THE ANALYSIS OF INDUSTRIAL BRANCHES IN THE TRENČIN REGION SUITABLE FOR THE CLUSTER CREATION

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Abstract

In recent years in the regions of Slovakia a formation and creation of two types of clusters can be watched: mainly technology and tourism. The only region where any cluster has not been created yet is Trenčín. Despite various forms of support being taken over by the creation of a particular cluster, there are registered a few cluster initiatives in this region. Due to the economic structure, the Trenčín region can be characterized as an industrial region with a long term tradition especially in the automotive, engineering, electrical and electronics, textile, chemical and rubber industry. Regarding the requirements of cluster creation the region has got the necessary social and technical infrastructure and the structure of entrepreneurial basis along with a predominance of the small and medium sized enterprises. The aim of this paper is to determine industries branches suitable for the cluster creation in Trenčín region. The analysis of the predominant industries will be made on the basis of Ellison-Glaeser index of industry concentration. This paper was created within the projects IGS FSEV: Cluster policy in the Slovak republic. Project registration number 1/2014, The impact of EU Commercial and Industry policies on the Slovak Republic's competitiveness enhancement. Project registration number is IGS FSEV 3/2014.

Keywords: region, cluster, industry, branch, index

1.   INTRODUCTION

Nowadays clustering is a very important issue in terms of current EU trade and industrial policies in order to enhance the EU export industries potential within the international economics environment especially with the comparison to the US economy. [1] The topic of industrial clusters in the Slovak Republic in recent year has become the forefront of the professional and the expert public, government and local government as a tool to improve the performance and competitiveness of regions. There were established more than 20 clusters from which around 60% are technology clusters operating in various fields of industry. More detailed analysis is given in [2].

Clusters represent a fundamental organizing framework for understanding local economy in regions and for developing economic performance and competitiveness. Clusters are geographic concentrations of interconnected companies and institutions in a particular field [3], [4], [5]. Policymakers and main representatives of region can contribute to their regions' economic success by knowing the comparative advantages of region and understanding role of industry cluster. To do so, they must go beyond simply conducting regional analyses. They should use the results of the analyses as a starting point for an ongoing dialogue with the firms and other economic and public entities that make up their region's clusters. Such a dialogue can help craft appropriate economic development strategies. Before beginning this process, however, policymakers and representatives of region must understand what clusters are and what they do, and likewise, what they are not and cannot do. The process of region analysis in this way we call the identifying industrial clusters (mapping). [6] The process of industry cluster identification can be done on 3 levels: national level, regional level of branches and micro-level of enterprises.

In definition of cluster overlap the areas of: cooperation and partnerships between firms, agglomeration effects, social capital, and economies of scale, transfer and dissemination of technology, innovation and knowledge management. Into account these areas, combined with effects that clusters bring, we found several definitions in the literature, from which we can derive common characteristics, which clusters are characterized. These are: grouping and geographical proximity of businesses, competence in a particular field and related fields, social relationships between actors in cluster, the informal social mechanisms by which the most successful clusters work [5], [7], [8]. The clusters offer a number of potential benefits beyond economies scales, lower production costs, which lead to innovation and productivity growth. [9] In general the cluster phenomenon is promoted as a tool for restructuring of regional economy, increasing of regional economy performance and improving its competitiveness.

The paper deals with the possibility of identifying potential clusters in Trenčín region in various sectors of the prevailing industry. For identification of potential cluster according to the character of the input data, can be used two approaches: qualitative and quantitative. [10] This paper is contribution to using quantitative methods for finding the opportunities for cluster creation in Trenčín region in field of industry using Ellison and Glaeser index. The objective of paper is twofold. On one hand, the paper conducts an assessment of agglomeration of industry in Trenčín region. On the other hand, the paper has scientific contribution in the way that takes the opportunity to clarify main problems with using the Ellison and Glaeser index in conditions of the SR. The paper builds on both a literature review and original calculation and analysis.

2.   METHODOLOGICAL BASE

Ellison and Glaeser index (EG index - γ) may be used to measure the geographic concentration for industry [11], [12]. EG index is an unbiased statistic of industrial localization [13]. EG index is based on Hirschmann - Herfindahl index (G_i) and Herfindal inex (H_i). The studies with application of EG index show that firms tend to clustering in areas in which an industry is geographically concentrated.

