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Local Clusters and Global Entrepreneurship:

The significance of spatial and relational propinquity in new firm formation

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Abstract

This paper explores the significance of local proximity for new firm formation in particular industries. Within the literature, entrepreneurs are viewed as critical to industrial cluster formation and development in regions, while at the same time clusters are assumed to foster entrepreneurship by providing established linkages and access to knowledge flows. Entrepreneurship is therefore modelled as an inherently local process within industrial clusters. However, given that firms, particularly in high-tech sectors, are often globally-oriented the significance of local proximity both geographically and relationally is ambiguous. Therefore, the research questions addressed in this paper are; How 'local' is new firm formation in an industrial cluster in terms of the networks created to establish and develop a globally-oriented firm and the influence of the cluster in the formation of such a firm? And how significant, if it all, is being located in a cluster for a globally-oriented firm?

To answer these questions, globally-oriented firms within the medical technology cluster in Galway were analysed. Data was gathered from twelve interviews with entrepreneurs in the cluster. Analysis of this data shows that even though these firms are established to serve an international market from the outset, the entrepreneurs use the local cluster and local networks to facilitate them in accessing international networks. Locating in the cluster is found to be significant for the entrepreneurs in three main ways: access to a specialised labour pool, a quality of life factor that makes it easier to attract and retain labour and the international reputation of Galway as a medical device hub that facilitates entrepreneurs in establishing global networks. Moreover, local networks in the form of mentorship between serial and more inexperienced entrepreneurs were found to be particularly important for building the credibility of such start-up firms and their international connections.

1 Introduction

Given the recognition that “*regions* have evolved along different trajectories through combinations of political, cultural and economic forces [emphasis in original]” (Cooke *et al.*, 1997 p. 480), regionally-based industrial development processes have captured the interest of academic and public policymakers for many years now. Due to the distinctive characteristics of regions, economic activity at this spatial scale of analysis has been the subject of much investigation by researchers, particularly in terms of innovation and industrial clusters (e.g. Porter, 1990; Keeble *et al.*, 1999; Maskell and Malmberg, 1999; Scott and Storper, 2003). Neighbouring firms engaged in similar activity within a region are argued to engage in trading and social networks that allows for the transfer and dissemination of knowledge among the cluster members. This facilitates high rates of innovation and may explain observed economic and dynamic differences across regions.

Within this line of thought entrepreneurship, defined in this paper as indigenous-based new firm formation serves as an important source of innovation and dynamism in an economy (Audretsch 2004, European Commission 2008). In studies of some of the most commonly analysed regions, such as Silicon Valley in the US (e.g. Saxenian, 1994), the Emilia-Romagna region in Italy (e.g. Best, 1990), and Cambridge in the UK (e.g. Keeble *et al.*, 1999) an innate culture of entrepreneurship and innovation is emphasised and thus these regions are characterised for their endogenous development. In the literature on industrial clusters, entrepreneurship is conceptualised to be an inherently local process. It is argued that clusters foster new firm formation by providing local relational linkages and knowledge flows that are crucial for the formation and development of firms while, in turn,

entrepreneurship furthers the development of the cluster (Feldman et al. 2005, Audretsch and Keilbach 2004)

This paper focuses on the role of clusters in the formation and development of a particular type of firm, that is, a globally-oriented firm. Such firms are established with the intent of serving an international market from the outset as opposed to focusing on a local market at inception. Under these circumstances this paper explores the extent to which such entrepreneurship is a 'local' process, that is, how if at all an industrial cluster plays a role in fostering and developing such firms. In particular, the paper addresses the following research questions: How 'local' is new firm formation in an industrial cluster in terms of the networks created to establish and develop a globally-oriented firm and the influence of the cluster in the formation of such a firm? And how significant, if it all, is being located in a cluster for a globally-oriented firm?

The second section of the paper provides a review of the literature around industrial clusters, the role of proximity, the link between clusters and entrepreneurship and defining globally-oriented entrepreneurship. The research methodology employed, which consists of a case study of the medical technology cluster in the West of Ireland is described in the third section while the fourth section presents the findings from this empirical work. Finally, discussion and conclusions are presented in the fifth section of the paper.

2 Industrial clusters and Entrepreneurship

The role of proximity

The literature and policy arena surrounding regional development and localised industrial agglomeration has been greatly influenced by both the Porterian industrial cluster concept (Porter, 1990) and the regional innovation systems approach. In the most broad and ambiguous manner, Porter (1990) has described a cluster as a group of firms and industries “related by links of various kinds” (p.131). More specifically, however, the following definition employed by Michael Porter for over a decade emphasises that the fundamental elements of clusters are geographical boundaries, the linkages among firms and organisations at a functional level (vertical and horizontal) and both the competitive and cooperative nature of those ties.

“Clusters are geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries; and associated institutions (for example, universities, standards agencies and trade associations) in particular fields that compete but also co-operate”

(Porter, 1998 p.197-198; 2000a p.253; 2000b p. 15; 2001 p.144)

The intensity of the interactions between the various actors of the cluster, which is enhanced by co-location, is argued to increase knowledge flows and thus the innovativeness and competitiveness of the cluster and region. However, it is the spatial boundary of clusters and, more specifically, the role of permanent geographical proximity that has been the source of criticism recently in the cluster literature (e.g. Lorentzen, 2007; Wickham and Vecchi, 2008; Bathelt et al., 2004). Firms, particularly those of a high-technology nature engage in global linkages to compete at an international level and as a result the relevance of local linkages and permanent geographical proximity within a cluster has been questioned (e.g. Lorentzen,

2007). This issue is compounded in the case of a small, open economy (Andreosso-O'Callaghan and Lenihan, 2008), which is generally characterised by the relative importance of foreign trade and the extent of inward and outward FDI (foreign direct investment) stock.

Scholars have delineated the concept of proximity distinguishing between relational and spatial forms of proximity in particular (Lagendijk and Lorentzen, 2007). While relational aspects refer to closeness in terms sharing, belonging and similarity, spatial proximity refers to geographical closeness (Torre, 2008; Lagendijk and Lorentzen, 2007). As the process of globalisation intensifies and firms engage in geographically extended trading networks relational forms of proximity have been emphasised as more significant than focusing on permanent geographical proximity or the co-location of firms in industrial clusters (Lorentzen, 2007; Onsager et al., 2007).

