University of Szeged
Faculty of Science and Informatics
Doctoral School of Geosciences
Department of Economic and Social Geography

ANALYSIS OF THE SUCCESS AND PROBLEMS OF THE CLUSTERING PROCESSES THROUGH THE EXAMPLE OF THE SOUTHERN GREAT PLAIN REGION

Thesis of Ph.D. dissertation

Lívia Berkecz-Kovács

Supervisor:

Dr. Rezső Mészáros

member of the Hungarian Academy of Sciences, Professor Emeritus

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I.   Justification of research topic

The basis of clusters regarding theoretical research goes back to the first half of 1900s, when Alfred Marshall draw attention to the theme with the examination of economic area concentrations and the social and cultural effects of industrial districts (Marshall, A. 1920). Since then, many approach and research directions appeared in economics and economic geography, regarding spatial concentration, economic networks, cluster examination. Thanks to this, the theoretical background of clusters is extremely rich now, different directions, definitions, classification criteria are available from neoclassic economic conception through Porter's work to the standpoint of regional sciences representatives (PORTER, M. E 1990, KRUGMAN, P. 1991, STORPER, M. 1995, ENRIGHT, M.J. 1996, MCCANN, P. 2008). The variety of viewpoints brought different expressions used as synonyms many times as agglomeration economics, industrial districts, networks, growth poles, local production systems (CRUZ, S.-TEXIERA, A. 2009).

Clusters contribute to the improvement of enterprise efficiency, the continuous encouragement of business and innovation cooperations and to the knowledge transfer, thus they can be an effective instrument for regional development and innovation policies (PORTER, M. E. – SÖLVELL, Ö. 1998, ISAKSEN, A. – HAUGE, E. 2002, LENGYEL, I. 2010, KETELS, C. *et al.* 2013, DELGADO, M. *et al.* 2014).

The development of industrial clusters in classical sense is a self-perpetuating and self-sustaining process driven by agglomeration and synergic effects, which can be speeded up and encouraged by different economic policy instruments. Cluster-oriented policy has a significant role for the developing and peripheral areas, since those negative factors arise here increasingly that pull back clusters' formation as bottom-up type initiatives (GROSZ, A. 2006). Accordingly, European Union put a greater emphasis on the incentive of clusters by appearing in its innovation policy and institutional system, and each member states built cluster development initiatives in their own regional development, economic development, and innovation policy (HIGH LEVEL ADVISORY GROUP ON CLUSTERS 2007, EURÓPAI KÖZÖSSÉGEK BIZOTTSÁGA 2008/A). Nowadays, nearly 2000 cluster are in operation in the European Union, including 38% of employed people, from which, in case of 150 clusters can be considered to be world-class regarding their employment, size or specialization. According to surveys, the presence of clusters has a positive effect on employment, level of wages and business environment, moreover enterprises as cluster members show greater productivity, innovation performance, unlike non-member enterprises (KETELS, C. – SERGIY, P. 2016). Following the conscious incentives of clustering process, greater attention was drawn to the analysis of their effectiveness and success, their function in emerging industries or the examination of cluster managers' role and importance (MEIER ZU KÖCKER, G. – MÜLLER, L. 2015, IZSAK, K. *et al.* 2016).

From the beginning of 2000s, the examination of background and the potential of clustering has become a very popular research area (LENGYEL, I. 2002, GROSZ, A. 2005, PATIK, R. 2007, SZANYI, M. 2008, VAS, ZS. B. 2009) and later, after cluster formation, in cooperation with the responsible authorities some analysis was born for short-term effect of conscious cluster development support, including the number and territorial characteristic of the Hungarian clusters (HORVÁTH, M. *et al.* 2013, COLOSSEUM BUDAPEST KFT. 2015). Although, for the efficiency of such initiatives, their sustainability as a result of further development, their contribution to the competitiveness of the region and enterprises, and to the growth of innovation capacity has been less examined yet.

II.   Research objectives, hypothesis

Thanks to cluster development programs more than 200 clusters came into existence in Hungary between 2007 and 2013, most of which remained in the start-up phase with the termination of grant resources. Among the matured, developed clusters 26 have the accreditation and are of international importance regarding the high employment rate, significant innovation effect and big development potential. Southern Great Plain had an important role in the clustering processes since 51 clusters developed from the beginning of 2000 from which 36 received regional cluster development financial support resulting 9 clusters reaching the accreditation phase. Regional clusters performed particularly well in the available economic development and research-innovation tenders during the 2007-2013 programming period trying to substantiate and solidify their cooperations with several common projects and developments (HORVÁTH, M. *et al.* 2013, COLOSSEUM BUDAPEST KFT. 2015).