Hirschmann-Herfindahl index (G_i)

This index is referred to as an index of gross concentration [6]. G_i is one of the indices, which quantify the degree of territorial concentration (the distribution of industry/among all regions). Formula of G_i:

$$G_i = \sum_{r=1}^{R} (S_i - X_i)^2 = \sum_{r=1}^{R} \left(\frac{E_{ir^*}}{E^*r^*} - \frac{E^*r^*}{E^{***}} \right)^2 = \sum_{r=1}^{R} \left(\frac{\sum_{p}^{P} E_{irp}}{\sum_{i}^{I} \sum_{p}^{P} E_{irp}} - \frac{\sum_{i}^{I} \sum_{p}^{P} E_{irp}}{\sum_{i}^{I} \sum_{r}^{R} \sum_{p}^{P} E_{irp}} \right)^2 \tag{1}$$

Where: S_i is the share of i branch of industry of employment in the district r, X_i is the region´s share (district) of total employment (region), E_{ir^*} is the regional branch employment, E^*r^* is regional employment, E^{***} is total employment in industry, E_{irp} is number of employed in i - sector, r-th region and p-th enterprise.

G_i index takes value from 0 to 2. If the value of index tends to zero, it means, that industry is equally distributed in region. If the value tends to the value of 2 the industrial branch is territorially concentrated.

Herfindahl index (H_i)

Original formula of H_i speaks about spillover (of capital) in industry due to the technology. In the Slovak Republic there is a problem to obtain data about plants (enterprises) from Statistical office of the Slovak republic (SOSR) due to confidentiality. From this reason in this paper the formula of H_i is used for identification of spillover of labor according to [6]:

$$H_i = \sum_{p=1}^{P} \left(\frac{E_{i*p}}{E_{i**}} \right)^2 = \sum_{p=1}^{P} \left(\sum_{r}^{R} E_{irp} \Big/ \sum_{r}^{R} \sum_{p}^{P} E_{irp} \right)^2 \qquad (2)$$

Where E_{i*p} is sectorial employment of enterprises in district, E_{i**} is sectorial employment of all enterprises in the region.

As a general rule, the Herfindahl index below 0.01 signals low concentration, while a Herfindahl index above 0.18 signals high concentration, the value between 0.01 and 0.18 signals, that the industry is moderately concentrated.

Ellison and Glaeser index of agglomeration EG (γ)

The original formula of Ellison and Glaeser index [11], [12] is:

$$\gamma = \left(\left(G_i - \left[1 - \sum_{r}^{R} (X_i)^2 \right] \cdot H_i \right) \Big/ \left[1 - \sum_{r}^{R} (X_i)^2 \right] \cdot (1 - H_i) \right) \qquad (3)$$

Ellison and Glaeser used for calculation the Herfindahl index H_i of the industry plant size distribution. In conditions of the Slovac Republic for calculation of EG - index we used in formulas (1) and (2) are explained above.

EG - index in absolute value takes maximum value 1. If the value of |γ| > 0.05 the branch of industry is highly agglomerated, if 0.02 < |γ| > 0.05 the branch of industry is moderately agglomerated, if |γ| < 0.02 the branch of industry is randomly dispersed [6].

3. DATA, RESULTS AND DISCUSSION

In the next part of paper is conducted the analysis of spatial concentration of production through Ellison - Glaeser index in selected branches of industry in Trenčín region based on data of employment in **Fig. 1**.
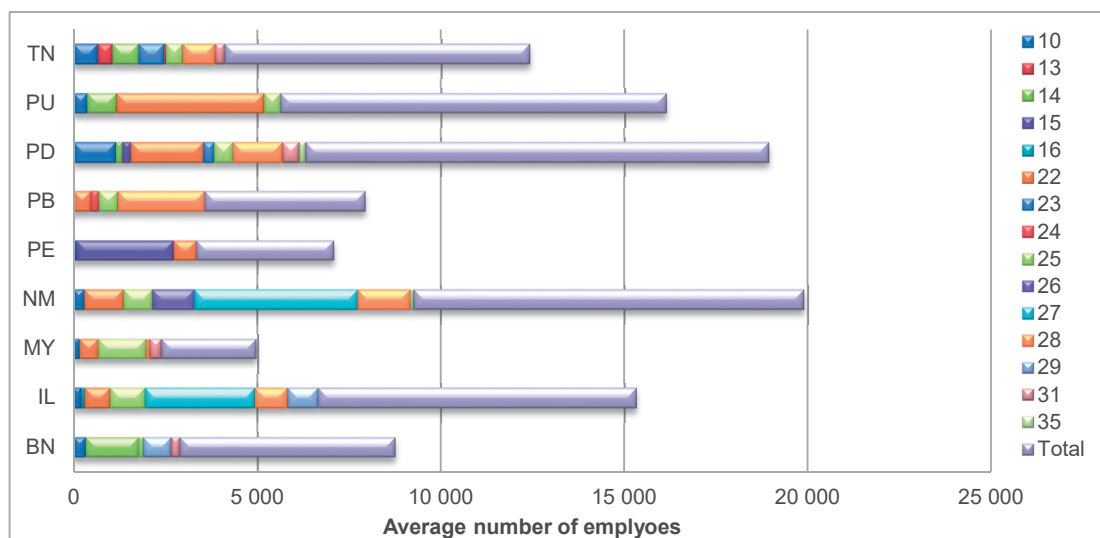

