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The Dual Role of Multinational Corporations in Cluster Evolution:
When You Dance with the Devil, You Wait for the Song to Stop

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Abstract:

This chapter shows that multinational corporations play a dual role in cluster evolution through the case of the wireless communications cluster in Northern Denmark. On the one hand, they bring in resources to the cluster, such as financial resources, technology, knowledge, innovation networks, and access to new markets. On the other hand, they cause changes in local interaction, decision making in firms, and the scope of activities in the value chain. This chapter highlights the positive and negative effects of multinational corporations (MNCs) and makes the claim that greater emphasis should be placed on MNCs when studying cluster evolution.

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1. Introduction

The role of multinational corporations in clusters is a growing topic in the literature (Santangelo 2009; Mudambi and Swift 2012; Sedita, Caloffi, and Belussi 2013; Mudambi and Santangelo 2015). MNCs are increasingly locating their activities within clusters in various countries and thereby affecting the dynamics of the clusters (Birkinshaw and Hood 2000). The entry of MNC subsidiaries is often seen as something positive, since they bring in new resources to the cluster and provide access to global networks (Giuliani, Pietrobelli, and Rabellotti 2005; De Propris and Driffield 2006). The MNC subsidiaries especially allow the cluster as a whole to be connected to other clusters in a similar field across the world, which is becoming increasingly important for achieving global competitiveness (Mudambi and Swift 2012). However, MNCs could also have negative influences on the cluster. For one thing, they are well-known for being footloose in times of crisis (Görg and Strobl 2003; Østergaard and Park 2015). In addition, the MNC subsidiaries' participation in local networks and their ability to choose their own technological search depend on the mandates that the subsidiaries have (Cantwell and Mudambi 2005; Østergaard and Park 2015; Mudambi and Santangelo 2015). This suggests that MNCs might have a dual role in cluster evolution in that they could exert both positive and negative impact over time.

The increasing focus on MNC subsidiaries in clusters is linked to a growing awareness that clusters also participate in global value chains, not only in the local value chain (Humphrey and Schmitz 2002; Giuliani, Pietrobelli, and Rabellotti 2005). In this line of literature, the focus is placed on the possible upgrading of the cluster through insertion into the value chain, mainly from the perspective of developing economies (Humphrey and Schmitz 2002). However, the participation in the global value chain might have an effect on clusters regardless of their position in the value chain, and it is the intention of this chapter to shed light on how a cluster with firms in the higher end of the value chain is influenced by relations in the global value chain in the course of its evolution.

In cluster evolution literature, other clusters in the same field and the global value chains are seen as a part of the external environment that affects cluster evolution (Menzel and Fornahl 2010; Martin and Sunley 2011). It is recognized that clusters might change their development path by diversifying into other parts of the value chain, but surprisingly little attention is given to the effect of the global value chain and to the role of MNC subsidiaries in cluster evolution. Thus the impact of the individual MNC strategies, subsidiary mandates, and subsidiary capabilities on cluster evolution has not been discussed sufficiently. Consequently, it is often neglected that, when clusters face changes in technological trajectories or in industry boundaries, the response of the MNC subsidiaries depends on their strategic independence given by the MNCs. When the subsidiary has limited strategic independence, the direction of technological search is determined by the headquarters of the MNC located elsewhere, which indicates that the technological evolution of the cluster can largely be influenced by the MNC strategies, depending on the importance of the MNC activities in the cluster. Metaphorically, the cluster will continue to dance to the song chosen by the MNCs. Therefore it is necessary to study the micro-dynamics of interactions within and between firms in clusters to understand the benefits and hidden costs of MNCs in clusters and their effect on cluster evolution.

The purpose of this chapter is to analyze the changes that occur on a micro-level when MNCs enter a cluster and how the MNC subsidiaries affect cluster evolution. Using detailed case studies of cluster companies during the life cycle of a wireless communications cluster in Northern Denmark and an analysis of patent data, this chapter illuminates the impact of MNCs on cluster evolution, specifically their dual role in changing the network within and outside the cluster and affecting the technological heterogeneity of the cluster.

