

Issues of quantitative assessment of the industry structure of a country's region

Romualdas Ginevičius¹, Andrius Stasiukynas², Dainora Gedvilaitė³, Neringa Slavinskaitė⁴

Abstract. The competitiveness of a country's region is significantly influenced by the structure of the industrial companies operating therein. Review of literature on the issue revealed that the majority of research is focused on a thorough assessment of changes to the said structure. It is an attempt to identify branches of industry the results of which are best for other branches. In other instances it is assessed with respect to exports of the branches, still in other instances the focus is on the economic results of the branches of industry. This allows us to conclude that today there are no methods for the complex quantitative assessment of the industry structure of a country's region. The purpose of this paper is to reveal issues of quantitative assessment of the industry structure of a country's region.

Keywords: competitiveness of a country's region, industry structure of a region, methods of assessment.

JEL: R10, O10, L60.

I. INTRODUCTION

Recently there have been more attempts to analyse the different aspects of regional development: what are the objectives of regional development, what should the strategic planning of regional development look like, what ensures sustainable development, etc. The practical realization of all these aspects of regional development is related to the competitiveness of regions understood as the ability to create favourable conditions for the development of economic activities, satisfaction of the needs of residents (A Study on the Factors of Regional Competitiveness, 2003; Mas-Verdu, Soriano, & Dobon, 2009; Tetsu, 2006; Skyt-Larsen, 2015; Boschma, 2004; Budd & Hirmis, 2004; Simanavičienė, Bruneckienė, & Šimberova, 2007; Rutkauskas, 2008; Snieška, Činčikaitė, Neverauskas, & Clusters, 2002; Bruneckienė & Činčikaitė, 2009; Lall, 2001; Huggins, 2003; Fridman, Rechko, & Pimonov, 2012; Berger & Bristow, 2008; Banytė & Salickaitė, 2008; Glinskienė, Daraškevičiūtė, & Lipinskienė, 2006; Annoni & Dijkstra, 2013; Wokoun, Damborský, Kouřilová, & Krejčová, 2012). In the global context, competitiveness becomes the essential condition for development and even survival. Market growth is the result of regional development as well as the general economic development of a country. Competitiveness transforms into the object of functioning from a condition to functioning, the object of

regional development (Žitkus & Mickevičienė, 2013).

Literature analysing regional competitiveness stresses the significant influence of the competitiveness of companies operating in a region (Gardiner, Martin, & Tyler, 2004; Grebliauskas & Stonys, 2012; Ženka, Novotny., & Csank, 2012; Aiginger, 2006; Camagni & Capello, 2013; Tamošiūnienė & Staskevičiūtė, 2011; Rakauskienė & Tamošiūnienė, 2013; Nicholson, Tsagdis, & Brennan, 2013; Charles & Zegarra, 2014; Bottazzi, Coad, Jacoby, & Secchi, 2011; Schott, 2004). Not surprisingly the shares of import and export of branches of industry are suggested as the main criterion for the assessment of the industry structure of a country or region.

Then as such competitiveness is viewed as the object of regional development, industry plays an important role. In turn the efficiency of activities depends greatly on the structure of companies operating in the region. Therefore we face both a theoretical and practical problem – the assessment of the structure of a region's industry, as only the ability to conduct a quantitative analysis allows the analysis of its changes, their effect on the results of activities, and to determine the direction of further development of the structure, i.e. to purposefully manage this process in order to increase the efficiency of activities.

II. AVAILABLE METHODS OF ASSESSMENT OF INDUSTRY STRUCTURE

Both theoretical sources and real life practice confirm that the economic growth of a country and the level of welfare largely depend on the results of industrial development. This may be the reason why the analysis often focuses on the position of industries in a country or a region. Various aspects of the said position are analysed. One of those important aspects is the structure of an industry of a country or region. It is thought that the results of such analysis helps to identify those branches of industry the achievements of which are best compared to other branches. The identification of significant branches of industry allows the potential of its structure to be assessed. A more detailed analysis of the activities and development of the identified significant branches of industry allows the determination of whether the current industry structure is focused on those activities that would be in demand not only within the country but also externally (Sabonienė, 2010). Such analysis also helps to formulate an advisable

^{1,2,3,4} Romualdas Ginevičius, Andrius Stasiukynas, Dainora Gedvilaitė, Neringa Slavinskaitė are with the Faculty of business management, Department of economics and management of enterprises, Vilnius Gediminas Technical University, 11, Saulėtekio al., Vilnius, Lithuania

economic policy of a country – respectively transforming the structure of an economy and the industry structure.