As a result of cluster development programs, a „cluster developing fever" evolved bringing a negative judgment of the concept of clusters, since one part of the fast-founded cooperations were only motivated by the available financial support and they disappeared by the termination of financial sources. The question arises whether at least one part of these clusters will be able to subsist in the long run and become a „top cluster" in economic terms which can contribute to the competitiveness of the region and country as well. For the effective support of these processes the heads of economic development programs must get deeper acquainted with the operation and motivation of clusters, and additionally, unfold the strengths and weaknesses which led to their success or failure.

The main goal of my dissertation is to investigate the efficiency and problematic aspects of the clustering processes by presenting the example of the Southern Great Plain Region.

Despite the fact that nowadays cluster development almost never take place at regional level, I choose Southern Great Plain region as the territorial unit for the basis of comparison, since this region showed an exceptional result in this field and during my work, I also had a chance to learn a little more of the clusters of this region. Furthermore, I consider that the development routes and cardinal problems can be represented well through this regional scale.

Based on the justification of the topic and the problem presented before, in my dissertation I was looking for the answer whether the clusters formed by the intensive top-controlled clustering processes of the past 10 years can be considered successful or not and whether they can become the dominant factors in the development of the region in the long run as well.

Relying on the analysis of literature I determined the success of clusters in the region by investigating four main areas in my research including the existence of the prerequisites for success, cluster benefits, innovation activities and long-term financial and professional sustainability. In my research I consider the clusters successful which have made progress in all four areas and achieved significant results.

The main question of my research, therefore, can be supplemented by the following four questions:

- Did the regional clusters manage to develop the necessary conditions for successful operation thanks to the subsidies?
- Did the clusters of the Southern Great Plain region exploit and utilize the advantages of cluster cooperations, and how significant is their additional value to their cluster members?

- How innovative are the clusters of the Southern Great Plain Region?
- Based on the developments and experiences did the established clusters manage to enter onto a professional and financial growth path and did they manage to become self-sustainable?

Besides answering the questions above, I tried to highlight the areas where the clusters need any change, further development or targeted external or internal intervention.

Based on the main aims and questions of the dissertation **I formulated the following hypotheses:**

There are many key factors behind the success of clusters. Different studies from different approaches have come to similar conclusions about these key factors. (Andersson, T. *et al*. 2004, Izsak, K. *et al*. 2016, Ketels, C. 2017, Horváth, M. *et al*. 2013). Among the key factors identified for successful operation there are some key ones the existence of which are necessary to base long-term cooperation. In my research, I consider the followings as such key basic factors: the geographical concentration and specialization, the appropriate cluster size and diverse composition, the existence of cooperation and mutual trust between members, the development of common professional background and goals and the foundation of a professional management organization to support these. In Hungary owing to a complex cluster development program between 2007 – 2013, more than 200 start-up and developing clusters have been supported with nearly HUF 8 billion. The funds were specifically provided to set up the basic conditions for successful collaboration that is, to involve members, develop a cluster strategy, common goals and organizational frameworks, to organize activities that support getting to know each other and building trust, to develop cluster management and to launch joint activities and developments. Approximately ¼ of the clusters created and strengthened this way are located in the Southern Great Plain Region which is considered outstanding compared to the national average. (NGM GFP HÁT International and Cluster Department, 2014) Based on all these, the first hypothesis of my research is the following:

1st Hypothesis: Thanks to the intensive cluster development support in the recent years, the clusters of the Southern Great Plain Region have the necessary prerequisites for successful operation.

Collaborative clustering offers clearly identifiable benefits for all participants. Maintaining and enhancing these benefits is crucial when examining the success of clusters. Cluster members will only be willing to invest energy and other resources in these collaborations if they are profitable in the long run. The benefits of clusters are diverse and complex and may vary from one participant to another. Through geographical concentration and cooperation members can, for example, achieve cost savings by utilizing shared resources or purchases, they gain valuable market knowledge and information faster and joint developments and projects among cluster members can also bring added value to them. (PORTER, M.E. 1998, COOKE, P. 2001, ENRIGHT, M. J. 2003, DELGADO, M. *et al.* 2014). To enhance these benefits, cluster management organizations also seek to contribute a number of activities and targeted services. Special services provided for cluster members are key tools to encourage collaboration. The right combination of these can have a positive impact on the performance of cluster organizations and thus on the success of the cluster as a whole (NERGER, M. *et al.* 2014., CHRISTENSEN, T. *et al.* 2012, KETELS, C. *et al.* 2013). Their main activities focus on building mutual trust and common cluster awareness, stimulating research development and innovation activities, performing various business development tasks, common market appearances and fostering international relations. Clusters established in the Southern Great Plain Region devoted most of the awarded funds to clearly define cluster benefits and

integrate them into strategy and to develop management activities and services to enhance these benefits. During their nearly 10 years of operation, a lot of experience in this field have been accumulated, so during my research I set up the following hypothesis:

2nd Hypothesis: Clusters of the Southern Great Plain Region make good use of the benefits of cluster partnerships, they represent significant added value for their cluster members and cluster management organizations have a major role to play in enhancing these benefits.

