomena within its real-life context (Yin 1984, p.23), which complements the aim of this study. The specific case examined is that of the exogenous development of a medical technology agglomeration located in Galway on the west coast of Ireland. As with many of the high-technology sectors in Ireland, the origin of this agglomeration is intrinsically related to the attraction of FDI to the region through policy initiatives. The study incorporates the collection of both quantitative and qualitative data. With some exceptions (e.g. Padilla-Perez 2008, Yeung et al. 2006, Oliver et al. 2008), much of the empirical research undertaken on the contribution of foreign-owned affiliates to industry clusters has been either quantitative in the methodological approach (e.g. Birkinshaw and Hood 2000, Birkinshaw 2000, Thompson 2002, De Propris and Driffield 2006, Shaver and Flyer 2000, Mariotti et al. 2008) or has involved an analysis of just the MNC affiliates rather than including an examination of all nature of firms in the industry cluster (e.g. Enright 2000, Peters 2000, Birkinshaw and Hood 2000, Thompson 2002). As a result, this provides a more limited insight into the extent and precise operation of spillover mechanisms (Thompson 2002) and the resulting effect on the locality. Consequently, it gives rise to a lack in a comprehensive understanding of the contribution of FDI to industry clusters. As Birkinshaw and Hood (2000) state, “for the industry cluster aspects it meant that we ended up with a rather restricted perspective on the dynamics of these clusters....a future

**Figure 1: Conceptual framework: the role of inward FDI in instigating a clustering process**



study looking at both indigenous and foreign-owned firms will be necessary before any definitive conclusions are drawn” (p.152).

Therefore, for this study both quantitative and qualitative data was gathered. Quantitative data from a postal questionnaire survey is used to profile the agglomeration and to gauge the

extent to which firms in the agglomeration engage in local and extra-local linkages. The questionnaire survey was distributed to the thirty firms identified in the region. A 50% response rate was obtained. As the agglomeration comprises of both indigenous and foreign-owned companies, the shares of responses to the survey that are indigenous and foreign-owned firms closely aligns with the shares in the population database, and therefore the survey responses are representative. The questionnaire survey was comprised of five main sections: company background; company innovative processes and R&D activities; company markets; external linkages; reasons for locating in the region and future growth of the firm.

Qualitative data was collected from semi-structured personal interviews with high-level managers in eight companies. In order to ensure the study was representative of the various types of firms in the cluster four indigenous firms (two small-sized and two medium-sized firms in terms of employment) and four foreign-owned firms (one small-sized, one medium-sized and two large-sized firms in terms of employment) were interviewed. The qualitative component to the methodology was used to add depth to the study by answering the question of how, if at all, FDI can instigate a clustering process. The next section discusses the findings from this case study research.

#### **4 Foreign-owned MNCs and the clustering process: a case study of the medical technology agglomeration in Galway**

##### **4.1 Origins and development of the medical technology sector in Galway**

Similar to that of other knowledge-based sectors in Ireland, the Irish medical technology industry is dominated by the presence of world-leading MNCs, such as Boston Scientific, Johnson & Johnson, Stryker, Vistakon, Medtronic and Tyco Healthcare. Fifteen of the world's top twenty-five medical technology companies have operations in Ireland (IDA Ireland 2008) and these, together with a smaller base of indigenous companies, employ an estimated 24,000 people in approximately 140 companies (IBEC/IMDA 2008).

The Galway region in particular has become recognised as “one of Europe's leading industrial clusters” (Brown 2005 p.11). The emergence of this regional specialisation came about from the establishment of foreign-owned operations that were initially attracted to the region due to alluring tax structures and financial packages as well as the availability of labour and the specific targeting of foreign investors by the industrial development agency,

IDA Ireland. Over time, the presence of foreign investors has built a specific area of expertise in cardiovascular devices within the region, particularly coronary drug-eluting stents<sup>1</sup>. Two of the world's top MNCs in the field of medical technology are now producing such stents from the region and create most of the employment in the cluster (employing approximately 4500 between them). One of these MNCs originally established in Galway in the early 1990s as a relatively low value-added manufacturing operation. However, with the local availability of scientific and engineering labour, the MNC opened an R&D facility and began developing as well as manufacturing devices, particularly in the area of stents (Fogarty 2003). Another world-leading MNC acquired a corporation that already had a cardiovascular operation in the region and it began developing these stents and related devices from this unit.