In order to suggest scientifically-based methods for the quantitative assessment of the industry structure of a region, one has to review the available suggestions. Setting the objectives of analysis of the industry structure is important in solving the analysed issue. The objectives are various: to determine the activities on which the industry of a country (region) is focused; to determine which branches of industry are competitive under the conditions of economic integration; to determine the potential of an industry; and to determine the reasons for structural changes, etc. (Janissen, Thomson, Clark, & Geer, 1998; Brunner & Cali, 2006; Capasso *et al.* 2015; Szirmai *et al.* 2005). Some authors strive to define which aspects reflect industry structure (Carlton & Perloff, 1994; Bradbury & Kodrycki, 2007).

The listed objectives show that a direct objective in conducting a quantitative assessment of the industry structure of a country or region is not set. Instead it is suggested to either determine the most competitive branches of industry or to assess structural changes. Therefore it is advisable to investigate whether the results of such research reflect the actual structure of an industry.

Some of the research is focused on the identification and analysis of factors of industry structure. It is suggested to divide them all into internal and external environmental factors (Fig. 1).

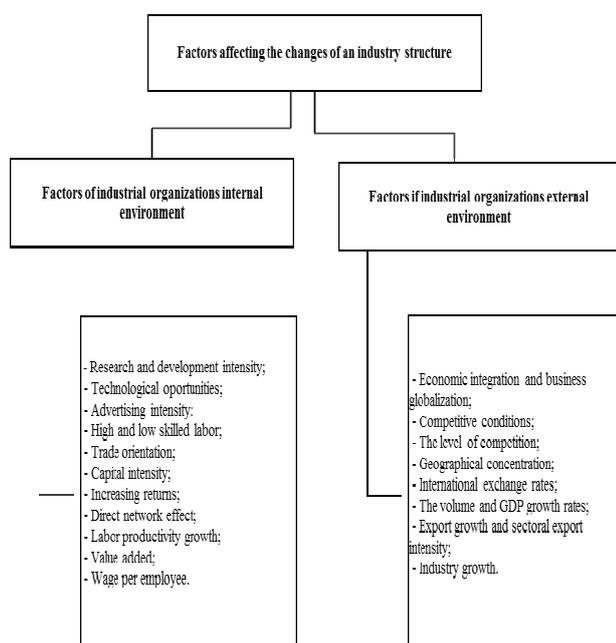


Fig. 1. System of factors affecting industrial structure (Source: Sabonienė, 2010)

As can be seen from Fig. 1, the suggested factors of industry structure are an attempt to enable analysis of structural changes and their reasons. And the structure itself, its make-up, remains untouched. But the said changes and their reasons largely depend on it.

Some other research is focused on a thorough analysis of changes of the industry structure. It is considered that companies operating in a certain branch are greatly affected by the market. Market changes themselves are caused by the following reasons: changes to the level of concentration of companies and consumers, changes to the conditions of entering and exiting the market, growth of diversification of production, integration and diversification of companies (Carlton & Perloff 1994).

Janissen, Thomson, Clark, & Geer (1998) distinguishes two groups of reasons for structural changes (Sabonienė, 2010):

1. Market-related reasons for structural change:

- technological changes (e.g. discoveries in the field of microelectronics, IT and telecommunications, new materials, biological technologies, the use of robot technologies, energy technologies);
- behavioural changes (e.g. changes of income and its distribution, changes in consumption and demand);
- trade and global specialization (e.g. trade and specialization related to the discovery of new export markets, associated with increased competition arising due to imported production);
- discovery and consumption of resources (e.g. development of the use of mineral resources, depreciation of land in certain regions due to erosion and salinity of land).

2. Management-related reasons for structural change:

- liberalization of trade and investment (e.g. one-sided reduced tariffs, non-tariff trade barriers, statutory marketing reforms, multilateral actions to liberalize trade and investment regimes);
- infrastructural and general country administration reforms (e.g. incentives for privatization of public organizations, incentives for liquidation of regulation of entry barriers, incentives for separation of different segments of infrastructure in order to increase competition);
- labour market reforms focused on the better use of market mechanisms to define the level and conditions of wages. Reforms of labour market programs, occupational health and safety legislation;
- competition and other regulatory reforms (e.g. changes to limited trade practices and price management laws, action programs for increasing competition);
- tax reforms (e.g. improvement of the system of income tax, development of the system of corporate tax).

