## ЗАГАЛЬНІ ПРОБЛЕМИ ЕКОНОМІКИ

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# MODERN APPROACHES TO IDENTIFICATION AND MAPPING OF CLUSTERS

*The article is aimed on the results of theoretical studies of the Economics clustering, in particular issues relating to the spatial formation and identification of the clusters. The author focuses on the theoretical justification of the feasibility of a new model in the cluster formation – Benchmarking Model, which provides a comparison of the most efficient forms and approaches to their spatial organization.*

*Keywords: organizational and economic clustering, Cluster Benchmarking Model, identification and mapping of clusters.*

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# СУЧАСНІ ПІДХОДИ ДО ІДЕНТИФІКАЦІЇ ТА ПРОСТОРОВОЇ ОРГАНІЗАЦІЇ КЛАСТЕРІВ

*У статті відображено результати теоретичних досліджень щодо кластеризації економіки, зокрема питань, що стосуються просторового формування та ідентифікації кластерів. Автор акцентує увагу на теоретичному обґрунтуванні доцільності застосування нової моделі формування кластерів - Benchmarking Model, яка передбачає співставлення найбільш ефективних кластерних форм та підходів до їх просторової організації*

*Ключові слова: кластеризація економіки, кластерна Benchmarking Model, ідентифікація та просторова організація кластерів.*

**Introduction.** It is well known that geographical co-location of companies has a positive effect on the economic performance of the companies in a cluster. Therefore the controversy is no longer about whether firms within a cluster have higher economic performance than firms outside a cluster. Much evidence points in this direction. Instead, the discussion is about whether it is possible to design a national and/or regional cluster policy which can positively affect the performance and outcome of companies with in a cluster.

In modern theories, concepts and paradigms of development more and more attention is paid to organizational and economic clustering. In particular, foreign economists analyze trends in the development of cluster systems in the global economy. Thus, in most cases, the construction cluster is associated with the need to unite under one of the special zone industrial business projects in a specific technological field; fundamental research and advanced system design of new products and preparation manufacture these products.

The goal of clustering is outpacing economic growth through development of new technological areas; preservation and realization of scientific-technological potential. In particular, the strategic directions of activity of clustering in Ukraine can be: technological modernization of the existing infrastructure platforms; creation and introduction of fundamentally new physical principles and effects of technology; technological modernization of industry basis; the formation of advanced technological platforms and their integration with the European technology platforms.

In this context it is important to examine the relationship between cluster performance and cluster – specific framework conditions and thereby get a better understanding of the key drivers of the best-performing clusters. In this way specific political instruments cannot be transferred from one political, cultural and administrative context to the other without careful consideration. It is therefore proposed to study the "Cluster Benchmarking Model", which will establish a fact –based tool in which knowledge-based cluster policy can be established.

The main objective of this article is to define the essence of "Cluster Benchmarking Model", which provides a comparison of the most efficient forms and approaches to their spatial organization for the best cluster performance in Ukraine.

**Results.** The vision of the Cluster Benchmarking Model can be explained in five steps (fig.1). Let`s consider this elements more detailed [1, 2]:

1. Policy relevant cluster mapping. This requires mapping the clusters which are relevant to policy-makers. To ensure that the analytical tool is relevant for different aspects of policy -making, it is necessary to make the tool as flexible as possible, so policy-makers can flexibly choose the composition of the clusters that they would like to benchmark.

2. Description of the economic outcome and the performance of clusters. Since cluster performance is nota single-dimensional concept, it is necessary to look at a range of outcome and performance indicators if we want to benchmark cluster performance properly.

3. Examination of cluster-specific framework conditions. This requires examining and quantifying cluster –

specific framework conditions and controlling for differences in the horizontal framework conditions at national and regional level.

4. Correlation of cluster performance and cluster-specific frame work conditions. To understand the relationship between cluster performance and cluster -specific frame work conditions, we want to regress the two see if a strong positive correlation exists which can justify political intervention. This will further more make it possible to understand which policies foster growth in clusters and which policies do not.