Innovation has a very positive affect on the success of clusters. Cluster partnerships play a defining role in business-to-business and regional innovation processes as an important tool for boosting regional economic development and innovation (PORTER, M.E. 1998, ISAKSEN, A. – HAUGE, E. 2002, ENRIGHT M. J. 2003, DELGADO, M. *et al*. 2014). Cluster brings together the key members of innovation from the economic, scientific and government sectors (ETZKOWITZ, H. – LEYDESDORFF, L. 2000). It provides a common forum and opportunity for personal meetings, accelerates the flow of information and the transfer of knowledge, in particular hidden knowledge, fosters more flexible and faster problem-solving and provides lower costs and less uncertainty. Cooperation and jointly implemented developments and projects contribute to bridging innovation gaps thanks to the lack of interaction between different actors and also to the application of knowledge generated in the academic sphere in a market environment (KETELS, C. *et al.* 2013). The environment supporting innovation becomes attractive to external investors and financial institutions as well, thus through the clusters the access to financial resources, funds and venture capital needed for high-risk and high-cost research and development activities also improves. New, innovative start-ups and spin-offs form and develop easier in a supportive and knowledge-intensive environment (COOKE, P. 2001). Clusters thus provide a favorable environment for innovation by providing the right knowledge base and other factors to support knowledge flow and exchange so clusters can become effective tools for innovation, growth and competitiveness. Regionally, after the outstanding performance of the Central Hungarian Region, the Southern Great Plain Region is ranked high on the list of regions in terms of the available R&D background, R&D resources, R&D expenditure and patents registered. The regional concentration of the research activities is quite high, in which the Szeged knowledge center and the University of Szeged play a significant role (KSH 2013, 2017). Almost half of the clusters created in the region can be linked to Csongrád County and Szeged within that. And the University of Szeged participates in more than 40% of the established clusters as full or support member. In addition, other science and research centers in the region were involved in the operation of the clusters. In terms of industrial and specialty distribution the clusters operating in the region are well suited to the county and national priorities and areas defined in the National Intelligent Specialization Strategy (National Intelligent Specialization Strategy 2014). The region has an outstanding position also in the formation of the Accredited Clusters with high innovation and export potential as ¼ of the 36 Accredited Clusters created can be linked to the Southern Great Plain Region. Between 2007 and 2013 these clusters and their members raised significant amounts of funding for their R&D activities and implemented a large number of innovation projects (Ministry of Finance, Deputy State Secretariat for the Implementation of Economic Development Programs, International and Cluster Division 2013). Based on these, in my research I investigated the following as the third hypothesis:

3rd Hypothesis: Clusters of the Southern Great Plain Region are built around the knowledge centers of the region, including the most important research and development actors, thus they conduct outstanding R&D and innovation activity.

A cluster can only be considered to be truly successful if it is sustainable both professionally and financially in the long run. Even for well-functioning, competitive clusters it is important to keep abreast of the latest industrial, professional and cluster trends and they regularly need to renew their strategy, goals and activities. It is also important for the clusters to create the financial funding for cooperation since to provide the framework for joint professional work, the operation of cluster organizations, the joint activities and appearances have significant costs. These costs are covered partly by the cluster members and partly by external grants allocated by different organizations. Within the funding structure of clusters external funding sources play an important role, but as time progresses, a kind of positive change can be observed in the case of clusters with a longer operational history and revenues from cluster members and business revenue from various services are becoming more dominant (KETELS, C. *et al.* 2013). International cluster trends also emphasize the importance of clusters' independence from external financial sources and, at the same time, the importance of non-financial incentives. (MEIER ZU KÖCKER, G. – MÜLLER, L. 2015). From 2014, domestic cluster programs have strengthened the development of marketable services for cluster management organizations through targeted tenders (GINOP 2014). As clusters in the region have been quite successful in tenders supporting various cluster activities, which have often required regular updates of strategies and objectives and received targeted grants to commercialize their service portfolio, lastly, during my research, I examine the fulfillment of the following hypothesis:

4th Hypothesis: Some of the clusters established in the Southern Great Plain Region have managed to achieve stable financial and professional growth, thus enabling them to become self-sustaining in the future.

III. Research methods

In my dissertation I applied various research methods in order to get a comprehensive picture of the clustering processes of the Southern Great Plain Region, the specificities of the established clusters and of the examined success factors identified in my research plan.