2. Theories on Cluster Evolution, Global Value Chains, and MNCs

The literature on clusters has often focused on the role of internal factors, such as Marshallian externalities and spin-off activities, when explaining cluster evolution. Some authors have made limited remarks on the role of external linkages in relation to the evolution of clusters. Menzel and Fornahl (2010) argue that cluster evolution depends on changes in the diversity and heterogeneity of knowledge in the cluster. They mention that cluster firms' networks with outside firms are important in bringing new knowledge to the cluster. In explaining the adaptive cycles of clusters, Martin and Sunley (2011) point out that the firms' connection to competitors or collaborators outside the cluster could be an important source of innovation. Bathelt, Malmberg, and Maskell (2004) also argue that external linkage to firms located outside the cluster is necessary for cluster development. These external "pipelines" bring new knowledge to the cluster that can be diffused to other firms through local "buzz." Local "buzz" is the information flow within the cluster through various types of formal and informal networks, which is a key source of knowledge spillover (Bathelt, Malmberg, and Maskell 2004). Although some authors have made remarks on how external linkages may enhance the adaptability of the cluster and increase the heterogeneity of knowledge, external relations still do not receive enough attention as the driver for changes in cluster evolution (Humphrey and Schmitz 2002; Bathelt, Malmberg, and Maskell 2004; Giuliani, Pietrobelli, and Rabellotti 2005).

Global Value Chain

The concept of the global value chain illustrates how firms and regions are involved in the global division of labor for producing certain products and services (Mudambi 2008). It explains that, as firms become more specialized in their activities, the production processes are more finely divided and allocated to firms located in different parts of the world. Firms in clusters are also connected to other firms located outside the cluster through buyer-supplier relations in the global value chains. External relations created by the global value chain are one of the channels through which cluster firms can get access to external knowledge and thereby increase the heterogeneity of knowledge.

In literature on global value chains, it is also acknowledged that clusters' insertion in global value chains may allow the clusters to realize "upgrading," which is defined as "innovating to increase value added" (Giuliani, Pietrobelli, and Rabellotti 2005, 552). This suggests that clusters with firms that have global buyers get opportunities for gaining knowledge that can be used for innovation. According to Humphrey and Schmitz (2002), firms can achieve four types of upgrading through their participation in the global value chain: process, product, functional, and intersectoral upgrading. The authors also note, however, that the governance mode in

buyer-supplier relationships affects possibilities for firms to learn from their customers. Depending on the governance mode, which can take the form of arm's-length market relations, networks, quasi hierarchy, or hierarchy (Humphrey and Schmitz 2002), the extent of a key firm's control and thereby the interdependence of suppliers in the value chain will vary. This will in turn influence the possibilities of firms and clusters to upgrade. Certain buyers will try to keep the supplying firms in a specific part of the value chain to avoid the erosion of the firms' position in the value chain (Humphrey and Schmitz 2002).

The literature on upgrading in global value chains has mostly focused on production-intensive, low-tech clusters in less developed countries and the possibilities for manufacturing firms to become more innovative and R&D intensive. However, mechanisms for upgrading and learning in buyer-supplier relations can also be applied to the high-tech clusters that need to sustain and increase the competitiveness of the cluster. For these clusters, the challenge is not moving up the value chain but keeping the inflow of knowledge from other actors in the value chain.

Multinational Corporations

MNCs in clusters play an important role in creating global pipelines as well. By design, MNCs can be understood as networks of organizations that are connected through organizational pipelines across national borders. Through these pipelines, MNCs are able to bring new knowledge to the cluster and also connect it to other clusters. Organizational proximity among the entities within the MNCs facilitates knowledge transfer over geographical distances (Boschma 2005).

The entry of MNC subsidiaries in clusters has recently gained attention in the cluster literature (Santangelo 2009; Mudambi and Santangelo 2015). When MNCs enter a cluster, they bring resources, such as technology, investments, and networks, but they also increase wages and poach skilled employees from other cluster firms (Østergaard and Park 2015). In some cases, they legitimize the cluster, thereby strengthening the cluster's identity (Santangelo and Mudambi 2015), which might attract other MNCs or other firms that have buyer-supplier relations with the MNC.

Whether or not MNC subsidiaries become integrated part of local networks depends on their entry mode (Santangelo and Mudambi 2015). Some MNCs enter a cluster through acquisitions of local firms to gain access to local knowledge and networks, while others enter through greenfield investments. The development phase of the cluster also affects the types of MNC entry (Sedita, Caloffi, and Belussi 2013). Mudambi and Santangelo (2015) argue that the timing of the entry is important in an emerging cluster in regions characterized as shallow resource pools. First movers often achieve a competence-creating mandate and benefit from local knowledge resources. Second movers find that these resources are "taken" and therefore often are competence-exploiting. However, the first and second movers gradually transform and build local resources, which create agglomeration externalities and make the location more attractive. Therefore late movers might enter through acquisitions of local firms to enter local networks with a competence-creating motive or with a greenfield investment if the agglomeration externalities are still weak (Mudambi and Santangelo 2015).