Against this debate, however, entrepreneurship or new firm formation is conceptualised to be a local process facilitated by the existence of both spatial and local relational proximity offered by industrial clusters. The following section focuses on this conceptual link between entrepreneurship and industrial clusters in the literature.

Entrepreneurship: Cluster formation, development and dynamics

From empirically evidencing that variations in the rate and character of new firm formation exists across regions to focusing on why such differences occur scholars have investigated the regional dimension of entrepreneurship for a number of decades now (Acs and Storey 2004). While traditionally the individual personality traits of the entrepreneur were the main focus of analysis in studies of new firm formation, the link between the regional context and new firm formation has garnered more interest. In this respect, academics have investigated

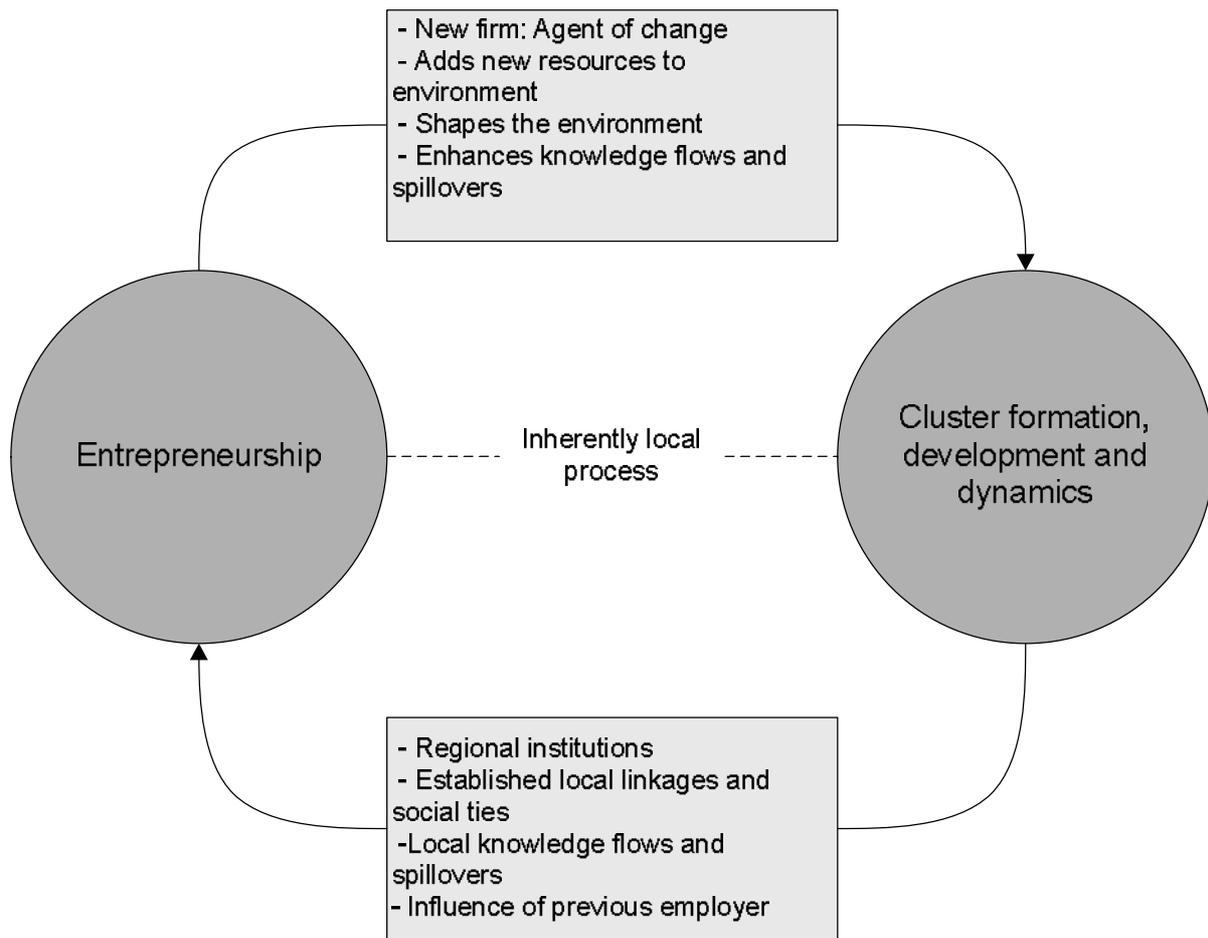
both the impact of entrepreneurship in a region as well as the factors present in a region that influence the extent of entrepreneurship which ultimately explain regional variations.

In the literature on regional industry clusters more specifically, entrepreneurship and cluster formation or development have been inextricably linked in case studies. For example, studies on Silicon Valley (US) (e.g. Saxenian 1994), Boston Route 128 (US) (e.g. Best 1990, 2001) and Cambridge in the UK (Keeble et al. 1999) tend to emphasise the significance of a culture of innovation and entrepreneurship in the evolution of clusters, while studies on high-tech clusters in Sophia Antipolis (Longhi 1999) and Ireland (Barry 2006, O’Gorman et al. 1997, O’Riain 1997) generally point to the importance of start-up or spin-off firms from the presence of local anchor organisations for the development of these clusters.

In appreciating the need to understand the evolution and historical development of industrial clusters to inform public policy, entrepreneurship has been theoretically modelled to be part of the formation and subsequent developmental stages of a cluster lifecycle, which policy can influence (Huggins 2008, Feldman et al. 2005, Wolfe and Gertler 2006). It is theorised that while some trigger or chance event may ignite local opportunities, the presence of latent entrepreneurs will transform these into new firm formations (Wolfe and Gertler 2006). Described as “agents of change” (Feldman et al. 2005, p. 130), entrepreneurs are placed at the centre of cluster formation in Feldman et al’s (2005) model and combined with regional institutions, resources and government policy, entrepreneurship remains a central component to the “self-organising system” that develops (p.133).