To answer the research questions the use of qualitative research methods was essential in order to gain deeper and more detailed information on the operation of clusters, innovation capacity, efficiency and their future development projection, and furthermore to get to know the individual opinion and experience of cluster leaders in this matter. During my doctoral research I conducted interviews among the clusters of the Southern Great Plain region. During the selection process I manage to involve those cluster managers or leaders of the regional clusters who:

- operate on a remarkable industrial sector or professional field of the region (according to the S3 strategy, regional operative programme, territorial development concept of the counties)
- are accredited clusters and/or engaged in R&D&I activity,
- engaged in increased cluster activity (through tenders, events, own websites)
- have at least 3-5 years of operational experience

For this, I took the list of regional accredited clusters as basis, and after I asked the interviewees to propose such cluster managers who would be worth to involve in the research. As a result, some cluster got involved in the research which did not receive any financial aid or do not have the accreditation, although they have a significant role in the region. The semi-

structured interviews were conducted between 2015 and 2016 with 20 clusters leader and manager.

I did not see the necessity to extend the number of interviewees for two reasons. On one part, after the 15th interview there were a lot of recurring motifs to be recognized in the answers and there were less new viewpoints to appear. On the other hand, from 51 established clusters the included 20 were operating at the time of interviews and satisfied the specified criteria. I was able to assess cluster activity with the help of their websites, press appearance, or the participation in the targeted events.

The interviews took 60-90 minutes and touched on the following issues:

- The establishment, composition, geographical embeddedness of cluster.
- The inner structure and operation of cluster, activity, strengths, weaknesses of cluster management.
- Cluster services, added values of the cluster for its members
- In-cluster cooperations, common projects, innovation activities.
- Financing, sustainability of clusters, future plans and strategic goals.

At some question of the analysis I also took the results of the analysis of the interviews of 17 cluster leaders from 2010 as a basis for comparison purpose. This analysis was conducted in the framework of project PACCLE, a Hungary-Serbia Cross-Border Cooperation Project, with cluster leaders operating in 2010. With the help of comparison, I examined that how cluster activities and goals change or develop in 5 years in some particular area.

One of the major limitations of my research is that despite my previous intentions, the opinions of the cluster members (due to their low willingness to respond) could not be obtained and built into the results. The interviews and the conclusions drawn from them obviously reflect only the opinions and attitudes of the cluster managers, which in many cases may differ, typically giving a more positive picture than the opinions of the members of the cluster. Consequently, there are some cases where I could describe the satisfaction and attitude of the cluster members only from the perspective of the cluster managers.

Regarding the financing, employment, or research-development performance of cluster members there were not any data available in the Central Statistical Office (KSH), since for enterprises the notation of being a cluster member during datafeed is not compulsory. These kinds of dataset can be collected voluntary or can be requested from cluster members and enterprises as a compulsory datafeed during to tendering processes, thus these data are limitedly available only for accredited clusters members. For the completion of my analysis, data was provided by International and Cluster Division of Programs within Managing Authority for Economic Developments of the Ministry of Finance (Assistant Secretariat for the Execution of Economic Development Programs) on nationwide accredited cluster performance from 2013 and 2018. With the help of this, I shortly examined the changes of economic and research efficiency of accredited clusters with some relevant indicators.

In my dissertation as a case-study I analyzed an example of a concrete, currently operating cluster of Southern Great Plain in detail too. The aim of the case study was to analyze my hypothesis and the results of the interview analysis in detail with the help of a specific pre-selected cluster. The case study is capable of presenting the relationships and motivations behind the success of clusters in more depth and from multiple perspectives and presenting it as a "good example" to other clusters or to individuals and organizations working on clusters. In my opinion, the further value of the case study is that nearly 10 years after the release of

the first financial funds, it now presents the development path, activities, success, future plans and possible difficulties of a cluster.

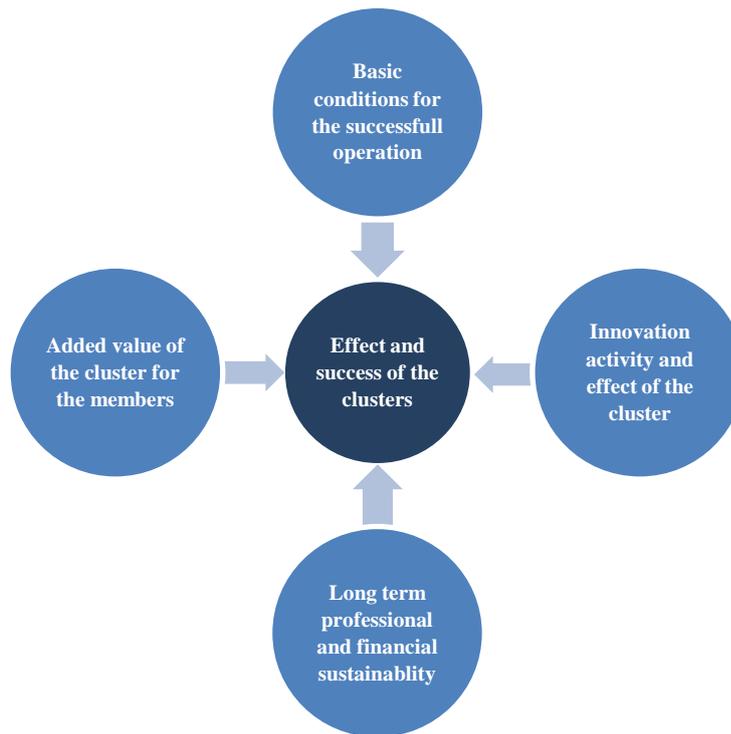The cluster asked for the case study was selected based on the following criteria:

- Work for at least 5 years to provide sufficient experience and knowledge of cluster management.
- Be active in one of the priority and knowledge intensive scientific or industrial areas of the region (based on S3 strategy).
- Be a diverse cluster of SMEs, universities and other organizations.
- Be an innovative, multiple accredited cluster.
- Be active at the moment.

For the case study in 2018 I did 3 semi-structured interviews and the documentation analysis of development plans, strategies, and presentations of the cluster. With the help of this case study, I would have liked to demonstrate the questions and motivations behind cluster development and efficiency through an example of a currently successfully operating cluster. With the help of the three interviewees, I sought to illustrate the individual themes from three different aspects, namely cluster manager, cluster supporter and university. The questions during the interviews were extended from the success factors examined in the dissertation to the steps and development directions of clusters in accordance with the international trends.

IV. The thesis summary of the research results

The objective of my dissertation was to investigate the effects of targeted cluster development programs from the past 10 years and to come round the efficiency of clustering processes in the Southern Great Plain region in detail, highlighting those fields, which need further development or reorganization. The thesis of this dissertation can be summarized along the following 4 questions according to the applied method (Fig.1.). Furthermore, the suggestions regarding cluster development are highlighted based on the analysis.

Figure 1. The applied method for investigation of the cluster processes in the Southern Great Plain Region

The basic conditions of successful regional clusters

The majority of regional clusters was established after 2007, thanks to the widely available grant resources, although their relatively small percentage reached the developing phase and operating now as well. Regarding the professional field of expertise of the existing clusters, they fit well in the directions for regional strategic development and cover the top business sectors, research areas for example machinery, automotive industry, healthcare industry, building industry, energetics, software development and laser technology.

From the viewpoint of cluster success, the appropriate company compound and number, and the competitiveness of the cluster members' services and products are important. Regional clusters are mainly built on the collaboration of small and medium sized enterprises organized along industrial value chains at strategic level. The ratios of small and medium enterprises reach 75%, but next to them most significant big and multinational companies are present in 5%, and in the decisive majority of clusters the most important research members, universities, research centers participate as well. According to cluster managers in 65% of clusters involved in research the small and medium enterprise background is their most important strength.

Concerning their size, they do not fully correspond with the aspects of economies of scale, since they cooperate 32 cluster members in usual. More and more clusters aim to reach the critical mass for efficient operation by different methods like cluster fusion, member extension or by developing a broader cluster cooperation ecosystem, thus there are cooperations, which reached 60-80 membership.

In cluster success *mutual trust* between cluster members has a significant role. In its formation the existence of former relationships, personal or business connections and recommendations have an important role. The strengthening of the capital of trust can be reached through information exchange at regular events and successfully conducted business projects by cluster leaders.

Concerning *geographical concentration* 70% of cluster members in the model operate in the region, though they have a good and close collaboration with other members outside the region. Geographical proximity might have a greater significance in maintaining personal relationship and the formation of trust relationships since it can facilitate these. In case of common professional work and projects there are not such long distance that could cause a problem for cluster members. With the development of information and communication technology and with the cluster appearance on the global market, on geographical proximity less emphasis is placed by cluster experts and parallel to this, the role of so-called relational proximity comes to the fore.

Regarding concrete cooperation, most clusters worked out *strategy and action plan* in detail, and implemented several common projects, developments, and in some cases investments with the help of financial resource. The large share of regional clusters operate in a relatively uniform management framework led by a cluster chairman and a cluster board with several years' experience in profession and management. Administrative management is carried out by professional cluster management organizations consisting of a few employees. They coordinate the cooperations, provide cluster's representation and with different management and professional services they try to support the success and acceptance of the cluster on national and international level as well. Regarding qualification, the members of cluster management have managerial qualifications, but other professional competence is an increasing necessity in the enhancement of cooperations.

Thesis 1: The clusters of the Southern Great Plain Region have the necessary prerequisites for successful operation.

Advantages of cooperations and added value in case of the clusters in the Southern Great Plain region

Clusters in the Southern Great Plain region try to exploit the advantages in cluster cooperations and they aim to develop their activities along a value chain, which can constitute mutual advantages and new market opportunities for each member. The maximum added value of regional clusters is outstanding in the generation of common research-development projects and the gaining of financial tender sources. In addition, clusters also facilitate knowledge sharing between members, the increase of their competitiveness, the establishment of international cooperation and the entry into the international market. However, the strength of these additional benefits is still relatively low, given their crucial importance for the future of clusters and international cluster development trends, therefore, these areas still need to be developed by the management organizations. The significance of cluster capability of gaining financial source was unquestionable in the 2007-2013 period, since a significant quality of tendering source was available which was appealing for cluster members. With the decrease

in the available tendering sources, cluster leaders need to move their focus areas consciously and the international market access, the importance of common product and service development might be promoted more.