How the subsidiaries of MNCs influence cluster dynamics depends much on their mandate. Cantwell and Mudambi (2005) describe how some MNC subsidiaries are given a competence-creating mandate that allows them to adapt to local needs, network with local actors, and develop new technologies, while others are given a competence-exploiting mandate and are focused on exploiting the MNCs' existing knowledge. Santangelo (2009) shows how competence-creating/knowledge-seeking subsidiaries are more embedded in the local economy and collaborate with local universities, while the competence-exploiting/market-seeking subsidiaries do not collaborate with local universities, local suppliers, or buyers. If the MNCs are co-located with market rivals, then the competence-creating subsidiaries are even more active in establishing linkages with local firms. The opposite reaction occurs in competence-exploiting subsidiaries due to the fear of unintended knowledge spillover to competitors.

Similarly, the decision power and autonomy of the subsidiaries impact how these firms influence cluster evolution. Reinau (2011) argues that local cooperation between firms in a cluster becomes much more difficult if it is between two MNC subsidiaries than if it is between indigenous firms because of differences in the extent of local decision power. The subsidiary mandate and its autonomy are related constructs that still need be understood separately. Mudambi and Cantwell (2005) do not find evidence that the strategic independence (autonomy) of a subsidiary increases the likelihood of firms achieving competence-creating mandates, but they find that once firms are mandated, the autonomy increase the intensity of R&D.

Being part of an MNC, and therefore being dependent on external decision making, not only affects interaction patterns within the cluster, but it also affects how these firms react when they face disruptions and changes in the cluster. Clusters are typically defined within a certain industry boundary, which also determines the technological specialization of the cluster. However, this technological specialization is not constant; it continuously develops over time following the technological trajectory of the indsutry (Dosi 1982). The main technological trajectory in a cluster might converge with other technological trajectories, forming a new trajectory, meaning that the cluster may go through a transformation in terms of its technological focus. When this happens, foreign firms are more footloose compared to indigenous firms and are more prone to leave a cluster, if the direction of the change does not follow their own technological focus (Görg and Strobl 2003; Østergaard and Park 2015). Decision making regarding an MNC's entry and exit lies typically in the hands of entities high up in the hierarchy; therefore, subsidiaries have limited decision power in these matters.

In summation, the entry of foreign MNCs in a cluster clearly affects the cluster's evolution. The entry of MNCs with a competence-creating mandate brings resources, new knowledge, and external networks to the cluster. It also helps to legitimize a cluster, strengthen its identity, create possible agglomeration externalities, and attract other firms. However, they also increase wages and poach human capital. In addition, MNC subsidiaries with a competence-exploiting mandate might limit local interaction in the cluster. Furthermore, even for competence-creating subsidiaries, there are limits to their technological search and their possibilities to react to disruptions in the market or technologies. Therefore, although an MNC's entry into a cluster may create positive impact for cluster evolution, it may also limit the adaptability of the cluster.

3. Method and Data

This chapter is based on a detailed case study of the wireless communications cluster in Northern Denmark from its emergence to its decline. This cluster is a critical case of a high-tech cluster in an advanced economy, and the role played by MNCs in this cluster is likely to resemble the role of MNCs in other high-tech clusters (Flyvbjerg 2006). The data used in this chapter are both qualitative and quantitative in nature. First of all, this chapter presents a detailed account of all the firms that have existed in the cluster from 1963 to 2011, noting the entry, exit, merger, and acquisition of the firms and documenting the number of firms and employees in the cluster over the years. Several researchers have followed the general history and some specific events of the firms and the cluster based on personal interviews with the firms and the cluster organization. This paper also draws on nine interviews with the eight largest cluster firms and the local university conducted in 1992. These interviews were originally conducted by Bent Dalum for an EU FAST project (see also Dalum 1993). This paper additionally draws on forty interviews and observations in cluster firms from 2006 to 2011 conducted by Reinau (2011). A part of the empirical data was supplemented by information found in the public and private archives, including newspaper articles and material used in older studies of the cluster (see also Østergaard and Park 2015). Secondly, data on patents are used to analyze innovation activities in the cluster. Patents granted by the U.S. Patent Office (USPTO) within computer and communication technology[1] with at least one inventor located in the cluster region are identified as patents created in the cluster. For those patents, information on inventors and assignees was collected to study global connection in terms of inventor network in both local and foreign firms.