Since the establishment and development of such organisations in the locality, an indigenous base of smaller-sized companies has emerged in recent years. Many of these indigenous and other foreign-owned companies in the region are involved in the production of related cardiology products, such as guidewires, balloon catheters, hypotubes and filters, which are all used in balloon angioplasty and/or stenting procedures, while other activities include pulmonary drug delivery systems, soft tissue implants and muscle and nerve stimulators. Indeed, the main field of activity for the majority (93%, 14 respondents) of firms surveyed is medical devices and/or the related components as opposed to supplying healthcare products, support services, engaging in clinical trials or producing diagnostic products.

Coinciding with the growth of medical technology firms, the National Centre for Biomedical Engineering Science (NCBES) was established at the local university in 1999 and it engages in research activities with many of the local firms. In addition, the university introduced a new degree programme in Biomedical Engineering in 1998, the first students of which graduated in 2002. The degree programme was established under the Department of Mechanical Engineering, which changed its name in 2002 to the Department of Mechanical and Biomedical Engineering, reflecting the Department's focus on biomedical research and education activities. The course assists in meeting the specific labour requirements of the local medical technology firms.

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<sup>1</sup> A stent is defined as a device that is placed inside a blood vessel, which has been obstructed by a blockage, to keep the vessel open. Stenting is a minimally invasive surgical procedure. A drug-eluting stent is essentially a medicated stent that slowly releases a drug to prevent the re-blocking of the artery.

## **4.2 Inter-organisational linkages – global and local**

### **4.2.1 End-users and suppliers**

This is an export-oriented cluster with all of the respondents selling output internationally, particularly North America and Europe. 40% (6 respondents) of companies surveyed sell all output abroad and none in the region or in the rest of Ireland while just two companies sell up to 80% of their output in the region and in the rest of Ireland with the remainder sold abroad. It was evident from the interviews that the companies engage with distributors, strategic partners and/or other company offices globally in order for the products to reach the marketplace. All companies designing and producing complete medical devices reported access to end-users of the device, that is, physicians, as vital for feedback on the devices as well as information on the instrumentation required for the latest procedures. Accessing end-users in the leading international markets is an important means of obtaining such information, while local end-users are used to a lesser degree. As a senior manager from one company stated;

“You need to keep a direct line of feedback from the end user, if you have got that off completely, you miss out”. (MNC D)

The inputs for most of the companies are sourced from a mixture of the region, the rest of Ireland, Europe and North America. Just 13% (2 respondents) of the firms do not source any inputs from Ireland. Often the highly specialised materials and components are sourced from abroad and more lower-value added activities are accessed locally. While the MNCs are part of global operations and therefore may have access to the corporation’s chain of suppliers, the indigenous companies interviewed reported the use of the internet and attendance at tradeshows as the main methods of accessing suppliers abroad that are generally quite specialised. As these suppliers are based across Europe, America and/or Asia the distribution of the goods to and from these destinations can be cumbersome and slow in which case local suppliers would be preferable but generally not possible due the specialisation of the activity. However, none of the companies reported any major issues in dealing with their suppliers abroad in terms of cultural or linguistic barriers. The companies tend to build long-term partnerships with the firms with a high degree of interaction to improve costs, efficiency and quality. Switching suppliers is not easy within the medical technology sector because of the regulatory standards that have to be maintained. It can take a number of years to get

regulatory approval for a supplier and as a result both indigenous companies and MNCs prefer to build long-term relationships with their suppliers. This means that firms will not immediately switch to a supplier that is located nearby for purely proximity reasons nor will they switch to suppliers based in lower cost economies simply for cost advantages. As trust builds between the companies and the regulatory standards are met, the relationship tends to be long-lasting.

