SOCIAL CAPITAL, A KEY MECHANISM FOR CLUSTER EVOLUTION? THE CASES OF TWO COMPETITIVE CLUSTERS, LIFE SCIENCE NORD AND UPPSALA BIO

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Abstract
As human beings we cannot live without being connected through ties to other people, we form relations based on trust, reciprocity, commitment, we follow norms and we have common values so we can exchange information and resources. In our economic interactions, social capital supports the invisible ties between entities, which enable the access and the use of resources through personal contacts. In regional clusters, over time, these elements interact at different levels, connect with other factors and may lead to increased competitive performance. This paper emphasises social capital as a key mechanism in cluster evolution and considers context and time dimensions and the life cycle of clusters to understand the analysed settings. The two relevatory cluster cases are part of the same megaregion, Baltic Sea, and operate in the industry of life sciences.

Keywords
social capital, context, time, cluster life cycle, competitive performance

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Introduction

The meaning of social capital and its contribution in understanding various processes extended through time with evidence from disciplines like sociology, economics, political sciences, economic geography. These perspectives broached the complexity of social capital, which, despite the easiness of understanding individually the underlying components, it cannot provide fully integrated functional frameworks.
That is attributed to the nature of social capital, context-sensitive and timebound. These dimensions were too often neglected in studies, which resulted in biased outcomes.
Closely connected with its two dimensions is its role in understanding cluster evolution and its connection with the stages of the cluster life cycle.
This paper aims to explore the role of social capital in cluster evolution. It also proposes a methodological approach resulted through a mixture of three frameworks, within the setting of two competitive clusters, from life sciences industry, Life Science Nord and Uppsala BIO. The paper has six body sections; the first four refer to social capital, as theoretical background, and then in relation with the contextual, time and cluster life cycle dimensions. The fifth discusses a methodological approach and the last one presents, in comparison, two cluster cases from Baltic Sea Region.

1. Theoretical background

The most common definition of social capital is an integrated and interrelated structure of three dimensions: structural (the structure of the relationships between the actors in the network), relational (the personal relationships between actors that have evolved over time-trust, norms, mutual obligations etc.) and cognitive (shared perceptions, narratives, interpretation frameworks, codes, languages, etc. (Nahapiet and Ghostal, 1998). Other opinions explain social capital as a „networking activity" or „network quality" (Chell and Baines, 2000), as the „network structure" (Walker et.al., 1997), as means to create a shared identity (Haydebrand and Miron, 2002), and as the ability to ensure resources by virtue of membership in social networks or larger social structures (Portes, 2003) (for other work on social capital see Coleman, 1990; Putnam, 2000). I understand social capital as a key mechanism that contributes to the functionality of human interaction and which shapes the economic behaviour of humans. It enables their access to and use of resources embedded in a specific economic context and it is also influenced by the time dimension.

Coleman (1988, p.108) suggests showing social capital value as a concept in „describing, explaining or reformulating important phenomena". Exploring the contextual effects and the dynamics of social capital in two competitive regional clusters not only makes an interesting and fervent topic both for economics and economics geography, but also challenges two existing deficiencies from the literature on cluster evolution.

2. Social capital and context

This section places social capital in relation with context in order to avoid a frequent biased approach identified in the literature on social capital. In his seminal work, Staber (2007) recommends reffering to contextual effects while making statements on the role of social capital on cluster performance, otherwise the view would be incomplete.

Staber (2007, p.510) identifies most common five potential contextual effects from studies connected to aspects of social capital in relation with performance, which lead to different outcomes of social capital in different contexts. The first one, restricted variability, limits findings to only a segment from a broader range of an independent and dependent variable. The second effect is the curvilinear relationship between social capital and different factors related to the cluster development.Then follow the effects of changing signs, changing causal direction and crossing levels of analysis.

It is of utmost importance to understand that there is no formula for amounts of structural, relational or cognitive types of social capital that in a certain framework can generate a certain amount of competitive advantage for that cluster. This subject is indeed sensitive because simply by extracting one element from the setting when changing the context might generate totally different results of competitive advantage or a lack of its evidence. The elements are not interchangeable, that is why they have to be observed in that setting and assessed accordingly. Otherwise, changing the causal direction changes the entire outcome. Likewise, a change in the context can determine a reversal in the sign of the observed effects; or even more concerning, the analysis can be compromised if not all elements of social capital may adapt equally to all levels in the cluster (Staber, 2007).

The key to avoid a biased research approach is contextualization. Staber (2007, p.513) proposes five ways to achieve it: 1) by a thick description of the research setting, 2) by context-sensitive sampling plan, 3) by focus on processes and events, 4) through attention to co-evolution processes at multiple level, 5) through attention to the social mechanism that links actions at multiple levels.