4. Analyses

4.1. Evolution of the Mobile Communications Industry

For many years changes in the mobile phone industry followed a rather stable technological development trajectory with jumps between different generations of mobile communication standards. These generations evolved from the first analog, country-based standards (1G) in the 1980s, such as NMT and AMPS, to the continent-based, digital communications standards (2G) in the 1990s, such as GSM, D-AMPS, and CDMA, as well as the world-wide communications standards (3G) in the 2000s, such as CDMA2000, W-CDMA, and TS-CDMA, and finally the newer 4G standards, such as LTE. Each of these constituted important technological shifts that posed a major disruptive challenge to firms in the industry. They allowed for new entrants in the industry but also marked industry shake-outs, and the firms in the industry became very large. Although the introduction of these new standards were planned and expected as it was based on international cooperation and competition between the players of the industry and public authorities, it still created disruptive changes every time the transition took place from one generation to another. Of all the transitions, the rollout of 3G in 2006 proved to be a disruptive innovation that changed the entire industry.

[1] Classification by Hall, Jaffe, and Trajtenberg (2001)

The technological development with different standards shadows a fast technological development and improvement of performance in the different components of the mobile phone, such as antennas, RF technology, FM radio, speakers, headphones, base bands, protocol stacks, screens, mechanical interfaces, batteries, cameras, menu systems, user interfaces, power management, and other software (e.g., games and apps). The underlying technological development of mobile phones combined with the new possibilities of high-speed data communications in the 3G network constituted complementary innovations. These changed the industry's technological trajectory and subsequently redefined industry boundaries as focus shifted to users and applications rather than connectivity and speed. Thus, new types of complementary assets, such as app stores and music services, became a key competitive feature. At the same time, former key competitive features, such as radio frequency (RF) solution hardware and antennas, had nearly become standard commodities and no longer core competitive technology. As a result, the entry of Apple and Google with the iOS and Android systems in 2007 and 2008 introduced new business models, which transformed the mobile communications industry and caused the decline of former giants Nokia, Motorola, Ericsson, LG, and Siemens.

The disruption to the industry and the subsequent decline of these large MNCs also changed the global value chains and linkages in the industry. Subsequently, the spatial configuration of the industry changed, and the clusters in which the declining MNCs were present suddenly faced significant challenges.

4.2. MNCs in the Wireless Communications Cluster in North Jutland

The first company in the cluster was established in the early 1960s and became successful in producing and selling maritime communication equipment. During the first two decades after its establishment, this company became the seedbed for spin-offs as some employees from this company created new firms in the related field of wireless communication. These companies were mainly specialized in technologies for Nordic standard mobile telephony (NMT), which represents the 1G technology standard in Nordic countries. In the late 1980s, when the technology generation shifted to 2G, a joint venture (DC Development) by two cluster firms (Dancall and Cetelco) succeeded in developing some basic modules of pan-European GSM phones, which was one of the dominant technology standards for 2G phones. However, the development work left both companies drained financially, and as a consequence, both were acquired by MNCs (Amstrad and Hagenuk). Another outcome of joint venture was that a local identity emerged in the cluster, where a generation of electrical engineers worked together within the GSM field. Furthermore, a strong competence in radio frequency technology was created in the cluster, stemming from the joint venture. This became apparent when a number of companies specialized in RF, for example, ATL Technology, a spin-off from Cetelco, which later was acquired by Texas Instruments (TI) and grew to become one of the most successful companies in the region.