It is therefore suggested in the literature that there exists a circular, mutually reinforcing link between entrepreneurship and the development of regional clusters (see Figure 1).

Figure 1: Industrial Clusters and Entrepreneurship



In the first instance trigger events in the form of policy shifts, demand changes, the closure of a firm (Pinch and Henry, 1999; Henry and Pinch 2000) or the outcomes from research conducted in a local university for example may encourage new firm formations. Knowledge that is created in one organisation may be commercialised in the form of a new firm (Audretsch 2004). These new firms begin to shape the local environment (Feldman et al. 2005) by setting it on a particular technological path and adding to the knowledge base of the region. As more firms are established, a cluster and associated institutions begin to emerge and develop, which fosters further entrepreneurial activity. From an examination of two regions in Japan, Aoyama (2009) shows that local entrepreneurs imitate business practices, norms, systems and networks in their new firms, emphasising the importance of the regional

context for shaping new firms. The author concludes that while entrepreneurs may be ‘agents of change’ (Feldman et al. 2005) in the cluster formation phase, they also act as carriers of ‘regional legacy’ (Aoyama 2009, p.508) in the developmental stage of a cluster. At this stage entrepreneurs imitate and create spin-off firms (Malmberg and Maskell 2001), which adds more knowledge resources and further deepens the cluster.

Audretsch and Keilbach (2004) use the term ‘entrepreneurship capital’ (p. 950) to refer to factors or ‘endowments’ present in regional clusters that encourage entrepreneurship. These include the existence of local formal linkages as well as social ties, the access to finance, the availability of labour skills, the access to research at educational institutes and the reinforcement that new firms in a particular sector can successfully establish in the local environment, all of which are conducive to new firm formation. It is also argued that forms of inertia exist with regards to entrepreneurship (Malmberg and Maskell 2001, Feldman et al. 2005) in that entrepreneurs are likely to establish firms in the place in which they reside, the place where they have established ties and the place of their last previous employer. While some authors have focused on the last employer of the entrepreneur as the source of ideas and opportunities (Cooper and Folta 2000, Keeble and Wilkinson 2000), namely the incubator organisation, others have contended that entrepreneurs draw on ideas and experiences from their entire career in setting up their company (Harrison et al. 2004). According to Harrison et al. (2004) ‘magnet’ or ‘anchor’ organisations are important in a region for attracting talented individuals that will then establish their own companies and are likely to stay within the same geographical area.

Overall, therefore, entrepreneurship is theorised to be an inherently local process (see Figure 1). Within the literature, entrepreneurs are viewed as critical to industrial cluster formation and development in regions, while at the same time clusters are assumed to foster

entrepreneurship by providing established networks and access to knowledge flows. However, this is somewhat at odds with the growing evidence that firms engage in extra-local linkages to compete and remain competitive. It has been empirically evidenced that firms engage in international trading linkages and access knowledge on a global scale, particularly in high-tech sectors (e.g. Nachum and Keeble 2003, Tödtling et al. 2006). More specifically, the phenomenon of globally-oriented firms from inception, that is, firms that focus on serving the global marketplace from birth is not well placed within the theory of entrepreneurship and industrial clusters. The following sub-section focuses on defining the concept of globally-oriented entrepreneurship.

Globally-oriented entrepreneurship

While traditionally firms are assumed to serve the domestic market first and then move into foreign markets when they have developed the necessary resources and level of experience, in contrast researchers have focused attention more recently on globally-oriented entrepreneurship. One such form is the existence of ‘born-global’ firms that has been acknowledged and investigated since at least the early 1990s (McKinsey & Co. 1993 as cited by Lopez et al. 2009, Cavusgil 1994 as cited by Lopez et al. 2009, Knight and Cavusgil 2004)¹. Born-globals are mainly defined in the literature as firms that export from inception or soon after. While some argue that born-globals are more commonplace in small or developing economies because the domestic market is too small to serve (Bell et al. 2003), others have evidenced the significance of born-globals in larger economies (OECD 1997). Furthermore, the rapid internationalisation of firms is often associated with more knowledge-intensive sectors (e.g. Autio et al. 2000). However, a study by Lopez et al. (2009) on the

¹ See Rialp et al. (2005) for a review and analysis of the literature on the early internationalisation of firms from 1993 to 2003.

Costa Rican software industry showed that few companies in this sector actually exported immediately after inception and that most served a regional market in the first instance.

The study by Lopez et al. (2009) raises an important issue with regards to defining 'born-globals' and its applicability for all types of firms and sectors. In its truest sense a 'born-global' company may be defined as one that exports from its inception or within two to three years of inception (Rennie 1993, Knight and Cavusgil 1996, Knight et al. 2004, Moen 2002). A substantial proportion of its sales should also be international (e.g. 25%) (Knight et al. 2004). Thus identifying those firms requires comparing exports as a proportion of sales and the birth date of the company. However, this definition has limits as for certain firms in some knowledge-intensive sectors it may not be possible to export from inception or soon after due to longer lead times from when a company is established to when the company can have a fully developed product ready for the marketplace. For example, it may take several years for a company developing a medical device in the healthcare sector to get approval for the device to be sold in the marketplace. However, this company may be globally-oriented from its inception in terms of its intention to serve a global marketplace as it develops the product and seeks international approval.

Therefore, even though it may not be possible for all firms to be 'born-global' in its strictest definition, the phenomenon of globally-oriented entrepreneurship is certainly prevalent in knowledge-intensive sectors in particular. Globally-oriented new firms can be differentiated from more traditional start-ups where internationalisation is a much more gradual process (the Uppsala-Model) by a number of factors, such as, focusing on global markets from the outset, simultaneously targeting international as well as domestic markets from inception, developing their product or service for a global market from the beginning, and by the entrepreneurs having a "strong international outlook" (Knight et al. 2004, p.647). Indicators

of such factors may include the geographic scope of the linkages and knowledge networks they create from the outset as opposed to solely focusing on export figures from inception that may not be relevant for certain firms in some sectors.