As a conclusion of this section, when there are different outcomes in different contexts this is not necessarily because there are different causes, but because the factors involved are context specific. Social capital is one of the important factors in the cluster evolution context, but it is not the only one that ultimately influences the setting.

3. Social capital and time

In this section the focus will be on the relation between social capital and the time perspective. Social capital is timebound, but compared to other types of capital its value is not given by how old or new it is. It is necessary that social capital be renewed so its productive function be preserved on the long term (Westlund and Bolton, 2003). Staber and Sautter (2011, p.1358) bring an argument in this favour, saying that „the performance of the clusters varies over time with the evolving knowlege base in the cluster". Su and Hung (2009) also concluded in their empirical study that social capital evolves in time, together with entrepreneurship and networking as factors which make the difference in the development of national and regional clusters, be they spontaneous or policy-driven in origin. They suggest these three factors are intertwined and they can hardly be provided by governamental policies.

Understanding phenomena through the theory of cluster life cycle was motivated by its applicability in clarifying the context described. As Staber and Sautter (2011, p.1358) expresses, the life cycle perspective „is an attempt to counter the charge that much research on clusters is ahistorical and acontextual in character." Taking this statement as a benchmark for my research and as another bias to avoid, I consider that the social capital assets in a cluster cannot be observed statically, on the contrary. Dynamics both in economics and economic geography has been important in understanding cluster processes.

4. Social capital and cluster life cycle

Literature on the evolution of clusters reveals that social capital changes according to the life cycle stage at the level of a regional cluster. Menzel and Fornahl (2010) distinguish four types of clusters according to their life cycle: emerging, growing, sustaining and declining.

One relevant effect, restricted variability, mentioned in section 2, can have implications on time perspective. For example, if a cluster is in the infancy stage, the structural and cognitive dimensions of social capital prevail because they generate the needed innovation, whereas the relational dimension is low. As the cluster progresses through stages, a structural and cognitive homogeneity happens because the established resources have to be well exploited.

For the incipient cluster, Menzel and Fornahl (2010, p. 229) indicate „scarce possibilities for interaction" because there are „few companies and employees"; in the growing cluster there are „open and flexible networks", „collective actions" and „institution building" and, in the sustaining cluster, „synergies and external knowledge" are stressed. In the declining cluster already, the focus is on a „narrow trajectory", with „closed networks" and low adaptability. Also, in Su and Hung (2009, p. 608) the authors present a comparative study of two biotechnology clusters which follow three main stages of evolution, „like an organism", origin, growth and decline/reorientation. Social capital is one of the key factors in their contexts, together with entrepreneurship and networks, other factors being availability of funds and scientific/industry base. Fosse and Normann (2017) created an analytical model which combines the dimensions of social capital (structural, relational, cognitive and political) with the cluster life cycle stages (emergence, growth, maturity and decline/renewal) and establish strategies which need to be done by the management of the cluster along the evolution of the cluster. However, this model has some limitations because it does not provide strategies for transitional phases between stages. Menzel and Fornahl (2010) state that when there is an unequal development in parts of the cluster, the cluster is in transition and it is difficult to place it into a category.

5. Methodological approach

Staber (2007) observes there are two different approaches of a researched problem. For example, first you assume and try to prove that the success of the cluster is attributed to the

social capital involved. The other approach is to discover which conditions lead to the success of the cluster. In the first case it is rather a quantitative approach, based on the researcher's assumption, whereas the second one is more qualitative, exploratory. The author advises for the second approach to have a broader selection of cases of clusters in different stages of evolution and contexts for comparing them.
Social capital relates elements like trust, norms, cultural values (they generally require a long period of time, sometimes decades, to register a significant change in their dynamic) and social networks, which influence each other at different levels of analysis. One can measure and document, for instance, the number of links, the number of nodes in the social network, the frequency of interaction through social network analysis, which is a valuable source of empirical research. However, it does not explain also the quality of the connection and for this, qualitative methods have a purpose.
As a consequence, because the action time of these elements of social capital may be different, my approach would be to analyse the settings of the selected comparative case studies through a cyclical time approach, by dividing time according to the steps of a cluster evolution process: initiation, growth and decline and by considering the contextual effects. This methodology is the result of combining the approaches of Su and Hung (2009), Staber (2007) and of Slawinski and Bansal (2012).
According to Slawinski and Bansal (2012, p.1540), there is a „clock time", originated from the Greek word chronos, which indicates a linear succession of events, it is „discrete, linear, measurable, divisible, precise, deterministic, and subject to only one interpretation" and there is an „event time", kairos, which indicates the „duration of an event, with a beginning, middle and end...connecting events through time" It is „subjective, open, organic and cyclical". A cyclical temporal perspective makes connections between events from past, present and future, the orientation is on long-term, cross-sector solutions between organizations are encouraged and there is a broad range of activities and high staheholder collaboration (Slawinski and Bansal, 2012, p.1555). The benefits of such an approach include a greater flexibility for organizations to respond to various possible outcomes (Marcus, 2009). This perspective is the characteristic of integrated firms, which show higher tolerance towards uncertainty, draw lessons from the past and also have long planning horizons. Their vision is in tune with the current vision of the two selected clusters, oriented towards maintaining their reputation in international competitiveness.
Due to the fact that the analysed regional clusters are examples of competitive performance in the industry of life sciences I assume they are in their growth phase as event time. Therefore, the focus in this paper will be on their initiation and growth phases.