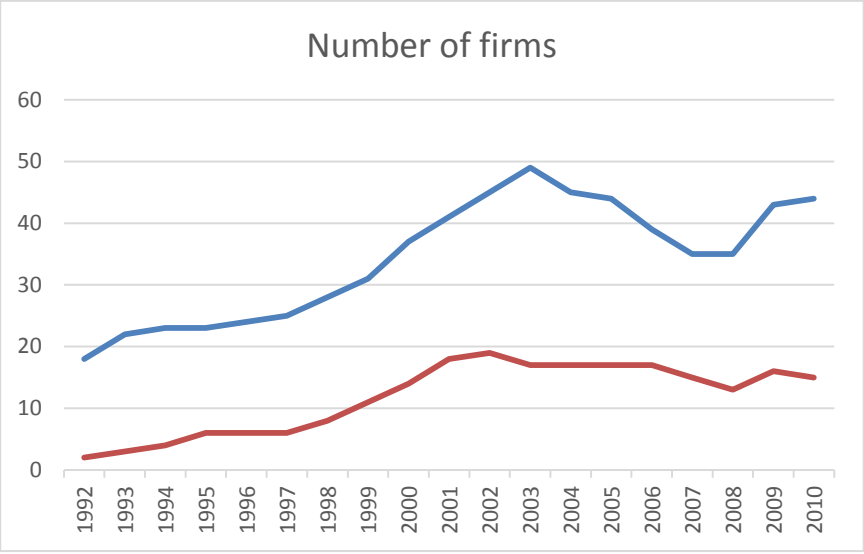
During the 1990s, more spin-offs and other new entrants were established based on the leadership in GSM technologies. During this period, foreign firms began to enter the cluster either through greenfield investments or acquisition of local firms. Examples of MNCs that entered the cluster in the 1990s include Analog Devices, Lucent, Bosch Telecom, Maxon, Texas Instruments, L.M. Ericsson, and Nokia. From 2000 onwards, the list of foreign firms expanded with the entry of Flextronics, Siemens, Infineon, Motorola, and Intel, among others.

While some foreign firms were involved in manufacturing activities, the majority of them focused on R&D activities, exploiting the world-leading research at the local university and the highly-skilled engineering graduates from the university. The entry of MNCs and the general growth of the cluster had an effect on the local labor market. In the late 1990s the increasing demand for engineers led to rapidly increasing wages but also attracted engineers to the cluster. It became difficult for noncluster firms to hire electrical engineers because the cluster firms paid higher wages. In many instances the MNCs' subsidiaries, which upscaled very fast, paid the highest wages and also offered other benefits, such as stock options.

The number of foreign MNCs in the cluster and their contributions to the total employment in the cluster from 1992 to 2010 are shown in Figure 1 and Figure 2. Although MNCs make up less than half of the firm population (the highest share was 43.5% in 2006), their contribution to employment is much higher. In the early 2000s, foreign MNCs employed almost 80% of the labor force in the cluster.

After the turn of millennium, the mobile communication industry went through another technology shift from 2G to 3G. This disruption was a game changer for many firms in the industry, affecting both foreign and local firms in the cluster. As many cluster firms lost their technology leadership following the technology disruption, the cluster began to decline. The main reason for the decline was a lack of cluster adaptive capability mainly caused by a technological and cognitive lock-in (Østergaard and Park 2015). We show that, among other factors, the existence of MNC subsidiaries influenced the adaptive capability of the cluster over time. The role of the MNCs is discussed further in next section. As can be seen in the figures, firm population and especially employment decreased starting in 2003. In the course of the downturn, the two core MNCs, Motorola and Texas Instruments, ceased their R&D activities in the cluster, which led to the layoffs of many highly skilled engineers in 2009.

Figure 1 Number of firms in the cluster



Note: the blue line shows the total number of firms in the cluster, while the red line shows the number of MNCs subsidiaries

Figure 2 Level of employment

Note: the blue line shows the total number employment in the cluster, while the red line shows the number of employees in MNCs subsidiaries

4.3. The Role of MNCs in Cluster Evolution

The entry of MNCs in the emergence phase was positive for the evolution of the cluster. The two main companies were in financial trouble because of high development costs related to the GSM technology. An interview with the founder of Cetelco revealed that the company needed financial support from Hagenuk to develop GSM competences, while Hagenuk needed Cetelco to gain these competences. The MNCs mainly entered through the acquisition of local firms and brought in important financial resources that allowed their subsidiaries to expand their production activities and R&D activities. They also brought new technological competences and access to new markets. In this phase the mobile communications industry was becoming increasingly international, but the markets were small and fragmented by different technological standards. The market was growing, and capabilities related to the mass production of electronics were becoming more important. In an interview from 1992, the head of Cetelco (owned by German Hagenuk) explained that the ownership offered financial stability, access to the large German market, access to the economics of scale in the sourcing of components, and help in improving their production capabilities. The rationale for the entry of MNCs in the growth and decline phases was somewhat similar to their rationale in the emergence phase. The MNCs still entered to exploit existing local competences and brought in financial resources, networks, and knowledge.