Given the prevalence and characteristics of such globally-oriented start-ups, the purpose of this paper is to explore the significance of regional industrial clusters for the establishment and development of such firms. Therefore, the paper focuses on the role of clusters in the formation and development of these firms, that is, the lower half of Figure 1. In particular, the paper addresses the following research questions: How 'local' is new firm formation in an industrial cluster in terms of the networks created to establish and develop a globally-oriented firm and the influence of the cluster in the formation of such a firm? And how significant, if it all, is being located in a cluster for a globally-oriented firm?

The research methodology employed to address these questions is presented in the following section, which is followed by the findings and discussion.

3 Research Methodology

Given that the research questions posed are exploratory in nature a case study strategy was used to examine the phenomenon of globally-oriented entrepreneurship in industrial clusters. Case studies allow the researcher to explore a phenomenon within its context (Yin 1984, Eisenhardt 1989) and from this build on and develop theory (Eisenhardt and Graebner 2007). The case chosen for investigation is the medical technology cluster in Galway city and county on the west coast of Ireland. This regional cluster case was chosen for investigation for a number of reasons. First, there is a clear agglomeration of companies and employment in this sector in Galway that has been previously documented (Giblin and Ryan 2010, Giblin *forthcoming*). Secondly, it is a high-tech cluster within a region of a small, open economy and

therefore globally-oriented entrepreneurship, which is of interest to this study, is more likely to exist in this cluster. Thirdly, while the cluster is driven by the presence of two large foreign-owned multinational corporations (MNCs), Boston Scientific and Medtronic, which create most of the employment in the region (employing approximately 4500 people), over the past ten years there has been a growing indigenous base of smaller-sized companies (Giblin and Ryan 2010). In 2009 the Galway medical technology cluster comprised of approximately forty companies in total and 57% of these were indigenous (i.e. 24 companies) (Giblin and Ryan 2010). Therefore, while it is a relatively embryonic cluster, there exists a growing number of start-up firms.

The unit of analysis is the networks that are created to establish and develop globally-oriented entrepreneurship within this cluster. By analysing these linkages the study departs somewhat from previous research in this area that tends to focus on the entrepreneur. For example, Harrison et al. (2004) explores the ‘localness’ of entrepreneurial activity in a technology-based cluster in Ottawa by analysing the entrepreneur themselves in terms of their career history and prior employment experiences as a source of ideas, resources and motivation for establishing the firm. Ylinenpää (2009) states that much research around networks and entrepreneurship “employs the individual entrepreneur or entrepreneurial firm as a point of departure and main unit of analysis and regards relations and interactions with external stakeholders as a context in which this main unit of analysis is embedded” (p.1159). As a result Ylinenpää (2009) suggests that the “system in which entrepreneurial actors operate forms a fuzzier picture” (p.1159).

In total, twelve semi-structured interviews were carried out with founders or general managers of firms in the medical technology cluster in Galway (see Table 1) and one interview, which provided a context for the study, was carried out with an experienced

businessman who has invested in or provided a directorship role to numerous medical technology start-ups in the cluster. Those companies developing a medical device or a component to a medical device were targeted for interview, as opposed to raw material supplier companies that are more likely to serve a local market. The extent to which these targeted companies can be considered to be globally-oriented entrepreneurship was investigated during the interviews by discussing the extent to which global markets were targeted by the company from its inception and the degree to which the founders have an international outlook from the outset. The focus of attention during the interviews was the networks the founders create to establish and develop their company, as well as Galway as a business location for the entrepreneurs. The following section presents the findings from this empirical work.

Table 1: The interviewed firms

Firm	Date of interview	Approximate length company is established at time of interview	Interviewee	First Med Tech company started by interviewee	Stage of company development at time of interview ²
Firm A	Feb 2010	7 years	Founder	Yes	Regulatory approval, just prior to roll-out of own product
Firm B	Feb 2010	5 years	Founder	Yes	Large animal trials undertaken, prototype of own product developed, patented
Firm C	Feb 2010	1 ½ years	Founder	Yes	Ongoing contract design and manufacturer, design phase of own product, pre-animal trials stage
Firm D	Mar 2010	12 years	Founder	Yes	Own devices in the market
Firm E	Mar 2010	3 years	Founder	No	Developed and have marketed own component of medical devices
Firm F	Mar 2010	5 years	Founder	Yes	Received European regulatory approval for own product and commercial deal completed for distribution
Firm G	Mar 2010	4 years	Founder	No	Own product developed and distributors on board
Firm H	Mar 2010	1 ½ years	Founder	Yes	Developed working prototypes for own product
Firm I	Mar 2010	10 years	Founder	Yes	Contract design and development of medical device components, OEM contractor
Firm J	Mar 2010	2 years	Founder	No	Design of own product and ready for clinical trials stage, ongoing subcontract services
Firm K	Feb 2010	4 years	Founder	No	Designed, developed and have marketed own products
Firm L	Mar 2010	7 years	General Manager	Yes	Designed, developed, marketed own products, ongoing OEM product development and design services

² Note: 'Own' product or component means in this context that the company is designing and developing their own idea as opposed to pure contract design and development services for other companies. However, the product may not necessarily be sold on the market under the company's own name.

4 Case Study: Globally-Oriented Entrepreneurship in the Galway Medical Technology Cluster

The Irish medical technology sector (with 24,000 employees in over 160 companies) is generally characterised by the dominant presence of large foreign-owned multinational corporations and a growing base of much smaller-sized indigenous firms in terms of employment (Giblin and Ryan 2010, Giblin *forthcoming*). This is a relatively substantial and growing sector within the Irish economy. Per capita, Ireland has “the highest number of people working in the industry in any country in Europe” (IMDA 2010) and more significantly, in a period of economic decline, merchandise exports in the first half of 2009 for Ireland was primarily driven by the life sciences sector, which includes medical devices (IEA 2009). According to the Irish Exporter’s Association, while total exports fell by 1% in 2009, merchandise exports “held up well as a result of the continued growth in the pharmaceutical and medical devices sector which grew by 12% and 4% respectively” (IEA 2009, p. 3).