#### **4.2.2 Interaction with universities and research centres**

The survey results reveal that 40% (6 respondents) of companies have a high degree of direct business or personal contacts with universities/research centres and just one respondent asserted that it never has any contact with such organisations. All the interviewed companies reported to have both formal and informal linkages with the local university, NUI Galway, through various science and engineering departments and particularly the NCBES research centre. While the local university is clearly an important resource in the region, collaboratively aligning with international universities and research centres is also critical for at least three of the companies interviewed - two large MNCs and one indigenous firm. These universities are based in the US, Europe and Japan. The criticality of working with such international institutes is evidenced by the indigenous company having a researcher placed full time in an American university, while a senior manager from an MNC stated that “there are so many centres of excellence in Europe and the US that we would be exceptionally naïve not to be working with them” (MNC B). The three companies report the importance of accessing these colleges because they have renowned research centres of expertise from which the firms can develop their R&D activities and they have leading clinicians and cardiologists associated with them that provide access to the end-user for the firm.

#### **4.2.3 Accessing industrial and technical knowledge**

Conferences, tradeshows and/or clinical congresses were cited by all the managers of companies interviewed as the primary mechanisms for keeping abreast of technological and industrial developments in the sector. These conventions and shows are typically renowned events hosted primarily in the US and Europe attracting leading medical technology companies and clinicians from around the world. Both MNCs and indigenous companies emphasise the importance of attending these events for accessing the end-user. However, the indigenous companies in particular, also point to the opportunities for networking, displaying

their products, attracting attention to the company, marketing and promoting the company, observing competitors, finding suppliers and potential partners.

While tradeshows focus on technologies and are aimed at medical device companies allowing them to showcase their products and materials, conferences are more oriented around the end-user. Often live clinical procedures take place at these conferences, whereby leading physicians demonstrate the latest devices. Therefore, medical technology companies can gather information on market developments as well as observe the needs of the physician so that the company can tailor their products to meet those requirements. Such conferences facilitate vital end-user access for the company. As a senior R&D manager from an MNC explained;

“We attend two or three of the principal medical conferences, which are dedicated to cardiology, interventional cardiology, so we’ll certainly do that and we’ll send quite a lot of people to them as well... where there is a lot of customer interaction – they see what’s happening in the market, they see what the cardiologists want or what the problems are” (MNC A)

Overall, as anticipated within the conceptual framework, the findings emphasise the extent to which the firms in the agglomeration participate in geographically extended events and linkages with suppliers, partners, distributors, end-users and research centres. Therefore, given the pervasiveness of such global linkages, the next section examines whether a clustering process has emerged from the presence of the foreign investors in the region.

### **4.3 The regional clustering process**

The findings reveal that the presence of the large MNCs has played an important role in creating a focal point in the region for medical technology activity. This role is shown to occur through two primary mechanisms, that is, local knowledge transfers and regional reputation effects, which are described in the following subsections.

#### **4.3.1 Local knowledge transfers**

There is evidence of start-up companies emerging in the region as a result of the presence of the large MNCs, implying a transfer of knowledge from experiences to the new companies. Of the five small-sized companies interviewed, three were established by people who had previously worked as managers in the large MNCs in the region. One of the other two companies established as a component supplier to medical device firms following the transfer

of know-how from a large MNC and with regards to the other company, a chairman who had previously worked in the local MNCs was appointed to this firm. These connections with the MNCs can create important network opportunities for the small start-ups. For example, one company reported that when the managing director worked in a previous MNC he had created links with a medical specialist in the UK, who in turn had linkages with opinion leaders in the healthcare market. This contact has allowed the managing director of the start-up to access feedback from international experts.