5. Learning from best practice through peer reviews. This requires furthering examining the cluster-specific framework conditions of best-performing clusters.

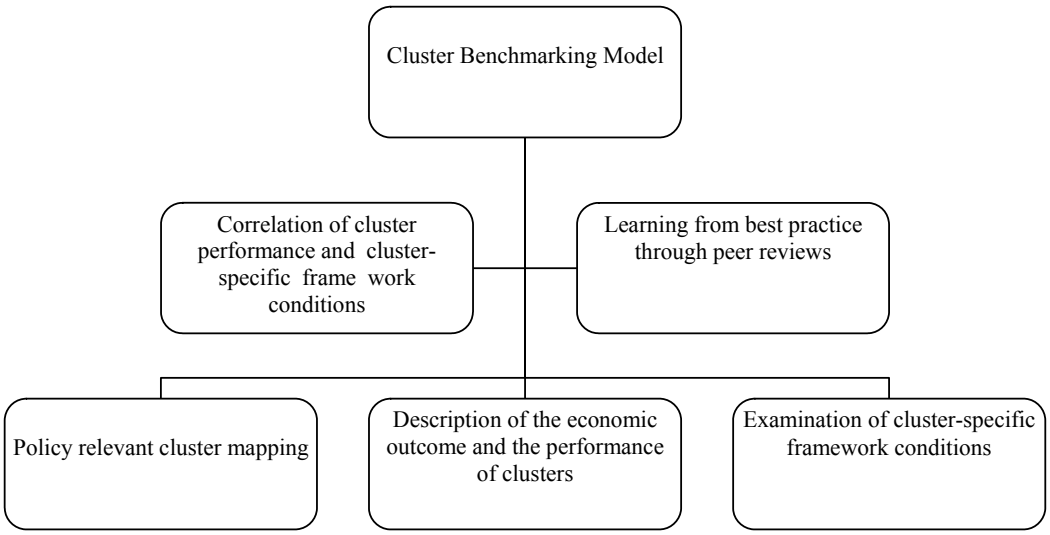


**Fig.1. Major Components of Cluster Benchmarking Model (Source: compiled by the author according to [1])**

In the context of increased attention to the clustering, critical review of the literature reveals many different ways of grouping industries into clusters. In order to get the most realistic picture of cluster formations, different kinds of statistics and databases have been used, and different approaches for gathering information in other ways have been applied. Generally, the choice of method for cluster mapping depends on which kind of clusters you want to identify.

Clusters can be identified and mapped by looking at localization quotients based on employment data. Is method is widely known and described in the cluster mapping literature [3].

A localization quotient for a given industry measures the extent to which a region is more specialized in an industry compared to the geographic area in question. The localization quotient is calculated as the industry's share of total employment in a given region relative to the industry's share of total employment in the whole geographic area in question. The localization quotient equal to one means that the given region is not specialized in the given industry.

This quotient equal to means that the given industry is represented by a 50 pct. bigger share of employment in the given region than the industry's share of employment on the level of all regions. It is indicates that the region is specialized in the industry.

If several regions are specialized in an industry, the methodology assumes that the industry is globally-oriented. When a pattern appears where a group of global industries are localized in the same regions, these industries are grouped into a cluster the method is structured as follows. First, the geographic area in question is divided into regions. Then the next step is to identify global industries by calculating localization quotients for every industry in every region. In this step, the industries of every region are divided into three groups: local, resource dependent and global industries.

In the following step, the localization quotients of the global industries are analyzed to find patterns of clustering. A statistical approach (a cluster algorithm) is used to run through different groupings of industries to find the best solution for grouping the industries based on the localization quotients. It is taken as an indication of a cluster when the same group of industries is over -represented in several different regions.

The choice of regions, the identification, and the grouping of industries are all part of an iterative process. Going through the method, refinements can be made in the different parts of the process until for motions of clusters seem to fit reality. For this, the resulting clusters are checked by different qualitative evaluations. The method is widely known and has been applied in many countries, mostly because it is relatively easy to use and it is only based on employment data on a region al level. This data is normally easily available.