6.The cases of Life Science Nord and Uppsala BIO

As social capital cannot be analysed in regional clusters out of the context and dynamics, in the same way regional clusters cannot be analysed out of their „regional ecosystem" (Hassink and Fornahl, 2017, p.9). Thus, for the comparative approach, the common grounds for clusters is their activity in the same industry and same megaregion, the Baltic Sea.
I focus on this area because it provides a common context of analysis little explored up to this point and so the cluster cases comparison can bring a contribution to the literature on the role of social capital in cluster evolution.
Also, as Staber (1996) confirms, many clusters are selected for analysis on the basis of the apparent success and then the authors explain their performance in social capital using theoretic terms. In case the authors want to discover the conditions attributed to the success of the cluster, the recommendation is to choose clusters with varying levels of social capital and success, as well as clusters existing in different contexts (Staber, 2007, p.514). That is the reason why I have chosen two regional clusters from different countries and aim to

further explore the context of their evolution and current competitive performance. The following observations are preliminary insights, based on secondary data research.
Life Science Nord Cluster was legally formed in 2004 and it is a co-financed project between Schleswig-Holstein Government and EU Commission, with an equal share of 40%, and a 20% sponsorship from members of the industry association Life Science Nord e.V. Its purpose is to raise added value in the fields of medical technology, biotechnology and pharma by strengthening the entire value creation chain in Hamburg and Schleswig-Holstein and become an internationally leading Life Science Network (EU Cluster Collaboration Platform).
I assume LSN is in its growing phase, according to Menzel and Fornahl's (2010) quantitative direct criteria for dimensions of a cluster. It has a growing number of members-230 (189 SMEs and 18 institutions for research and universities) and employees (49.900, in 2016). It earned the EU Gold Label for its extraordinary network management in 2016. LSN collaborates very well transnationally with Denmark, Finland, Lithuania and Sweden (EU Cluster Collaboration Platform) as member of a larger network, ScanBalt.
The second case is Uppsala BIO Cluster, from one of the well-known life science hubs in the world. The cluster was legally established in 2003 in a spatial environment which had a tradition in the Pharmaceutical Industry since late 1990s and early 2000 (SU Report, 2012), with the goal to become „internationally competitive within life science" (UB History). The cluster is one of the three winners of Vinnväxt, a ten-year programme promoting sustainable growth through developing internationally competitive research and innovation environments in specific growth fields (UB History).
The heritage of the region was representative in the three main centers of the cluster: Uppsala, famous for Biotech tools and supply and Diagnostics, Stockholm for Pharma and Sörmland for biopharmaceutical production facility. After a decline in Pharmaceutical sector worldwide, the region had to find solutions for declining facilities in Södertälje. So, building on Sweden's reputation as a leader in innovation, new cooperation networks created between universities and companies started to operate in Stockholm-Uppsala region. In 2004 BIO-X programme began and provided a platform for new ideas and research findings. The opening of the region towards external collaboration was possible since 2007 through the collaboration Stockholm-Uppsala Life Science, meant to market the region's life science over the Swedish borders. Today, the cluster, a startup hub in the mature phase (UB Report, 2017), has the motto: „We make life science more competitive. Everyday."

Conclusions

The paper presented preliminary insights into the cases of two clusters from the industry of life sciences, both having a competitive stance and operating through different settings. Social capital appears to have an important role in these settings by being a factor facilitating relationships, access and use of resources, by being a glue and a lubricant in the clusters's evolution and by generating competitive advantages.
The contexts and the evolution in cyclical time are crucial for a good evaluation of the influence of social capital in clusters. The initial structure allowed Life Science Nord to have a good collaboration between governments from national and supranational level with companies and other institutions, like universities and hospitals, which contribute to advances in technology. Uppsala BIO has evolved as a structure based on academia-industry collaboration, which proved to be placing it as a factory for highly successful companies. Both clusters are currently very competitive on the life sciences markets.
This paper has limitations related to the empirical evidence, due to the fact that it brings just preliminary insights based on literature review and desk research cluster-related data. A future paper is intended to present the outcomes of collecting and interpreting field research evidence on the selected cases.