Furthermore, there is a lot of interaction between the MNCs and the local suppliers, which builds the knowledge base of medical technology in the region. Clear evidence of this is provided by the indigenous component supplier which moved from the electronics and metal-work industry solely into the medical technology field as a result of their interaction with the local MNCs. The local MNCs have provided a pathway for this firm to international markets as the company sells to global sites belonging to the MNC as well as the local sites. Another example of knowledge transfer to local suppliers arose when a managing director from one MNC explained that there is a high degree of interaction and learning between the local supplier and the corporation. As a result the indigenous company develops expertise in the medical technology area that it can apply to projects with other companies, as is evident in the following interview excerpt;

“We train their labour and we bring them in.... it means in Company X [local supplier]– ....they have this pool of trained labour that move from one job onto another job”. (MNC D)

The use of local suppliers by MNCs in the region acts as a positive externality for the other indigenous companies in the agglomeration that use the same suppliers. The MNCs are important customers for the local suppliers and they impose high international standards on the materials and services supplied. Therefore, without the need for much further investment the indigenous companies benefit from the availability of high quality suppliers in the region. As the CEO of an indigenous company remarked;

“I think that’s the one advantage for a smaller start-up company...is that some of the bigger companies, you know, [MNC A, MNC B], they force these...supplier companies..., to comply with the standards and because they are ultimately the biggest customer then they can drive the standards that these suppliers need and a quality system within [MNC B] isn’t going to allow a supplier to slip and we would benefit from that...So they can come in here and in a very short period of time be quite productive”. (Indigenous C)

The presence of the large MNCs is also important for developing a pool of skilled labour and attracting workers to the region, as noted by many of the managers interviewed. Having access to a pool of skilled labour is an important resource for companies in the sector and is facilitated by the concentration of firms in the region. In addition, as the presence of the large MNCs provides people with the opportunity to move between companies, labour is attracted to the region. Two of the companies that have lost staff to other firms in the region observe that labour mobility is often positive because knowledge is shared and new contacts as well as opportunities arise. As a senior engineering manager from one of these companies commented;

“I know we’ve lost two or three [people] to [MNC A]...But I mean I don’t see it as a bad thing, [MNC A] guys come down here and they bring ideas about what they do and vice versa up there”. (MNC C)

The final mechanism by which knowledge transfers to the region from MNCs is through their collaborative involvement with the local university and its research centres. One of the large MNCs in the region is an official industry partner to REMEDI, a regenerative medicine research centre, based at the local university. Indeed, all of the companies interviewed had formal or informal collaborations with the university that took various forms, such as the sponsorship of PhD and Masters students by firms, the analysis and testing of materials or the use of equipment and labs. Such contact between the university and the local firms enhances knowledge flow in the region.

#### **4.3.2 Regional reputation effects**

In addition to local knowledge transfers manifested in the form of start-up firms, high-quality suppliers, skilled labour and university-industry collaborations, the presence of the foreign-owned MNCs was also found to create intangible effects. When asked about the region as a business location for medical technology firms, the interviewed managers from the smaller companies referred to the benefits of being part of a centre of activity that is driven by international players and therefore is internationally recognised. The senior R&D manager from one indigenous company commented;

“It’s one of the centres in the world really for the medical device industry. You’ve got three of four of them, you’ve got the Galway-based, you have Minneapolis in the States, California....I think, well....we’re very much a relatively small player..., it’s such an international discipline really within the medical device industry that I think as long as you are based in some of these hubs you are not left out

of the loop because you'll always have contacts with [MNC B] and some other of the larger companies". (Indigenous A)

One of the main advantages of being part of such a centre of activity is that international actors are drawn to the region and this facilitates local firms in establishing global linkages. A senior manager from one indigenous firm reported; "I don't think working with people abroad is a problem. Because Galway is kind of a centre for the medical device industry they [the suppliers] are actually over here a lot so they do visit every year or every second year, so you have the personal contact there as well". (Indigenous A). In addition, due to the high concentration of medical technology activity in the region, created particularly by the presence of world-leading MNCs in the field, a leading international tradeshow conference, MEDTEC (Medical Equipment Design & Technology Exhibitions & Conferences), has taken place as a regional event in Galway over the past number of years. The tradeshow and conference, which is also held in at least five other countries provides medical technology companies the opportunity to showcase their products and build new relationships. Many of the managers pointed to its value in "actually attracting companies to come in here". (MNC B). As a director from one indigenous company explained; "we use events like the local trade conference". "...[it] helps us keep in touch with our customers..." (Indigenous B).