Cluster management organizations aim to increase the attractiveness of cluster membership with several services. The services were widespread and varied in 2010, ranging from organizational and communication tasks through networking, project generation to different fundraising activities. Over the past 5 years, positive progress has been made mainly in internal and external communication activities, in organizing professional and benchmarking clubs as well as educational programs and in exploring funding opportunities, as more and more clusters provided these services to its members. Compared to 2010, foreign networking has emerged as a completely new activity, which has been gaining prominence in cluster life in recent years. Clusters also need to focus strongly on different export markets in order to gain or maintain a sustainable competitive advantage and they also need to get to know the successful operating models of international clusters. Cluster managers have also realized that in the future they should focus on simplifying and improving the quality of their service portfolio rather than expanding that. In the case of clusters in the region, no internal evaluation or monitoring procedures have yet been developed to measure members' satisfaction, but Cluster Accreditation and the European Cluster Excellence Initiative are considered the two most important certification processes, as they provide a form of feedback and can serve as a guide for future developments. Clusters also need to develop common cluster awareness and cluster members' collaborative activity in the future, as they show moderate to below-average performance in both areas.

Thesis 2: At present, clusters in the Southern Great Plain Region provide the greatest added value to their members only in terms of research and development activities and access to grant resources, the services of the management organizations should be focused on the different long-term breakthrough points (eg. access of international markets, strengthening of international relations).

The innovation activity and effect of the clusters of the Southern Great Plain region

Regional clusters were organized around the most important regional knowledge centers and their activities cover the most significant research areas of the region. The participation rate of universities and research centers is remarkable, since there are a few clusters which do not have a college, university or other research institute as a member. Their role is to assign the research themes and direction, the realization of R&D projects and tenders, the assurance of educational, training activities and R&D capacity. Enterprises with intense R&D&I activities characteristically emerge from the cluster founding members who recognized the importance the cooperation and knowledge sharing in innovation project at the very beginning. Outside of them, those enterprises can be highlighted which are under innovation pressure otherwise, and they have enough capital and capacity for research and innovation. Although, there are some special field i.e.: healthcare, pharmaceutical industry where not only the big companies but small and medium sized enterprises can be active participants of R&D&I projects. Despite of the high participation of colleges, universities, they do not consider to be significant members in the clusters. The biggest problem with the cooperation with them appeared in the difference in operation and motivation.

In the programming period between 2007 and 2013 the accredited, regional clusters and their members participated in 197 R&D tenders and receives 28 billion HUF financial support from the R&D&I tenders of the Economic Development and Innovation Operational Programme which is 24% of all the called financial support.

Most clusters did conduct common R&D&I projects, although their results realized as a concrete marketable product or service only in two cases. The cluster managers' most important task is to create an incentive atmosphere for knowledge sharing and creative brain storming. For this, innovation services are available and they organize many professional programs, meetings, workshops and other events, where, besides knowing each other's activities in details, they emphasize the deepening of professional and personal relationships, since an atmosphere of trust is necessary in innovation for the increasingly appreciated tacit knowledge transfer.

Regarding the clusters' innovation activities, I examined the strength of the innovation encouraging factors in clusters. For this, I grouped 18 encouraging factors along 5 main themes (*1. R&D sources and base, 2. R&D services, 3. Knowledge transfer and collective learning, 4. Competition and market reach, 5. Cooperation and risk mitigation*). I analyzed, based on this alignment, how much these factors are appreciated by cluster managers from the viewpoint of innovation, and how determining their presence in the activity of the cluster. From the viewpoint of innovation, clusters find different *R&D services and base* the most important, but they evaluate other factors important from the viewpoint of encouraging innovation activities in addition. Examining the in-cluster appearance of the given factors, the results are more moderate, so in clusters, the larger share of important factors are not as accentuated to their importance as they should be.

Necessary resources (infrastructure and human) for R&D&I activities and *easier requisition of external innovation sources* can be highlighted as the strongest group from the viewpoint of innovation among the indicators of *R&D services*. Based on this, the importance of gaining external (typically tendering) sources is shown in research-innovation as a driving force of cooperation. From the viewpoint of cluster operation, the strongest group in the group of *R&D resources and base* are the *strong university R&D base* and *strong specialization,* which are proved to be more decisive than the others. This is a very interesting and partially controversial result since cooperation with universities cannot be seen to be very determining in clusters based on the cluster managers' opinion, though their resources are valued to be an incentive indicator in innovation fields. All in all, most cluster leaders agree on the importance of innovation incentive factors and their roles as well, though they think that these do not predominate in cluster operation as much, thus further resource allocation is needed for their development.

