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Cluster Evolution and a Roadmap for Future Research

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Introduction

There is increasing recognition that the existence of clusters can only be understood when studying their dynamics over time (Audretsch and Feldman 1996; Pouder and St. John 1996; Swann et al. 1998; Maggioni 2002; Brenner 2004; Iammarino and McCann 2006; Menzel and Fornahl 2010; Ter Wal and Boschma 2011). In fact, clusters may be best understood as products of a path-dependent process (Martin and Sunley 2006). In that context, scholars have described the main features of cluster development over time, and have explored the driving forces behind their evolution. In their seminal contribution, Menzel and Fornahl (2010) proposed a cluster life cycle model in which firms enter and exit the cluster, capabilities of cluster firms develop and interact (and might converge), and inter-organizational linkages within and beyond the cluster are established and dissolved along the cluster life cycle.

Contributions of this special issue

This special issue takes up important issues related to the recent literature on cluster evolution. A key question is which kind of theoretical framework is needed to analyze cluster evolution. Many feel an evolutionary approach is appropriate because it accounts for path-dependent processes. The contribution of Martin and Sunley explores theoretically what kind of evolutionary framework suits best the analysis of cluster dynamics. They criticize a life cycle approach on clusters, for being too deterministic, among other reasons. Instead, they propose a framework based on the adaptive cycle model taken from the ecology literature, and discuss the scope and limits of such a model of cluster evolution.

There is also increasing awareness that an actor perspective is needed to understand the functioning of clusters, because firm heterogeneity is part and parcel of every cluster (Boschma and Ter Wal 2007), and might even be considered a driving force of cluster evolution (Menzel and Fornahl, 2010). The second contribution of our special issue by Jacobson and Hilliard take up this particular point, by looking at the extent to which cluster characteristics versus firm-specific features determine the ability of cluster firms to respond to new challenges in a rather mature cluster. They present the empirical case of pharmaceuticals in Ireland, and the Cork cluster in particular. Their research addresses the question whether

stand-alone firms or firms located in a pharmaceutical spatial agglomeration are better able to cope with changes in environmental regulations. Their contribution points to the importance of firm-specific factors, search routines and dynamic capabilities. These factors are of higher relevance to adapt to changing environmental regulations than local learning and knowledge diffusion processes. Hence, no convergence of the knowledge bases of the local actors could be observed.

The need for an actor perspective is also incorporated in the contribution of Giuliani who explores more specifically the role of technological gatekeepers in the growth of clusters (Morrison 2008; Suire and Vicente 2009). She claims that during the early growth phase of a successful cluster, leading firms acting as technological gatekeepers become progressively more important sources of local learning. In her contribution, Giuliani provides empirical evidence for this in a study on a Chilean wine cluster. In doing so, she takes a (knowledge) network approach to clusters which is extremely important, because, as she showed earlier in her own work, being part of a cluster does not necessarily mean you benefit economically from that, unless you are well connected to the local (and non-local) web of knowledge linkages. What she persistently shows is that cluster firms are not all connected to each other evenly, making some cluster firms thrive, while others struggle and having a hard time.

While contributions on cluster life cycle have emphasized the cognitive dimension (i.e. the heterogeneity in the capabilities of cluster firms) and network dimension (i.e. the position of cluster firms in networks within and beyond the cluster) of cluster evolution, scholars have also looked at the institutional texture in clusters (Becattini et al. 2009). However, there are not too many studies that have focussed on the evolution of the institutional setting in clusters (Maskell and Malmberg 2007). The contribution by Staber and Hilliard explores this so-called soft architecture behind cluster evolution. Interestingly, they elaborate on the notion of cluster identity, and explore how this may provide a continuous and enduring asset in some cases and an impediment to adaptation and growth in other cases. By looking at divergent patterns in two ancient clusters in Germany, they demonstrate that cluster identity indeed forms a threat in some clusters while it is an asset for directing the cluster in more promising future directions in other clusters. According to Staber and Hilliard, it is human action that can both exploit and adapt this identity that can make the difference in cluster evolution.