The regional dimension to the sector in Ireland is most pronounced by the cluster of activity in the West of Ireland. Almost 40% of total employment in the medical device sector in particular is in the Western region (EGFSN 2008, p.23) and in 2004 the policy advisory board, Forfás, reported that the “region had an employment share of over three times the national average for this sector” (i.e. a location quotient of 3.92) (EGFSN 2006, p. 8). As the main economic centre in the West, Galway has had significant investments by the leading MNCs in the world, including, Boston Scientific, Medtronic, Abbott, Merit Medical and Covidien. CR Bard provided the first major investment in medical technology to the region in the early 1980s, followed by Boston Scientific and Medtronic in the 1990s.

As Giblin and Ryan (2010) report there has been a growing number of indigenous medical technology companies in Galway over the past decade. The businessman interviewed for the purposes of this study stated that he has experienced a marked change in the type of indigenous firm establishing in the region. In essence there have been two waves of start-ups; the first a group of supplier companies in the 1980s and 1990s primarily servicing the foreign MNCs and the second wave consists of firms that have mainly established over the past decade and are designing and developing finished medical devices or a component to a device. These firms tend to develop products for an international market and are the actors of interest for this study. The following subsections provide an analysis of the networks they create and the influence as well as significance of the local cluster in which they operate for their formation and development.

Characteristics of firms: Global or local networks

All of the companies that participated in the research can be considered to be globally-oriented from inception as they have targeted international markets from the outset in terms of designing and developing their product and the entrepreneurs take very much a global outlook in terms of the markets they are or will be servicing (see Table 2). This is primarily because of the global nature of the industry and the domestic market is simply too small to serve. Even in the case of Firm I that is only involved in contract design and development of products and is not developing its own product, its first customer was international.

The other firms pursue different strategies for financing their product development and for getting products to the market. For at least four of the companies, the entrepreneur has engaged in consultancy or contract design or development services, whereby they may access local medical device customers (mainly MNCs) to help fund the R&D (Research & Development) process of their products. The remaining firms rely solely on a combination of

venture capital, government support and/or self-funding to design and develop their products.

Table 2: Globally-oriented entrepreneurship in the Galway Medical Technology Cluster

Firm A	“Well again it’s a very simple equation. If you were just going to supply the Irish market you wouldn’t last very long because the Irish market, you know, the specialist things that we do, there would be twenty maybe labs in Ireland so if you were just going to do that hey forget it so you have to be global and in our business, medical devices, the US is hugely important. The US is fifty per cent of the worldwide market so you really have to have some strategy for the US and getting to the US ...” (Founder)
Firm B	“...we’re looking at a global market. The Irish market is totally insignificant for us. Totally. It doesn't sustain. We're looking at Europe, US, and Asia. Three continents” (Founder)
Firm C	“the market is international it’s not here in Galway...there’s a huge international market there’s no doubt about it” (Founder)
Firm D	Speaking about the early stages of developing the product and doing an international deal: “[I was] building up my team with the money I was bringing in from consultancy off the major multinationals and then using the money from that to plough back into developing my own products, and so that was moving along very nicely and then a friend of mine said to me that he had great – he’d seen a great technology out in California....So I negotiated a licence agreement with them” (Founder)
Firm E	“From day one you have to be global because it’s a global industry” (Founder).
Firm F	“complete a deal that’s a distribution deal or a license deal with these companies your product is going to get to the larger market much faster than if you tried to do it yourself. So the view we took for the next phase of our development is a partnering arrangement and we’ve done that with Merit Medical on our first” product. (Founder)
Firm G	“...we are an international business based in Galway, you know, I actually, you know, the Irish market is almost meaningless to me” (Founder)
Firm H	“[Firm H] is based on a global, you know, global access and a global market access because quite frankly if we were developing in the kind of cost input it’s going to take to develop our projects you just would never get the return on a local basis...”(Founder)
Firm I	“...and picked up the customers... our first customers, we continued to do business with them... [they were] based in Italy...they were our first customer” (Founder)
Firm J	Interviewer: “you are not particularly supplying a domestic market....” Interviewee: “No, the American market is going to be our major focus” (Founder)
Firm K	“our industry cannot support an industry that is set up to serve the Irish market – there’s nothing to it here. No offence to Ireland, we're just tiny. We are 1% of Europe, it’s tiny” (Founder)
Firm L	“Our biggest market is the US – we probably do around two thirds of our business in the US” “So our first product we designed and developed a medical device... And that received approval - an FDA and CE mark...and that there on started the opportunity to start getting revenue from products and feeding our R&D pipeline...[W]e developed a relationship, which was important, with a strategic partner – [MNC].... in the US” (General Manager)

In terms of getting the product to market the firms generally use or intend to use international distributors or partnership agreements with MNCs that are based internationally. The small size of the company and the lack of sales and marketing experience of the entrepreneur were cited as the main reasons why directly selling to the market through establishing international offices was not pursued at least initially. As one founder explained;

“Are we going to be a company that basically develops technology, develops products, which we can do. Get them through the clinic and get the qualified, which we can do. And then set up our own sales team and take it to the market or find a partner that’s going to do that and the decision we made is that we were going to partner on our products and release them through their systems to the market and there was two reasons for that. One is the financing required to set up your own sales and marketing team and that’s where being a small company in the West of Ireland becomes particularly difficult. And the second one is that you’ve got people like Boston Scientific, Merit Medical, Medtronic and other companies with huge infrastructure and sales teams on the road already so if you can complete a deal that’s a distribution deal or a license deal with these companies your product is going to get to the larger market much faster than if you tried to do it yourself”. (Founder, Firm F)

In terms of creating contacts with international distributors and/or strategic partners the interviewees stated that they rely on tradeshows and most significantly contacts they would have established in their previous employment prior to setting up the company or in a company previously established by the entrepreneur. At least two of the companies have established partnerships with the MNCs, Boston Scientific and Merit Medical, both of which have subsidiaries in Galway. However, the founders reported that they don’t have a major relationship with the Galway-based subsidiaries but instead deal with other units of the corporation abroad. At the same time, one interviewee stated that their location in Galway made it easier to attract the global corporation to the region to visit their firm and establish the relationship as this corporation already had a subsidiary in Galway. The interviewee of the second company sought the assistance of their chairman, a local experienced businessman who had previously worked in the MNC in Galway to help establish the connection with the corporation internationally.