Thesis 3: The clusters of the Southern Great Plain Region are built on a significant knowledge base and around the most important knowledge centers, but their R&D and innovation activities are still below expectations and in many points they need to be improved.

Long-term financial and professional sustainability of regional clusters

In the financial framework of regional clusters, the presence of grant resources is determining and they typically finance their operation from grant funds, membership contributions and the temporarily very low service incomes. The financial situation of clusters cannot be regarded as stable and the management's biggest challenges are the establishment of financial background and the maintenance of continuous activity from cluster members. Most of the clusters did not find those income sources which could cover their common activities on the long-term. In the last few years, the major part of cluster leaders realized that they can be successful only if they can operate independently on a market basis and the advantages originating from the cooperations exceeds the input well.

The generation of service income might be a solution for the maintenance of cluster management activity, but this is realized effectively in fewer clusters yet. For this, such services are needed to which solvent demand is shown from the members and external market actors as well. The programming period between 2014 and 2020 focuses mainly on these areas, but these goals are partly realized. During next years it will be decided whether the financial background of clusters will be managed to be stabilized. The majority of consulted clusters are on the view that without external resource with membership contributions, services and other income they are able to finance their own operation. Although, this might not assure the development of clusters and their progress to an international level and for this, they are going to need external aid.

Regarding the professional development and transformation of clusters, they have a very clear, well-defined common vision. They plan common research-development and innovation projects; they aim to become visible at international level for the realization of international projects and for the exit to international markets. More clusters conceived the improvement of intersectoral and inter-cluster cooperation as a goal to improve their competitiveness. The professional sustainability of regional clusters can be also created by having the ability to grow and by the generation of cooperations with high added value at an intersectoral and international level for the members. Although for its practical realization there are hardly any examples in the region.

Thesis 4: The clusters of the Southern Great Plain Region are still heavily dependent on external support, funding sources and they have not really been able to generate the sources of income needed for financial sustainability. However, in terms of professional sustainability, international and intersectoral cooperation needs to be developed and strengthened.

On the basis of the results above, it can be concluded that the clusters of the Southern Great Plain Region have established the necessary bases for successful operation, but there are still many external and internal developments deeded in the areas of cluster advantages, innovation and financial and professional sustainability.

Based on the interviews and examinations of case study results, those fields outline clearly, where regional clusters need internal and external development for long-distance efficiency. The practicality of results and my proposals on this basis can be summarized in the following points:

For cluster managers, the proposed internal development directions:

- Instead of gaining financial resource of tenders they should concentrate on those common projects and developments which provide business benefits.
- Beyond traditional management approach, cluster managers will need professional knowledge to understand the most important problems of the professional field and the special needs of the members.
- Provided services need to be further developed to respond professional demands as much as possible, which could assure a wider range of entrepreneurial sphere.
- Special attention needs to be paid to incite cooperations with other relevant sectors or clusters.
- It is necessary to concentrate on university-company cooperations as much as possible because it is a partly unexploited possibility. For this, equally active initiative role and a high level of openness is needed from cluster leaders and university actors.

- Size expansion or strengthening inter-cluster cooperations is a very important factor for reaching the economies of scale threshold and for increasing international attractiveness of clusters.
- A concrete business model needs to be elaborated for financial sustainability of clusters. Cluster activities and services should be commercialized.
- From management it requires effort to understand international markets, to increase international visibility of clusters and to promote international relationships. For this, they need to resort to the development of clusters and the support of external relations aiming international organizations.
- The clusters finance raising activities should be transferred to international level.
- Clusters need to allocate resources to the development of competence and knowledge for international activities (i.e.: foreign language knowledge, external market knowledge, capture of direct European Union resources).

Regarding cluster support the following proposals can be conceived for cluster decision-making bodies and authorities:

- Instead of the use of direct financial resources, indirect, not-financial type of incentives should be applied for cluster support because these draw less resource-hunting cooperations but could contribute to the strengthening of the cluster management's motivation and activity efficiency.
- Among non-financial type of incentives, familiarization of international practices has major importance, even to the level of business model.
- There might be a need for initiatives for broadening the cluster managers' competence and knowledge like practice-oriented training and courses.
- It is proposed to support international cooperation and market access (international professional conferences, participation in stakeholders' meetings).
- The sector specific professional support or mentoring of the cluster managers' work is an important area.
- The need for direct financial resources is only required in the enhancement of cooperations of research, development and innovation. It is suggested to support market-oriented common research and development activities which result marketable products or services.
- It is recommended to activate universities and research centers with the introduction of targeted programs for example cluster innovation voucher programs.

