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THE EXAMINATION OF THE HUNGARIAN CLUSTERIZATION IN THE CONTEXT OF THE GEOGRAPHIC CONCENTRATION, THE CRITICAL MASS AND THE FINANCIAL STRUCTURE

Theses of the Doctoral (PhD) Dissertation

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1. Introduction of the theme and the objectives

The thesis examines the possibilities of the cluster initiatives operating among special Hungarian economic circumstances in the framework of the geographic concentration, the critical mass and the financial structure of the organizations. On the one hand the goal is to provide a general solution for the identification of the smallest sustainable cluster size which contributes to the emergence of several benefits including positive external effects and dynamic agglomeration economies. To the appearance of these advantages the most important requirements are the spatial proximity and the certain number of the co-operative actors especially the enterprises and the educational institutions which have to reach a minimum number (critical mass) to realize the gains. The author hopes that her research will support the political decision makers and the cluster managers in Hungary to create a successful cluster promotion system and examine the clusters' chance of survival. On the other hand she integrates the key factors of the cluster initiatives as the financial structure, the optimal size of

the collaboration, the facilities of the further expansion and the question of the sustainability into an economic-mathematical model.

Looking at the list of the cluster initiatives supported by the government it can be revealed that these organizations are still very popular nowadays and this statement can be proved on the example of the West-Transdanubian Region as well. In the mentioned area more start-up clusters were promoted in the framework of the New Hungary Development Plan than any other operating or developing clusters in the extension of their services.

However the productiveness and the efficiency of the initiatives are controversial and very often discussed in Hungary among others because of the lot of negative examples. The greatest part of the clusters in this country can be characterized with periodic operation, deformed financial structure, strong dependence on the external sources, increasing passivity of the members and total lack of the common R&D activities and any other innovation processes. The thesis attempts to explore and connect the factors and the cause-effect relations hiding

in the background of the clusters' failure. To this effort an economic-mathematical model proved to be the best solution. It highlights the context between the most important elements including the geographic proximity and concentration of the economic actors and the balanced financial structure besides the cluster size which has to exceed the critical mass. Without these conditions the sustainability of the organizations can get to danger.
The aim of the dissertation is to prove or reject 5 hypotheses.

1. 1. Hypotheses

H1: The majority of the mathematical and statistical methods applied in the Hungarian and foreign literature is suitable to examine only the industrial branches (value chains organized around an economic activity) but they can not be used to evaluate the clusters as well.

H2: The cluster promotion policy can not be established sufficiently because the procedures and the devices it employs are not appropriate to examine the real cooperation within the cluster formation. It results in the decision making process of the proposals applied for the

financial assistance separated for clusters that it qualifies the industrial branches and not the clusters operating in them. Cluster promotion means the development of the selected industrial branches through the establishment of their actors' co-operation.

H3: Industrial parks provide very favorable infrastructural and operational circumstances within a region and hereby they influence the location decision of the companies positively resulting in geographic concentration and spatial proximity of the actors which settle down close to each other. The strong concentration measured on the basis of the employees contributes to the formation of social networks which can enhance the chance of establishing new cluster organizations as well.

H4: Although a cluster is a very complex and complicated system which changes continuously and develops with the passing of time its fundamental relations can be described by a simple economic-mathematical model. The key elements of a cluster as its financial structure, its optimal size, its chance to the further extension and the sustainability can be connected in the framework of this model.

H5: The „critical mass" of the cluster can be defined as the smallest sustainable cluster size which at first provides the appearance of distinct advantages including the positive external benefits and dynamic agglomeration economies related to the spatial proximity and the adequate number of the economic actors. This composition is represented by one point in the mathematical model which is a corner solution and from this status it follows that it can be determined clearly if the other operational parameters are known and set up.

2. Methodology and the content of the paper

The thesis consists of 5 chapters and each of them required different research methodology.

The first chapter reviews the theoretical background of clusters and introduces the most popular concepts highlighting the differences among them. It summarizes the principles of the European Union about the creation and promotion of clusters and deals with the Hungarian clusterization processes while it places great emphasis on the evaluation of the West-Transdanubian region's capabilities. This part is based on secondary research

activities. The author had to process the domestic and foreign literature therefore she visited more libraries and downloaded a lot of materials from the Internet. Completing this knowledge with practical information about the cluster initiatives operating in the West-Pannonian area the candidate made a survey and visited the cluster managers to make interviews with them. Her personal experiences and impressions were built into the first chapter.