Along with the distributors and strategic partners, establishing networks with clinicians is fundamental to the development of the company. The clinicians are the main source of ideas for the product and through all phases of development from design to commercialisation to incremental product changes the firm maintains an important link with clinicians. As the General Manager of one company stated;

“We cannot compete on a top level unless we are working with clinicians and we can get that relationship and that product development skill. There’s no point in me out here working on a device downstairs unless I have a relationship with a clinician who is feeding in...’this is what I’m working on, on a daily basis, this is the surgery’...’come in and have a look at the surgery...come in and develop a product together’. You have to have both people working together”. (General Manager, Firm L)

“I mean at the end of the day if you’re designing or defining a medical device or product for the medical market you absolutely need clinical input. If you think you could do it without clinical input you’ve a problem”. (Founder, Firm F)

The clinicians accessed by the firms are either based within Ireland or abroad. The younger firms and less experienced entrepreneurs tend to engage with clinicians based in Ireland and as the firm develops they access international physicians. For those more experienced entrepreneurs that have established other firms prior to the one under investigation, they generally have direct contact with internationally-based clinicians. Furthermore, the interviewees spoke of the importance of accessing “influential physicians” (Founder, Firm A), “world-leading surgeons” (Founder, Firm B), “imminent surgeons” (Founder, Firm C), “top guys” (Founder, Firm F), “high competent surgeon[s]” (Founder, Firm H), “opinion leaders” (Founder, Firm I), “Chief cardiovascular surgeon[s]” (Founder, Firm J) and “superstars, top-tier experts” (Founder, Firm K) for the development of their business.

As previously noted the experienced entrepreneurs tend to have made connections with internationally-based clinicians through their previous businesses but also attend leading clinical congresses and conferences to access the top-tier physicians. For the other firms, they use their strategic partners or distributors to access clinicians, they attend leading clinical congresses and they use their Board of Directors, which may include experienced local business people to create contacts with physicians. In the case of at least two of the young firms and first-time entrepreneurs, their Board members include a clinician or they have established a medical advisory board.

For those companies accessing suppliers for developing prototypes or the finished product they tend to use local suppliers for basic raw materials or local as well as nationally-based contract manufacturers. However, if needed, they also access more specialised suppliers abroad. Similarly, the interviewees reported linkages with Higher Education Institutes (HEIs) and research centres at all three geographic scales – local, national and/or international. All of the interviewees reported that they had either formal or informal linkages with the local university or institute of technology in the form of research linkages, social networks or the allocation of office space. Three of the companies under investigation are located in business centres on the campus of local HEIs. Linkages with international research centres or universities were also cited by a number of interviewees, which were particularly important for accessing clinicians abroad.

Overall, the firms can be characterised by the extent of the global networks they establish with various actors from the outset. The following two subsections focus more specifically on the influence of the local cluster on firm formation and development which emerged from the interviews and how significant locating in the cluster is for these firms.

Cluster influence on new firm formation

The cluster was found to be influential in the formation of these firms in two important ways. First, the cluster played an important role in developing the skills of the entrepreneur. Secondly, the cluster was significant in the formation and development of firms through the establishment of contacts and networks between experienced business people and inexperienced entrepreneurs within the cluster.

All but one of the individuals interviewed had experience working in Galway-based MNCs in the medical technology space before establishing the present company in which they work. Even in the case of the exception to this, the entrepreneur had worked as a freelance consultant with a local medical technology MNC prior to establishing the company. The founders referred to the importance of this work experience for creating contacts, getting international exposure, meeting with clinicians, meeting quality standards, developing their managerial skills and technical skills, and establishing credibility as a business person in this sector. All of these aspects proved invaluable for setting up their own companies. This point is emphasised in the following quotations from the interviews conducted:

“quite frankly it’s the only place to get a grounding in the business because, particularly the medical device business, it’s very much, it’s very international.... understanding markets, links in with clinicians – all of those things and it’s a very, very relevant part of building the knowledge base to take flight in this business” “...working at a senior management position, working out in the clinical environment with the marketing groups, understanding clinician needs, you make relationships and build on them over the years. It’s...you’ve got to serve your time” (Founder, Firm K)

“...you bring a culture – you understand about validation, all of the supply sources come natural to me because I have them all. So I can put something together very fast and develop the resources for it” “there is an awful lot of entrepreneurial skill coming from the MNCs – the engineers that leave and set up their own – that’s very much there and I think it’s a spawning ground for small businesses like us” (Founder, Firm J)

“...you're taking the experience that you get in the big multinationals and the relationships you build up...you build up relationships and you get to know people and you get to know the market, so you stand back and you say, right, I know I can approach these people and I know I have some ideas and I know this doctor and he can get involved with me to check out the idea. So you build up that experience and then you just have to have personality types that are prepared to be silly enough to jump”. (Founder, Firm I)

“...they are almost like a university for the people who go in there, they are so well trained in the worldwide regulatory requirements ...so they learn a huge amount about the market, they learn a huge amount about the products, they learn a huge amount about where the business, all businesses are going...you know this is the next big thing... some smart guy in there spots it and says you know what I'm going to set up a company and do that ... and they decide right, we know what to do, we know what has to be done, we know the people to hire and they come out of there with a lot of credibility when you go to investors”. (Founder, Firm C)

Most of the founders are not from Galway originally and only four of the interviewees did their third level engineering degree or diploma in Galway while the remaining eight obtained third level education in Dublin, the UK or Limerick. In the case of one company, while the General Manager had work experience in a Galway-based multinational, the founder is from the United States and chose Galway to establish his company because of the “hub of manufacturing” that existed in this area (General Manager, Firm L).