In the emerging phase of the cluster, most cluster firms were involved in all activities in the value chain, from R&D to design, manufacturing, logistics, marketing, and after-sales services. However, some of the early firms (e.g., T-COM and RRI) introduced a new business model in the cluster. They focused on R&D and design and sold turnkey solutions to other firms, which then manufactured and sold the mobile phones as their own brand. The large company Cetelco also offered OEM products for other firms (e.g., Hitachi and Philips). The MNCs that entered the cluster in the early 1990s also focused on R&D and design. Most of them entered by acquiring local firms to access their knowledge and competences. Many local firms collaborated with the MNCs before they were acquired by them.

During the growth phase the cluster was increasingly located in the high end of the value chain, since the new entrants were only doing R&D. The manufacturing and also marketing activities gradually moved away from the cluster, and in 2004 the last mobile phone manufacturing activities in the cluster shut down. The cluster firms positioned themselves in the high end of the value chain, and the subsidiaries became more focused on R&D in very specific technologies. This distributed R&D effort of the MNCs resulted in the rapid growth of the subsidiaries, but it also made them even more detached from the market and limited their options to explore other technologies and business opportunities. Therefore, it became difficult to see major changes in the market in the mid-2000s. In the cluster, the key to survival was seen as additional 3G and 4G development work. However, the introduction of the iPhone and the Android system changed the key competitive features in the industry. The focus on 3G and 4G technology rather than the new competitive features made the cluster unable to adapt to the disruption.

MNCs entered the cluster to exploit local knowledge, and the subsidiaries were given development mandates, but the degree of strategic independence became limited. After the successful introduction of a first-generation GSM phone by the joint venture DC Development, the local managers of the two companies behind the joint venture (Dancall and Cetelco) wanted to expand the mandate to also include the development of a second-generation GSM phone in order to stay on the technological frontier. However, this move was eventually blocked by Hagenuk. One of the reasons for this action was that Dancall had begun a formal collaboration with Philips, and Hagenuk did not want to collaborate with Philips. A manager of a cluster company that had been acquired by Korean Maxon explained that he had to ask Maxon whenever they wanted to collaborate with other companies. Thus the subsidiaries' strategic independence was limited. However, the development engineers in the various companies continued to have widespread, local, informal networks through which they shared knowledge. In the later stages of the cluster evolution, local interaction between cluster firms became increasingly limited because the subsidiaries were focused on the internal MNC networks and markets.

As most foreign firms established R&D centers in the cluster, they were deeply involved in innovation activities in the cluster. An analysis of the patenting activities of the cluster firms reveals the positive influence of MNCs on innovation in the cluster. Firstly, foreign MNCs contributed highly to the level of innovation activities in the cluster. Table 1 shows the number of patents granted by the US patent office (USPTO) within the field of computers and communication, with at least one inventor located in the region of North Jutland. A comparison

of the number of patents owned by local and foreign firms shows that patenting activities in this region were mostly driven by foreign firms.

Table 1 Number of patents granted to the cluster firms

	Local	Foreign	Total
1992	1	0	1
1993	0	0	0
1994	0	1	1
1995	0	1	1
1996	0	0	0
1997	2	3	5
1998	3	1	4
1999	2	12	14
2000	2	5	7
2001	4	11	15
2002	2	27	29
2003	4	5	9
2004	2	2	4
2005	1	6	7
2006	0	10	10
2007	1	5	6
2008	0	3	3
Total	24	92	116

Furthermore, foreign firms allowed the cluster to gain access to knowledge outside the cluster by encouraging global collaboration on innovation activities through their organizational pipeline. Table 2 shows that foreign firms engaged in a higher degree of global collaboration in innovation activities. Patents granted to local firms only include three inventors located outside Denmark, while the number of foreign inventors in the patents granted to foreign firms is much higher. Foreign multinationals are likely to have a network of R&D centers distributed around the world, which allows international collaboration within the organizational boundary. Figures 3 and 4, by mapping the locations of co-inventors in foreign firms and local firms, illustrate the stark contrast of the degree of international collaboration on innovation.