V. Applicability of the research results

The results of this dissertation can be of different use in practice. The achievements of the cluster survey can provide detailed information for decision-making bodies of economic development programs, thus they contribute to the further development of cluster programs and major direction of actions, since they reveal the weakness and deficiency of cluster cooperations and identify those fields by whose support significant effects can be achieved. On the other hand, the results can be of use for cluster leaders and members too, since they can provide the basis of comparison and framework to evaluate their own efficiency and to appoint their development focus areas. Thirdly, certain results of this dissertation can be applied to a wider circle of entrepreneurs and resident population on informational and awareness-raising basis to reduce the negative judgement of clusters. Namely, the results reveal that only in one part of clusters had resource hunting initiative, and for efficient operation and long-distance maintenance goal-oriented, persistent work is needed from cluster

managers, and further, there is a tight layer of Hungarian clusters which are based on real cooperation and are able to show significant market outcomes.

VI.   Further directions of the research

The outcomes of this dissertation raise numerous further questions on the basis of which the research is possible to be continued with a wide variety of directions and different methods. The results are recommended to be further extended and specified with the inclusion of cluster members' opinions, experiments and motivations, which can be supported by questionnaire survey conducted among them, although their willingness to answer is very low. For time comparison, the later repeat of research might serve interesting results, since it might come to light that clusters deemed partly successful will have pulled through long term and in which direction they will have developed. The research would worth to continue in international comparison with other clusters in countries which has similar situation and background to Hungary (i.e.: V4 countries), since it would be interesting to examine, that with what difficulties other countries face regarding clustering and what kind of proposing solutions have evolved in sustaining them. Last but not least, maybe the most interesting research direction is the detailed time-variant data analysis of economic, employment and research-development of in-cluster organizations which results quantified data and indicators to support clusters' efficiency and effectiveness.

VII.   List of publications related to the thesis

1. **Kovács L. (2011)** Innováció, vállalkozások és klaszterek kapcsolata a Dél-alföldi Régióban, In: Józsa Klára, Bajmócy Péter (szerk.): Geográfus Doktoranduszok XI. Országos Konferenciája CD kiadvány, Szeged, SZTE TTIK Gazdaság- és Társadalomföldrajz Tanszék, 2011.

2. **Kovács L. (2012)** Klaszterek, mint a hiányzó innovációs láncszem? A klaszterek szerepe és elhelyezkedése a Dél-alföldi Régió innovációs tevékenységében Kockázat-Konfliktus-Kihívás, VI. Magyar Földrajzi Konferencia tanulmánykötete, Szerk: Nyári Diána, 2012, Szegedi Tudományegyetem Természeti Földrajzi és Geoinformatikai Tanszék, 429-443.

3. **Kovács L. (2012)** Clusters - the missing item of the innovation chain? The role and position of clusters in the Souhern Great Plain Region, Hungary Central European Regional Policy and Human Geography, University of Debrecen, Department of Social Geography and Regional Development Planning, 2012, 2, 49-61.

4. **Kovács L. (2013)** Az olaszországi ipari és technológia körzetek kialakulása és jellemzői, In: Józsa Klára, Bajmócy Péter (szerk.): Geográfus Doktoranduszok XIII. Országos Konferenciája CD kiadvány, Szeged, SZTE TTIK Gazdaság- és Társadalomföldrajz Tanszék, 2013

5. **Berkecz-Kovács L. (2015)** A klaszterfejlesztés eredményei, a klaszterek sikerei a Dél-alföldi Régióban, In: Szabó, István; Bohonyi, Noémi; Haffner, Tamás; Horváth, Orsolya; Márhoffer, Nikolett; Molnár, Emese; Pál, Eszter; Schaub, Anita; Varga, Zoltán (szerk.) IV. Interdiszciplináris Doktorandusz Konferencia 2015, Pécs, Magyarország: Pécsi Tudományegyetem Doktorandusz Önkormányzat 2015, 337-346.

6. **Berkecz-Kovács L. (2015)** A klaszter-alapú gazdaságfejlesztés eredményei a Dél-alföldi régióban, In: Keresztes, Gábor (szerk.) Tavaszi Szél 2015 / Spring Wind 2015 Konferenciakötet: I. kötet, Eger, Doktoranduszok Országos Szövetsége, 2015, 501-510.

7. **Berkecz-Kovács L. (2015)** Klaszterek szerepe a tudásalapú gazdaságban, In: Buzás, Norbert; Prónay, Szabolcs (szerk.) Tudásteremtés és -alkalmazás a modern társadalomban tanulmánykötet, Szeged, Szegedi Tudományegyetem, Interdiszciplináris Tudásmenedzsment Kutatóközpont, 2015, 28-38.

8. **Berkecz-Kovács L. (2018)** New trends in the development of Hungarian clusters: The case of the Southern Great Plain region, REGIONAL STATISTICS 8, 2018, 1, 78-95.