The second most significant way in which the cluster played a role in the formation and development of the firms was the establishment of networks between local experienced businesspeople and inexperienced entrepreneurs, that is, first-time entrepreneurs locally. Four of the interviewees can be considered serial entrepreneurs in the sense that they have set up more than one medical technology firm in the region, while two other entrepreneurs established their firms (Firm D and Firm I) twelve and ten years ago respectively. Furthermore the experienced businessman who was interviewed to provide context to the study has worked in the cluster in Galway for thirty years. These experienced business people

tend to have access to a wide and strong network of international contacts in particular, which was emphasised in the last subsection. They also have business acumen and credibility within the medical technology space. As a result the more inexperienced entrepreneurs interviewed stated that developing relations either formally or informally with these more experienced people locally is important for business formation and development, particularly in terms of accessing finance. On a formal level most of these experienced business people are on the Board of Directors or are Chairpersons of one or more of the younger firms that were founded by inexperienced entrepreneurs interviewed. Even if such a formal connection did not exist all the entrepreneurs spoke of the importance of informal networking with such experienced business people in the cluster. The following quotations from the interviews demonstrate the significance of such local networks;

“....you get entrepreneurs like himself [referring to an experienced business man in the cluster] who have just, who again knew the global market, knew the technology, knew the trends and, you know... He’s a non-executive chairman here...[he brings] experience, governance, strategic vision...and we have a strong board here now and I think it’s very important. I guess we’ve raised a considerable amount of equity investment but also...if a company is going to spend a couple of hundred thousand Euros to qualify you, they want to make sure that you’re there in one year and then three years and then five years’ time and that’s why they like to see you progressing and, you know, to see you’re well funded and they see a strong board of directors”. (Founder, Firm E)

“I would know all of them (referring to other experienced business people in the cluster)...[We] ring each other for therapy every now and again” (Founder, Firm E)

“[It’s] absolutely key, you know people..., I don’t want to be throwing names here but you know people like [name of experienced entrepreneur in the cluster] who had been through it all here before, you know, who was a very willing, you know, willing with information and just very generous with his information and time...This is just like over coffee or over lunch or whatever just to meet with these people [referring to experienced entrepreneurs in the cluster] and what has been their experience and how they have done it and all that kind of stuff so but you know I did that with a number of different people down here and started to get connected to other people who then you know... You know people like that, that I just

connected with who were able to talk about you know how they got funded, we would have spoke about the type of services they used and that type of thing so, you know you can't under estimate that network and a willingness for those guys, like it's literally a half an hour or an hour..... it's almost like you know you are connecting rings, you are connecting.... You are connecting into a bigger pool all the time and it's that network I suppose that. And I saw that I suppose from the very early stages that that's what I needed to connect into to make this, you know I think I would have been struggling to do it in Dublin or even in Limerick. (Founder, Firm H)

"Absolutely, you know [name of experienced businessman in the cluster] [his] reputation goes before him. We needed someone who could lead and direct our company and give young people – at the time [the Founder] was young, he was in his early 30s and I was young as well - and we needed someone with a lot of experience who has been through it before and could direct us in the right paths. So most definitely having [name of experienced businessman in the cluster] on the board has led us in...the right direction and we haven't looked back. He has been a very important cog to us in the last eight years and he is still chairman of our company in 2010". (General Manager, Firm L)

"It's connection and confidence, it's about credibility, when you go to an investor he's got to feel or they've got to feel that you are credible, now whether you do that with your product or your team or your product and your team right is entirely up to you, but they do like to see the product and the team, they are gone very choosy lately" (Founder, Firm C)

Significance of locating in the cluster for firm development

When asked about the significance of locating in the cluster for the development of the firm the most commonly cited points by the interviewees were; the access to a specialised labour pool, the benefits of Galway as an internationally renowned hub for medical technology and the quality of life in Galway for attracting and retaining engineers. The specialised labour pool has developed primarily as a result of the presence of the large MNCs in the region but also the local university and institute of technology play a role in the supply of biomedical and mechanical engineering graduates. These quotes from two founders emphasise the importance of the cluster for providing skilled labour;

“...we’ve got Medtronic operators, Abbott operators, all who’ve hit the ground running who don’t need to be, you know, that has the GM, the good manufacturing practice ... for medical devices experience, they know the documentation, the importance of regulatory, regulated business. It is so the fact that all that expertise is here, that labour pool, it’s enabled the likes of us...so like when people are in - even the customers - and they say ‘oh’ and they’re sitting down, ‘where did you work before’, and he says ‘Boston Scientific’ or worked in Abbott you have already made a reputation and as soon as you start”. (Founder, Firm E)

“It’s [referring to the cluster] fantastic in terms of the skilled people in specific areas. If you are going to hire a group of R&D engineers, it’s a great place to come. It’s much better than any place in the UK just because we have experienced people, similar with regulatory, with people that have quality backgrounds. So there is a pool of talent and it’s not surprising because look at what we’ve got around us, there’s a great pool of talent around here. And there are suppliers that understand the quality systems”. (Founder, Firm K)

“...you know if you are looking for people, particularly on the operational side and in the R&D side, you know, the best paper you could be advertising in is the Galway Advertiser, not the Irish Times, you know, there is such a skill base”. (Founder, Firm G)

Most significantly, the interviewees referred to the importance of Galway being known internationally as a hub of medical technology activity for their business as it facilitates them in creating networks abroad. It is the region’s reputation for medical device manufacturing capabilities and regulatory compliance that the smaller indigenous companies benefit from. This is primarily as a result of the presence of the world-leading MNCs, such as Boston Scientific, Medtronic, Merit Medical and Covidien. When the entrepreneurs go abroad to establish networks, the international actors know of the Galway region and its positive reputation. Furthermore, the hub of medical technology activity attracts global actors to the region as they visit the subsidiaries of the MNCs or attend international trade shows that are held locally which facilitates smaller firms in organising site visits and meetings with them. This positive reputation effect, which has also been evidenced in previous studies (Giblin and Ryan 2010, Giblin *forthcoming*) is emphasised in the following quotations;