While clusters have forcefully been embraced by policy makers for a very long time, it comes as a surprise that the scientific literature on clusters has hardly addressed policy implications in a systematic manner. The last two papers of our special issue aim to contribute to that topic. The contribution of Brenner and Schlump explores the policy implications in a cluster life cycle framework. This focus on cluster policy has hardly been raised so far. And when it has, policy recommendations on cluster development are given irrespective of the stage the respective cluster is in. By means of mathematical modelling, the paper provides new insights on the strength of the impact of different policy measures across the cluster life cycle, and in that sense, it is complementary to the literature that has been dealing with the design of cluster policy. The last contribution by Hassink and Shin sheds more light on the role of policy in such an evolutionary framework by looking at the shipbuilding industry case in South Korea. In this industry, very strong governmental investments in early stages of the life cycle could be observed which triggered the subsequent development of the industry. These high levels of subsidies resulted from the industrial policy in South Korea for which shipbuilding was one of the targeted industries. This led to a very low number of (large) entries and exits compared to the expected high levels of entries and exits in the beginning of the industry life cycle. After the initial tendency of increasing specialisation, in recent years a re-orientation of the actors inside the cluster could be observed, with an increasing heterogeneity and an extension of non-local linkages to the national and international level.

Ongoing research challenges

Research on cluster evolution has made progress in the last couple of years, but there are fundamental questions to be raised that are still relatively unexplored. As discussed in the contribution of Martin and Sunley, the cluster evolution literature is still in search of an appropriate analytical framework. While most scholars have favoured a life cycle approach (e.g. Brenner 2004; Menzel and Fornahl 2010; Ter Wal and Boschma 2011), Martin and Sunley (this special issue) propagate an adaptive life cycle model. Both models favour an evolutionary, contingent approach instead of a deterministic approach, and both value the need for case studies of context-specific cluster dynamics over time. The adaptive life cycle model may do more justice to the complexity of the context-specific evolution of clusters but also runs the risk of coming up with as many trajectories of clusters as there are clusters. The cluster life cycle approach is stronger in searching for general drivers of cluster evolution, and is better capable of deriving testable hypotheses concerning the circumstances under which particular cluster trajectories emerge. Future work should try to combine the strength of both approaches, and investigate the processes responsible for the transitions between stages. Which roles are played by internal or external processes? Is the provision of necessary resources the core driver of development? Can cluster evolution be explained by learning processes? A thorough discussion of fundamental drivers and their integration in an analytical approach will certainly help to sharpen our theoretical understanding of cluster evolution, to generate testable hypotheses, and to structure empirical research.

While it is hence crucial to define the appropriate framework, more efforts are also needed to perform longitudinal studies on clusters. Few empirical cases have taken a longitudinal perspective so far, because data availability on clusters over a longer period of time is a real problem. This is especially true for the study of the formative stage of cluster development, which therefore has received little attention so far (Fornahl et al., 2010). Promising research avenues are the extent to which new clusters build on related industries, and how institutions are created and reshaped to enable the take-off of clusters (Krafft, 2004). Besides cluster formation, other core transitions are the renewal and transformation processes of existing clusters which help them to adapt to changing technological or market environments and to keep their competitiveness over a long period of time. Some studies point to the importance of related diversification (Neffke et al., 2011). However, more insights are needed on the role played by new organisations (and which types of entries really matter), the learning processes that take place inside the organisation, the importance of the quantity and nature of extra-regional linkages, and the changing knowledge compositions at the regional level.

Besides industrial and institutional dynamics, studies are starting to explore networks dynamics as a cluster evolves. As Giuliani in her contribution shows, it is crucial to look at the knowledge networks at the cluster level, which organisations (like gatekeepers) take up dominant network positions, which network structures facilitate the circulation of knowledge within the cluster, and what is the extent and nature of extra-cluster linkages. An equally challenging research avenue is to explore how these network structures in clusters change over time, and how it affects the behaviour and performance of cluster firms and the evolution of a cluster as a whole (Orsenigo et al., 2001; Malerba 2006; Cantner and Graf 2006; Hendry and Brown 2006; Balland 2011; Ter Wal 2011; Li et al., 2011; Vicente et al., 2011).

Moreover, the contribution of Jacobson and Hilliard (this special issue) points to the importance of taking a closer look on the co-evolutionary structure of organisations and regions, instead of focussing only on single drivers and elements of cluster evolution. How are firm-internal R&D and learning processes related to those of other organisations in close geographical proximity? How do the individual network structures of organisations – especially their local and non-local linkages – affect each other and how do they add up on the

regional level? In order to shed more light on these questions, the empirical approach has to be broadened. To reach this goal, different data sources – ranging from the collection of primary data by qualitative research or questionnaires to a multitude of secondary data sources such as publications, patents, subsidies or collaborations – must be brought together and used to investigate this co-evolutionary process in clusters. Since this probably cannot take place for a country as a whole, comparative regional cases studies are most likely the approach to be employed, but with a more extensive use of data, as pointed out.

These and other issues need to be taken up in future research, in order to increase our understanding of cluster evolution.

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