Fig. 1 Average number of employees in districts of Trenčín region [14]

The Trenčín region is divided into 9 districts (Bánovce nad Bebravou - BN, Ilava - IL, Myjava - MY, Nové Mesto nad Váhom - NM, Partizánske - PE, Považská Bystrica - PB, Prievidza - PD, Púchov - PU, Trenčín - TN). Input data on sectoral employment in districts were obtained from the SOSR. Data are for industrial enterprises (areas of Statistical classification of economic activities SK NACE 2) with 20 persons employed or more

registered in the commercial register. The main problem is to monitor the number of enterprises on districts´ level, the data are available only on region level for whole branch of industry. Due to this reason, the analysis is focused only on the level of spatial concentration of production. For Trenčín region there is available data from 22 industrial branches, but not all of them are observed at district level. In view of this fact, there are selected industrial branches for analysis: Manufacture of food products (10), Manufacture of textiles (13), Manufacture of wearing apparel (14), Manufacture of leather (15), Manufacture of wood (16), Manufacture of rubber products (22), Manufacture of other non-metalic mineral products (23), Manufacture of basic metals (24), Manufacture of fabricated metal products (25), Manufacture of computer products (26), Manufacture of electrical equipment (27), Manufacture of machinery and equipment (28), Manufacture of motor vehicles (29), manufacture of furniture (31), Electricity, gas, steam supply (35).

3.1   The application of Ellison and Glaeser index of agglomeration

As first Herfindahl index (H_i) was calculated, which has interval boundaries $0.18 < H_i < 0.01$ and the maximum is 1.00. Median of this index is 0.206, average is 0.224. Moderately concentrated branches of industries are: 29, 16, 23, 35, 24 and 25. Highly concentrated industries according to calculation of this index are the rest of the observed branches of industries (see **Fig. 2**).
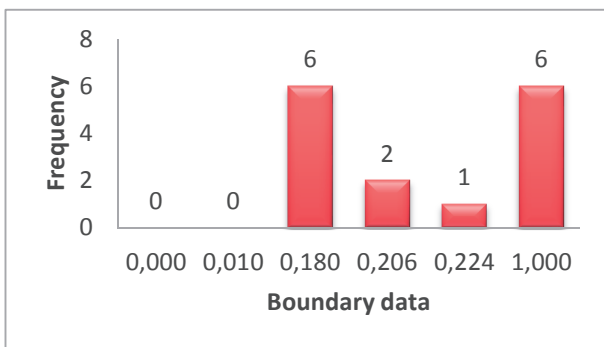
Fig. 2 Histogram of Herfindahl index (Hi) author´s calculation based on [14]
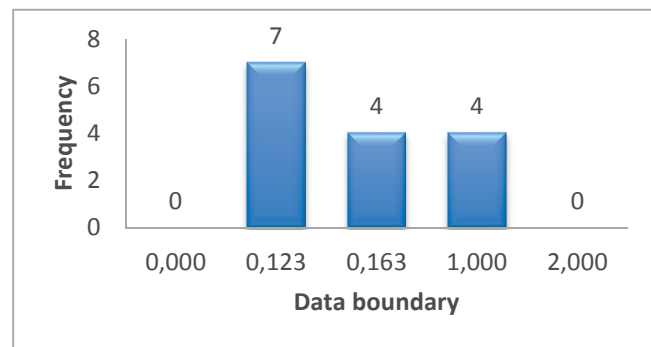
Fig. 3 Histogram of Hirschman - Herfindahl index (Gi) author´s calculation based on [14]

Hirschman - Herfindahl index (G_i) takes the value from 0 to 2. The tendency to zero means that industry is equally distributed in space. Median of this index is 0.120, average is 0.160. From analyzed branches of industry takes value from 0 to 0.123 the branch 10, 26, 23, 29, 31, 14 and 22, the value from 0.123 to 0.163 takes branches: 13, 35, 24, 16. This implies that industry in region is equally distributed (see **Fig. 3**).