Table 2 Global collaboration in patenting activities

	Local firm	Foreign firm	Total
Local inventor	44	180	133
Foreign inventor	3	130	224
Total	47	310	357

Figure 3 Co-inventor location of patents granted to local firms in communication in North Jutland

Note: the dots represent the locations of co-inventors of patents assigned to firms located in the cluster

Figure 4 Co-inventor location of patents granted to foreign firms in communication in North Jutland

Note: the dots represent the locations of co-inventors of patents assigned to firms located in the cluster

The dual role of the MNCs was also seen in the cluster decline phase. Many of the MNCs were footloose and chose to close their subsidiaries in the cluster as a response to the disruption in the industry rather than making efforts to adapt to the disruption in the cluster. However, a few MNCs also entered the cluster seeking

specific competences, such as Molex that hired seven former Motorola employees working with antenna technology and also bought equipment from Motorola when it closed down in 2009.

4.4. An Example of the Role of an MNC in the Evolution of the Cluster

The story of ATL Research illustrates the role of MNCs in the evolution of the cluster in more detail. ATL Research was a local spin-off company with thirty employees, which was acquired by Texas Instruments in 1999 and renamed TI Denmark. It became a success story, reaching around 250 employees at its peak in 2006, before a downturn and its final closure in 2009. ATL Research was acquired by TI because of its specific competences in making RF solutions and ability to integrate them with base-band processors.

Interviews with the founders of ATL Research revealed that, from their perspective, the driver for the acquisition was changes in the market that made it increasingly difficult for them to survive. The big players either developed their own RF competences or acquired these competences through acquisitions of companies like ATL Research. From a cluster perspective, acquisitions by MNCs were not only about getting access to the resources and networks of the MNCs but also about survival.

The acquisition gave access to both resources and a global R&D network, but the subsidiary did not have much strategic independence. The former CEOs were “just” managers, and the decision power lay in remote headquarters, which was made clear from the very beginning. R&D engineers in TI Denmark felt the MNC’s control even in their daily work. They went from having almost no rules for how to approach solutions to being part of a system in which different agendas from different parts of the MNC had a significant impact on R&D work. The R&D workers also experienced increased bureaucracy in decisions on technical solutions.

It also became apparent to the local management in TI Denmark that they are exposed to competition from other TI subsidiaries. More specifically, other TI sites started to build competences and gain work tasks and responsibilities in the RF areas too. Therefore, to survive, the subsidiary had to constantly work on getting new work tasks and building new competences. As GSM technology matured and GSM development had less and less value, there were many internal discussions about what new wireless technologies should be worked on in the future. Despite the concern, the GSM solutions that TI Denmark was working on became low-cost solutions for phones aimed at the third world rather than newer smartphones and 3G technologies. Towards the end, it became unclear what unique RF tasks, knowledge, and competences TI Denmark possessed. TI Denmark closed down in 2009.

5. Conclusions

This chapter showed that MNC subsidiaries can play an important role for the evolution of a high-tech cluster in an advanced economy. The MNCs enter with a knowledge seeking behavior to exploit local knowledge and competences. They also give their subsidiaries a development mandate, but the degree of the subsidiaries’ strategic independence varies. MNCs bring resources to the cluster, such as financial resources, technology,

knowledge, innovation networks, and access to new markets. The financial resources help the cluster companies survive and boost the expansion of the subsidiaries. MNCs internationalize the innovation networks in the cluster and allow for collaboration on patents across vast geographical distances. MNCs also bring production technology and provide easy access to foreign markets. As a result, MNCs enter in the cluster's emergence phase and actually support the survival and growth of the cluster. This positive effect of MNCs on cluster evolution has often been overlooked in literature that focuses on internal factors in clusters.

However, there is also a dark side to MNCs' entry in a cluster, which includes changes in local interaction, lack of strategic independence, and a narrowed scope of activities in the value chain. The fine slicing of the value chain and the specialization in R&D activities of the subsidiaries leads to a lack of market knowledge and increasing dependence on auxiliary competences in the MNC organizations. The lack of strategic independence also decreases the scope of the subsidiaries' technological search and possibilities for exploring new business areas. The cluster thus becomes more vulnerable to market disruptions. As the subsidiaries get more involved in internal competition for development projects within the MNC networks and do not have much decision power and strategic independence, their interaction and collaboration with other local actors is less prioritized over time.

This study argues that MNCs should be treated differently compared to indigenous companies in the cluster literature due to their specific characteristics described above. MNCs contribute with much more complex dynamics to cluster evolution than their role as potential sources of external knowledge suggested by Menzel and Fornahl (2010) and Martin and Sunley (2011). Instead, studies need to include detailed analyses of the subsidiaries' mandates and their strategic independence.

6. References

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