Therefore, the presence of the world-leading MNCs in the region attracts international attention and builds a regional reputation that produces positive effects for the neighbouring firms. The perception of the region as being a centre of activity for medical technology draws international actors to the region and facilitates firms in establishing global networks. As CEO of a local indigenous company remarked; "You can't underestimate the value of putting yourself in the right environment" (Indigenous C).

## **5 Discussion**

It has been suggested in the literature that in order to capture external economies from FDI, such investment must enter existing clusters driven by indigenous firms (Phelps 2008 and De Propris and Driffield 2006) and cluster policy should not be focused on generating clusters through the FDI mechanism. However, the empirical research to support or refute this is limited. The purpose of this paper is to investigate how, if at all, inward foreign investment can instigate a clustering process when it is attracted to a region as a result of targeted public policy rather than the existence of local sectoral capabilities. The case study of the medical

technology agglomeration on the west coast of Ireland reveals that the establishment of foreign-owned MNCs in the region, particularly that of two internationally leading organisations which have created significant employment in the region, have resulted in the emergence of a medical technology cluster.

The presence of the foreign-owned MNCs has resulted in local knowledge transfers and regional reputation effects. Knowledge has transferred to the local economy from the foreign investors and is apparent in the emergence of start-up firms, the growth of a pool of skilled labour, the development of high quality suppliers and the development of industry-university research collaborations. In addition, the presence of significant product development and manufacturing facilities by two world-leading MNCs, both in field of cardiology devices has resulted in reputational effects for the region. International attention is drawn to the region and global actors visit the cluster due to the presence of the MNCs. Consequently, their presence facilitates local neighbouring firms in establishing their own linkages abroad and participating in global networks.

## **6 Conclusions**

Overall, the research shows that FDI can instigate a clustering process. It contests the view that there are generally limited local spillovers in FDI-generated clusters (De Propris and Driffield 2006) and, contrary to other perspectives (Phelps 2008), it shows that external economies can be captured locally from FDI in such clusters. It also reveals that FDI can generate a clustering process that goes beyond vertical sub-contracting relationships as described by De Propris and Driffield (2006). Indeed, the case reveals that even without extensive trading linkages locally, a significant clustering effect can occur as indigenous firms in the same or related field of activity benefit from locating in the same region as the large foreign investors as it facilitates them in accessing and establishing global networks.

However, the issue of the stability of the cluster that is formed remains. Generally, in the study it was found that for the MNCs the various reasons encouraging them to remain in the region include having developed a knowledge base in a specific area of expertise within the corporation as well as their investment in labour skills locally and in the quality of local suppliers. However, changing external circumstances such as alterations in the tax system, an increase in operating costs relative to other nations or political influences may drive a decision by the headquarters of a corporation to relocate the knowledge and invest in another

location. In the case of the medical technology cluster, it is reasonable to conclude that the sustainability of the cluster is dependent on the two leading MNCs retaining significant operations in the region as their presence is creating the clustering effect. However, in contesting Phelps's (2008) and De Propris and Driffield's (2006) view the study shows that a cluster process can be generated by foreign investors and as external economies can be reaped locally it is worthwhile for policymakers to pursue the FDI mechanism for generating industry clusters. The study reveals that this is particularly apparent in the case of a small, open economy such as Ireland whereby the economy is too limited to indigenously build a sector in which the country does not already have a comparative advantage. However, under these circumstances the second phase of development for policymakers to focus attention on should be moving the cluster beyond a dependence on FDI by promoting the capabilities of the emerging indigenous base and assisting the firms in establishing linkages abroad. As the capacity and capability of the indigenous sector becomes more established in the future, FDI will be attracted to an endogenously driven cluster without the need for public policy instruments to target such investors.

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