Fig. 4 Histogram of γ, author´s calculation based on [14]

Finally, using previous calculations was expressed by the Ellison and Glaeser index (γ). Median of this index is 0.156, average is 0.203. In Trenčín region the industrial branch 24 is completely randomly dispersed and the rest of branches according to the interval boundaries are highly agglomerated (see **Fig. 4**).

Summary of the result of the indexes´ calculation in selected branches of industry are shown in the **Table 1**.

Table 1 The results of Ellison and Glaeser index calculation, author´s calculation based on [14]

Index	10	13	14	15	16	22	23	24	25	26	27	28	29	31	35
Hi	0.20	0.58	0.30	0.36	0.07	0.25	0.08	0.15	0.16	0.34	0.35	0.21	0.02	0.21	0.08
Gi	0.06	0.12	0.11	0.45	0.13	0.12	0.11	0.13	0.27	0.11	0.21	0.27	0.11	0.11	0.12
γ	0.17	1.00	0.24	0.25	0.08	0.16	0.06	0.00	0.18	0.33	0.17	0.13	0.11	0.09	0.07

The results of analysis shows, that in Trenčín region only one branch of industry is randomly dispersed (24), the rest of industrial branches are highly concentrated. According to calculation of Herfindahl index a high concentration is in branches: 10, 13, 14, 15, 22, 26, 27, 28 and 31. The advantage of using EG index is that it realized an analysis of the industry from multiple perspectives. The calculation includes counting of number sub-indicators. The risks of using index in the conditions of the SR are the input data. In this reason the using of EG index is limited and has only partial explanatory character for defining branches of industry suitable for the cluster formation. Therefore, it is necessary to take into account other factors such as: socio-economic structure of region, educational infrastructure, and structure of enterprises, industrial parks and many more. The assessment of these factors is in the next subchapter.

3.2   The assessment of the potential clusters actors

The issue of clustering in Trenčín region was elaborated in: Regional innovation strategy (2005 - 2008), the supplement of the Program of social and economic development in Trenčín region (2007 - 2013), the Sustainable development agenda of CBC in territory of Euroregion Bíle-Biele Karpaty (2014 - 2020). In Trenčín region are recorded cluster initiatives in various field of industry, for example the project between the A. Dubček University of Trenčín and university of T. Baťa in Zlín. The part of this project was the mapping of potential for closer cooperation at institutional and organization level in the form of creative cluster. [15] The *educational infrastructure* consists of 43 specialized secondary schools, 16 vocational secondary schools, 3 universities with 6 faculties. 13123 *enterprises* operate in the region, in areas of industry (14.68%), and manufacturing (13.75%). In terms of size categorization in the region operate mainly SMEs (13039 enterprises from a total of 13123 enterprises in 2012). The largest representation has category of 0 -19 employees (83.59% in 2012). [16] The *significant enterprises* in Trenčín region are from for branch of clothing industry, electrotechnics industry, machinery industry and metal working industry and automotive industry. The advantage for cluster formation may be the existence of an *industrial park* in the region. In Trenčín region, there are 10 industrial parks from the field of electrotechnics, mechanical engineering, electrotechnics and sanitary products. [17] Finally the region has a relatively well developed road infrastructure, in the length of motorways is on the 2nd spot in Slovakia.[18]

CONCLUSSION

The results of the arguments set out in this paper shows that in Trenčín region there are assumptions for the cluster creation in the branches of industry: Manufacture of rubber products (22), Manufacture of fabricated metal products (25), Manufacture of computer products (26), Manufacture of electrical equipment (27), Manufacture of machinery and equipment (28).

For cluster creation other conditions are fulfilled: in the region operate the university with focus specialization on mechanical engineering, automotive and rubber industries, there is a wide variety of secondary vocational schools, corresponding to the cluster needs, there is transport infrastructure available, there is the presence of final producers in the region and their cooperation with universities, availability of labor, foreign investors, significant companies and industrial parks and the industry is one of the sectors in which the most enterprises operate in Trenčín region.

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