The second part discusses the several mathematical and statistical methods which can be applied in the examination of clusters including the input-output tables and the graphs. Latter facilitate the visualization and illustration of networks' connections although their efficiency is restricted in the analysis of clusters. That organizations point beyond networks and industrial branches and this fact influences the application of the devices as well. Michael Porter and his research team worked out a very popular cluster mapping methodology which is introduced in detail in the second chapter too. It can be used for the exploration of particular economic activities' densification points and if this process was

completed with other indicators it would be possible to identify the key sectors of an area. The implementation of the mentioned analyses happened on the data base of the West-Transdanubian region and the results of the research are summarized in the second chapter. The most important consequence is that none of the devices is appropriate for the examination of clusters' essential aspects as the intensity and quantity of the relations and facet-to-face connections. The selected key sectors identified by the author on a lot of indicators are compared afterwards with the results of the domestic and foreign surveys listing different economic activities with high degree of geographic concentration and specialization e. g. these industrial branches provide the best conditions to create new cluster initiations. The comparative approach plays a very important role in that part of the thesis.

The third part is similar to the second because both are based on primary researches. In the third chapter the candidate analyzes the Hungarian manufacturing industry from the aspects of clusterization, concentration and specialization. In the framework of the research the

sectors' maturity and the circumstances of the co-operation formed within them are examined from the point of view of clusterization. More of them have received government assistance several times however they do not fulfill the basic requirements of clusterization as the geographic concentration and the minimum number of the economic actors (critical mass). During the results and the conclusions were summarizing by the author it came into her mind that the research could be extended for the industrial parks as well because these formations have very strong effect on the organization of the space and it can be assumed that their number influences the clusterization processes positively. The candidate makes an effort to prove this hypothetical connection between the number of the industrial parks and the number of the clusters.

The fourth chapter combines and systematizes the elements discussed above but the financial structure is added to the research. An economic-mathematical model offered the best solution for this which was tested on the operating parameters of a real cooperation belonging to the most successful Hungarian cluster organizations, the

so called accredited innovation clusters. The results are illustrated on expressive figures while the final conclusions are summarized in the fifth chapter.

2. 1. Database of the analyses

The necessary database to the potential cluster mapping process and the identification of key sectors in the West-Transdanubian region were downloaded from the dissemination database published by the Hungarian Central Statistical Office. Regional statistics were used in TEÁOR'98 ('03) for the West-Transdanubian Region and its 3 counties (Győr-Moson-Sopron, Vas and Zala county) from 1999 till 2008 providing the time series to the trend analysis. The examination of the employment is based on the regional labor market statistics created for the enterprises with more than 4 employees completed with the social security and non-profit institutions as well as institutions of central and local government in TEÁOR'98 ('03) from 2000 until 2008. The LQ indices were calculated on this database as well.

The tendency of the clusterization experienced in the manufacturing industrial branches, the geographic

concentration and the specialization were analyzed on the database of the Central Statistical Office including the number of the employees and the enterprises and the gross value added in the term of 2003-2008. In 2008 the TEÁOR codes and the industrial classification changed and the comparison between the period before and after became complicated. In that cases when the data base were published in regional and industrial classification after 2008 the author recalculated the indices and extended the mathematical and statistical analyses till 2012.

3. Results and conclusions

T1. After the author surveyed the most popular mathematical and statistical methods applied in the examination of the networks and the clusters she has to state that neither the input-output models nor the graphs, the potential cluster mapping process and the indices used in the identification of the key sectors are able to analyze the real cluster formations. Each of the tools listed in the dissertation has other reason for the

unsuitability of it therefore the first hypothesis is agreed by the candidate.

T2. Studying the list published by KETELS AND SÖLVELL in 2006 about Hungarian industrial branches which are mature for the clusterization and provide good possibilities to the creation of new cluster initiatives among their actors on the basis of the employment, the author draws the readers' attention to the contradiction which can be experienced in these sectors. On the one hand they are characterized with the fulfillment of the critical mass, strong geographic concentration and high degree of specialization although real cooperation and cluster organization can not be revealed in the background. On the other hand more clusters can be found in the practice which received government assistance in spite of the insufficient conditions and the neglect of the most essential requirements because they were not examined or the methods applied in the analyses were not appropriate according to the 1st hypothesis. The governmental policy and commitment reflects the results of the candidate's empirical research related to the key sector identification in the West-Transdanubian

region which highlighted the emergence of new, innovative and prosperous industrial branches opposite the traditional Hungarian sectors as the wood and furniture industry, the textile industry and the engineering industry within the manufacturing industry. These activities can be described with decreasing tendencies in the employment and the number of the enterprises and their actors have to face a lot of problems. The negative examples when unreal cooperation and clusters of flourishing industries were supported instead of the exemplary collaborations of declining sectors – which is rejected by the author – prove that the government is not informed adequately about the quality and frequency of the actors' interactions and relations. The calls for proposals advertised for the start-up and developing clusters in the New Széchenyi Plan prefer industries to real collaborations within clusters and try to enhance certain sectors through the promotion of their networking process.