Experience of functioning of cluster structures suggests that the choice of regions must be made a priori before the clusters can be identified. Although the sizes of the regions can be altered in order to find a best fit, only one choice of regional aggregation can be made before the actual mapping. Some clusters might only be identified at

a small geographic scale, while others require a larger geographic scale to be identified. Therefore, the mapping method has the risk of separating clustering industries into two regions with the result of no clusters are identified in either of the two regions.

To solve the problem of choice of regional sizes (used in the localization quotient method) and get a more flexible way of mapping clusters, research is being done on a new geographical method called the Ripley's K-method [1]. The idea is that the method considers the mapping of clusters as an optimizing problem of distances between companies. No regional choice needs to be made in advance as the method finds the optima l size of each cluster with no predetermined geographical borders. The methodology has a quite technical character. The first step is to plot the geographical locations of all companies in every industry, and then calculate the distances between all companies in each industry.

Thee geographical concentrations of each industry can then be compared to a benchmark distribution, e.g. the distribution of total employment. The comparison reveals whether the given industry has locally over representations and can be considered as globally-oriented [4, 5]. The geographical concentrations are found by optimizing the distances between the companies, that is the sizes of the specialized areas. This solves the problem of pre-defining choices of regional sizes as in the localization quotient method.

Another widely used way of identifying and mapping clusters is the qualitative approach of asking experts with in the field. This can be systemized in different ways through setting up a panel of experts or by sending out questionnaires or inter viewing expert sand central business persons on which clusters or cluster initiatives they see as important in their region or country .

When the clusters are identified, data for the cluster can be collected for further evaluation and analyses. The methodology of asking experts has some obvious issues. With few experts there is a risk of getting a subjective view on the clusters in the area in question. This form of identification is also difficult to standardize and compare across regions and national borders – which is an impediment to benchmarking. Nonetheless, the approach is a good supplement to other identification methods.

A special case of asking experts to identify clusters is the snowball method. One way of getting more information on the cluster transformation process is to use the snowball method. The snowball methodology starts out by asking a panel of experts on which emerging clusters they know of within a given geographical entity. The clusters can be defined around the key driver of innovation of a company such as for example environmental technology, design, or security. This step gives a draft idea about the most important emerging clusters according to the experts.

A "snowball" is then launched among the experts specialized in a given cluster. Here, the experts are asked for important references to key companies and knowledge institutions in the cluster. They are also asked for a reference to an expert who knows more about the cluster [6]. The snowball continues by asking the newly attained expert references about their important references to key companies and knowledge institutions in the cluster and about their relevant expert reference. The snowball stops when no new expert references are revealed. A new snowball is launched among all the companies and knowledge institutions identified in the snowball among the experts. The companies are asked if they recognize themselves in the given cluster, which sub cluster of the main cluster, they think they belong to, and lastly, about their references to other companies and knowledge institutions within the given cluster. Another positive aspect of the method is that the mapping is on a company level and can also include various networks and knowledge institutions.

**Summary.** Summarizing the different methodologies for mapping clusters that we have described in this article, the following lessons can be learned. A widely known method is the localization quotient method which groups global industries into clusters by the use of regional employment data. The method is relatively easy to use and relies only on employment data which is the most available data. On the other hand, however, it has computational limitations and there is only limited experience with applying this method for the purpose of mapping clusters.

A widely used practice when mapping clusters is to make use of the product statistics. Here export data can be used to identify the most interesting global industries and input-output tables and graph analysis can be used to find patterns of clustering among interacting industries. As opposed to using statistical databases for mapping clusters, experts and other central businesspersons can be asked about their knowledge on existing clusters. Not many experiences has been made using this method for mapping cluster, but it has good potential for being a good supplement for other evaluations of cluster formations.

Another advantage is that the mapping is on the level of both companies and knowledge institutions. Going through the different methodologies for mapping clusters, our conclusion is that different methodologies exist for different purposes and different definitions of clusters- no method is perfect. An important aspect is the data availability which must always be taken into consideration when choosing a mapping method.

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