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References

Chell, E. and Baines, S., 2000. Networking, entrepreneurship and microbusiness behaviour. *Entrepreneurship and Regional Development*, 12, pp.195–215.

Coleman, J.S., 1988. Social Capital in the Creation of Human Capital. *American Journal of Sociology*, 94, pp. S95–S120.

Coleman, J.S., 1990. *Foundations of Social Theory. Chapter 12*. Social Capital. The Belknap Press of Harvard University Press. Cambridge, Massachusetts and London, England.

EU Cluster Collaboration Platform, [online] Available at: <https://www.clustercollaboration.eu/cluster-organisations/life-science-nord> [Accessed 4 April 2018].

Fornahl, D., Henn, S. and Menzel, M-P., 2010. *Emerging Clusters. Theoretical, Empirical and Political Perspectives on the Initial Stage of Cluster Evolution*. Edward Elgar, UK.

Fosse, J. K. and Normann, R., 2017. *Management strategies in cluster projects: Cases and discussion*. In The Life Cycle of Clusters. A Policy Perspective, Editors, Hassink, R. and Fornahl, D., Edward Elgar Publishing, USA, pp.115-134.

Hassink, R. and Fornahl, D, 2017. *Introduction: Towards a more open and dynamic approach on cluster policy*. In The Life Cycle of Clusters. A Policy Perspective, Editors, Hassink, R. and Fornahl, D., Edward Elgar Publishing, USA, pp.1-10.

Haydebrand, W. and Miron, A., 2002. Constructing innovativeness in new-media start-up firms. Environment and Planning, A 34, pp. 1951–1984.

Lawson, C. and Lorenz, E., 1999. Collective learning, tacit knowledge and regional innovative capacity, *Reg. Studies*, 33, pp. 305-317.

LSN, 2016. *Report 2016.* [online] Available at: <http://www.lifesciencenord.de/fileadmin/norgenta/Ueber_Uns/Der_oekonomische_Fussabdruck_2018.pdf.> [Accessed 13 March 2018].

Marcus, A., 2009. *Strategic foresight: a new look at scenarios*. New York: Palgrave Macmillan.

Menzel, M-P. and Fornahl, D., 2010. Cluster life cycles—dimensions and rationales of cluster evolution. *Industrial and Corporate Change*, 19(1), pp. 205–238.

Nahapiet, J. and Ghoshal, S., 1998. Social capital, intellectual capital, and the organizational advantage. *The Academy of Management Review*, 23(2), pp.242-266.

Portes, M., 2003. Social capital and community development. In: M.F. Guillen, R. Collins, P. England, M. Meyer (Eds.), *The New Economic Sociology— Developments in an Emerging Field*, Russell Sage Foundation, New York, 2003.

Putnam, R.D., 2000. *Bowling Alone. The Collapse and Revival of American Community*. New York: Simon & Schuster..

Slawinski, N. and Bansal, P., 2012. A Matter of Time: The Temporal Perspectives of Organizational Responses to Climate Change. *Organization Studies*. 33(11), pp. 1537 – 1563.

Staber, U., 1996. Accounting for variations in the performance of industrial districts. *International Journal of Urban and Regional Research*, 20, pp. 299-316.

Staber, U., 2007. Contextualizing Research on Social Capital in Regional Clusters. *International Journal of Urban and Regional Research*, 31(3), pp. 202-521.

Staber, U. and Sautter, B., 2011. Who are we and Do we need a change? Cluster Identity and Life Cycle, *Regional Studies*, 45(10), pp.1349-1361.

SU Report, 2012. *Stockholm-Uppsala: Life Science Company Report*, 2012. [online] Available at: <https://uppsalabio.com/wp-content/uploads/2017/05/14993_stockholm-uppsala_life_science_facts_and_figures_2014.pdf> [Accessed 6 April 2018].

Su, Yu-Shan and Hung Ling-Chun, 2009. Spontaneous vs. policy-driven: The origin and evolution of the biotechnology cluster. *Technological Forecasting & Social Change*, 76, pp. 608–619.

UB History. [online] Available at: <https://www.uppsalabio.com/about-uppsalabio/history/> [Accessed 7 April 2018].

UB Report, 2017: Health Tech Business Opportunities in the Stockholm-Uppsala Region [online] Available at: <https://uppsalabio.com/wp-content/uploads/2017/05/health_tech_2017.pdf>, p. 4, [Accessed 6 April 2018].

Walker, G., Kogut, B. and Shan, W., 1997. Social capital, structural holes and the formation of an industry network. *Organization Science*, 8, pp.109–125.

Westlund, H. and Bolton, R., 2003. Local Social Capital and Entrepreneurship. *Small Business Economics*, 21, pp. 77-113.