The evaluation of the cluster formation is solved with higher success in the applications of the Accredited Innovation Clusters because questions are composed

related to the cooperation and the aspects of the social network and not only the economic circumstances are checked which should be the essence of the program.

The hypothesis is true only in part.

T3. Comparing the list of the industrial parks with the areas where the employees and the gross value added geographically concentrate it can be experienced that the greatest part of the industrial parks' employees work in the manufacture of basic metals and in the manufacture of electric and machinery equipment where the production of the gross value added is outstanding. This statement is true inversely as well: several industrial parks were established in those counties until 2009 where these sectors dominated. For instance four industrial park titles were awarded in Vas, Zala, Komárom-Esztergom and Fejér counties and three in Győr-Moson-Sopron county which proves that the improvement of the productivity and the enhancement of the producing capability stand in first places among the governmental purposes. The number of the industrial parks increased dynamic in Pest and Csongrád counties too where the manufacture of coke oven products dominated with its

huge proportion of the gross value added production. Former extended the circle of the industrial parks with 11 new titles while 6 new industrial parks were formed in the latter between 2002 and 2009. Borsod-Abaúj-Zemplén and Hajdú-Bihar counties acquired 5 new industrial park titles in the same term and they seemed to be strongly concentrated because of the outstanding performance of the manufacture of chemicals and chemical products sector in the gross value added production.

Summarizing the above described processes a positive connection can be supposed between the territorial location of the industrial branches with high proportion of the gross value added production and the number of the industrial parks. The most concentrated industrial branches measured on the basis of the gross value added can be manifested in those counties where the most industrial parks were formed. However there are some industrial parks where the gross value added is concentrated thanks to the presence of a very innovative and dominant manufacturing industry and it is represented only by one multinational company which is

not interested in the creation of a cluster but in the building of its supplier chain. The best examples are the Rába Industrial Park in Győr, where the location of the Audi Ltd. can be found and the Komáromi Industrial Park where the other big vehicle manufacturer, the Suzuki Ltd. functions. None of the mentioned enterprises are active members of any cluster initiatives nowadays although each company played a very important role in the establishment of the first Hungarian clusters at the beginning of the 2000.

Finally we can state that the industrial parks seem to contribute to the geographic concentration of the gross value added in some industrial branches but in the employment they do not result in density points. However, the latter could facilitate the formation of relationships among the economic actors and lead to organization of cluster initiatives. The concentration of the gross value added can be caused by one dominant company as well and it is not sure that it is interested in the creation of a cluster organization or intends to participate in that actively.

The hypothesis is rejected by the author.

T4.-T5. The fourth chapter describes an economic-mathematical model created by the author in detail which helps to identify the sustainable cluster sizes based on the operating parameters of the organization. The model determines the sufficient number of the productive members (especially enterprises, producers and service providers whose main exercise is to meet the market demand) and the unproductive members (including the higher-educational institutions, the research institutes, different foundations, the local governments and other non-profit actors) which is essential to the long term operation of the collaboration. The model integrates the financial conditions, the ideal (optimal) cluster size and the problematic of the further expansion and helps to identify the smallest cluster size and its composition which equals with the point of the right angle representing the solution set of the model and provides the appearance of the positive external benefits firstly. This point is the so called critical mass in the model and can be determined unequivocally.

Both of the hypotheses are proved.

4. Summary

The strength of the thesis according to the author is the economic-mathematical model which enables the experts to join and examine the clusters' main success factors together. It facilitates the analysis of the co-operations' long term possibilities and helps with the identification of the critical mass if the most important operating parameters are known. Although more simplifications were necessary which limit the model's practical adaptability. For instance the application of the money gaining from several proposals, the utilization of the products related to the joint actions and the positive external effects arising from the cooperation and the geographic proximity of the economic actors are restricted. It is not guaranteed that every participant can take advantages of the results of the collaboration including the passive members as well. The monetary nature of the model has to be moderated too because not only the services provided within the cluster can motivate the enterprises to participate in the cooperation but the positive external benefits and the local advantages as

well which can not be measured in money. Another interesting question is for me what kind of changes could improve the cluster members' willingness for the payment of the participant fee and how the model could handle the different territorial capabilities. Each region creates other opportunities to their actors and the several factors determine the areas' ability to support. It is enough to think on the distinct sources of the Regional Operative Programs.

The directions of the further researches are given and the author is committed to improve her model which was created with the aim to inspire new ideas in the circle of the regional scientists and to contribute to the organization of more successful cluster initiatives in Hungary.

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