“we [referring to the region] enjoy a very strong regulatory...reputation and credibility and even for manufacturing we have a very strong reputation for it so if I find if you’re in Shanghai, China or San Francisco, California and you say you’re based in Galway, people don’t, people know where Galway, Ireland is and in this industry know where Ireland is and they know where Galway is and they know that it’s a major cluster for medical,... in medical Galway and Ireland is very well globally recognised and so immediately that brings you credibility when you start marketing overseas as well” (Founder, Firm E)

“I don’t know if there is a better place in the world to do what we’re doing, I don’t think there is. At the end of the day I think something like a third of the global medical devices on the market over a third are produced here in Galway because you’ve got the leading, the Boston Scientific, Medtronic, you have Abbott in Ireland and, you know, other smaller company spin offs as well”. (Founder, Firm E)

“Galway is renowned as a medical device manufacturer and I think we need to appreciate that in Galway and in Ireland. The biggest medical device companies are based here, between Boston Scientific, Medtronic, Covidien, they are leading top ten players in the world in terms of medical device manufacturing” (General Manager, Firm L).

“There is a credibility, a cluster has emerged” (Founder, Firm K)

The final point made by the interviewees in relation to the significance of locating in the cluster for the development of the firm was a quality of life factor in Galway. The importance of place emerged during the interviews as a significant factor for attracting and retaining engineers in particular but also in terms of getting global actors to visit the region.

“There is also a quality of life in Galway and you know my experience and [the Founder’s] experience will tell you that if you want to retain good engineers they are going to come and work in an environment that has a good quality of life and whereby there is an excitement and a good atmosphere here. So that’s very important, young, hungry, good quality of life, educated workforce and a knowledge economy for medical device manufacturing”. (General Manager, Firm L)

“And I think the third piece of it is a little bit, it’s a softer side of it and the softer side of it is Galway is a good place. Galway is a good city. So if I say to a clinician we’re based in Galway I would like to have you come over and review our products and see where we’re at that’s a very easy sell...So there’s quite a few strings to Galway being a very, very positive place to be”. (Founder, Firm F)

Overall, the findings demonstrate that while these are globally-oriented companies that predominantly pursue international markets, the local cluster still plays a significant role in the formation and development of the firms. In the next section these findings are discussed in more detail within the context of the literature and final conclusions are drawn.

5 Discussion and conclusions: Local clusters and global entrepreneurship

The purpose of this paper is to explore the phenomenon of globally-oriented entrepreneurship within industrial clusters. Scholars have argued that entrepreneurship is central to both the formation and development of industrial clusters (Feldman et al. 2005) and that “our understanding of regional economic systems may be enhanced by a consideration of entrepreneurs as economic agents who actively interact with their local environment” (Feldman et al. 2005, p. 139). Audretsch and Keilbach (2004) refer to the factor endowments in a cluster, such as formal and informal local ties that encourage and foster the growth of new firms, which in turn influence the development of the cluster. It is reasonable to expect that an industrial cluster may encourage the formation of new firms which are set up to supply the local market as the access to local linkages for trade and local market knowledge are already well-established. However, the ambiguity in the literature lies in explaining how, if at all, a cluster can encourage and promote the formation and development of firms that are predominantly outward-focused from the outset. These firms are termed in this paper as ‘globally-oriented’ as they are set up to supply and international market from inception.

This research adds to the literature by showing how clusters can play a role in the formation and development of such globally-oriented entrepreneurship. Therefore, the paper seeks to address the following research questions:

1. How 'local' is new firm formation in an industrial cluster in terms of the networks created to establish and develop a globally-oriented firm and the influence of the cluster in the formation of such a firm?
2. How significant, if at all, is being located in a cluster for a globally-oriented firm?

A case study of the medical technology cluster in the west of Ireland was undertaken to answer these questions. Interviews were conducted with the founders or general manager of globally-oriented firms in the cluster. Most significantly, the focus of analysis was the networks the founders create to establish and develop their company, as well as Galway as a business location for the entrepreneurs. All of the firms were found to be globally-oriented in that they are developing products for an international market and focus on establishing global linkages with strategic partners, distributors, clinicians as well as research institutes. However, in terms of the first research question, the local cluster was found to be significant in the formation and development of the firms in two ways. First, the cluster played a role in the skills development of the entrepreneur. In corroborating with previous research (Giblin *forthcoming*, Harrison et al. 2004) anchor organisations in the form of large MNCs in the cluster were found to be particularly significant in developing the managerial and technical skills of the entrepreneurs and in getting international exposure in terms of creating contacts with partners and clinicians abroad and in establishing their credibility as a business person within the sector. Secondly, the cluster was found to be important in the local linkages that have developed between experienced business people and the inexperienced entrepreneurs within the cluster. Four interviews were conducted with serial entrepreneurs and one interview was conducted with a business person with over thirty years business experience in the cluster. The research showed the importance of a local mentorship role between these experienced people and the inexperienced entrepreneurs. The former individuals have strong

business acumen and access to a wide international network that the inexperienced entrepreneurs access either through local social ties with them or having them as chairperson of their firm or part of their board of directors. These local networks were found to be significant for the formation and development of the firm.

In terms of the second research question posed the research showed that locating in the cluster was important for the firm in three ways: access to a specialised labour pool, the reputation of the cluster as an international hub within the medical technology space that facilitated the firms in establishing networks abroad and the quality of life in the region that assisted in attracting and retaining employees. These findings substantiate previous research on industrial clusters that has shown the importance of clusters for providing access to skilled labour and for facilitating firms in participating in international networks through the positive regional reputational effects that the cluster can create (Giblin and Ryan 2010).

While there are of course limitations regarding the extent to which this case study research can be generalised to other types of clusters in other regions, the paper provides a basis for which future research can focus on. In particular, the paper shows that while globally-oriented entrepreneurship is prevalent in high-technology industry clusters, local entrepreneurial skills development, the positive reputational effects of a cluster and most significantly, local networks in the form of mentorship connections between experienced and inexperienced entrepreneurs are significant for the formation and development of globally-oriented firms. Overall, it can be concluded therefore that the spatial and local relational proximity of clusters matter for new firm formation, even in the case of globally-oriented entrepreneurship.

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