After analysing the reasons for industry structural change and the change itself, suggestions can be provided for the quantitative assessment thereof. One such suggestion is to determine the level of specialization of the trade of a country or region, i. e. production exported by the branches of industry. This is focused on the shares of export and import of goods of certain sectors of industry (Drysdale, 1988; Garnaut, 1989; Anderson, 1995; Balassa, 1965; Chow & Kellman, 1993; Sheehan, 2000; Bernatonytė & Normandienė, 2009; Sabonienė, 2009; Dumčiuvienė, 2001; Snieška & Bruneckienė, 2009; Čučkovic, Jurlin, & Vučkovič, 2013). A specialization index is calculated that allows to assess the level of specialization of a country in exporting the production of a certain branch (or group of

branches) of industry. It is considered that this index is quite reliable for the analysis of the importance of a specific sector of an economy (Sabonienė, 2009). It is not sufficient for industry structure in the context of a country or region. In order to analyse this as a whole, it is difficult to apply the index (Sabonienė, 2010). As an option it has been suggested to assess the level of specialization firstly in all sectors, and then to combine the assessments as one aggregate value. The integrated index was formed to assess the level of all knowledge applied in the manufacturing of the production exported by the manufacturing industry of the country.

To apply this index, the expenditure of every branch of industry on research and development needs to be known, which is established by OECD. Index CI is calculated according to the following formula (Sheehan & Tikhomirova, 1996):

$$CI_i = \frac{\sum_{i=1}^n (X_{ij} I_{ij})}{\sum_{j=1}^n X_{ij} CI_0}, \quad (1)$$

where CI_i – specialization index of industry of country i ; X_{ij} – export of branch of industry j of country i ; I_{ij} – relative ratio of intensity of research and development of

branch of industry j of country i ; $CI_0 = \frac{\sum_{j=1}^n n_{ij} I_{ij}}{n_{ie}}$; n_{ie} – number of manufacturing branches of industry of country i ($i = i, \bar{n}$).

Thus the index shows to what level the export of goods is concentrated in branches that stress research and development.

Another case: assessment of changes of the structure of industry is based on a single system of indices. Here again the CI index is applied, but it is transformed in a way that allows the income of residents of the country to be assessed, depending on the structure of the industry of the country (Tichomirova, 1997).

Five groups of indices covering the most significant aspects of industry have been suggested (Fig. 2):

- Added value per employee.
- Wages per employee.
- Export growth.
- Export intensity of the branch.
- Index of application of research and development.

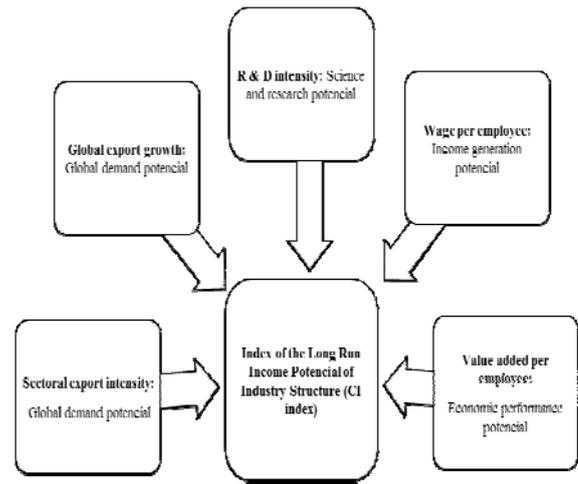


Figure 2. The components of Index of the Long Run Income Potential (Source: Sabonienė, 2010)

The analysis of CI index is based on the assessment of uninterrupted income level that depends on the current structure of the industry. It is also correlated to added value per employee, which is mostly related to the part of added value that can be transferred to an employee in the form of wages as compared to the value received by the owner of capital (Sheehan, 2000).

It is considered that long-term industry structure income potential may be correlated to the rate of growth of the global economy and changes thereto.

The numeric value of the suggested rank covers the overall rank of all components depicted in Fig. 2. Based on this, manufacturing branches are listed in decreasing order according to overall composite rank. In such an instance, industry structure may be assessed based on changes to shares of large sectors of manufacturing industry.

The suggested index is calculated in the following manner (Tikhomirova, 1997):

$$CI_i^T = \frac{\sum_{i=1}^n X_{ij} I_{ij}}{\sum_{j=1}^n X_{ij}}, \quad (2)$$

where - the index of the long-term income potential of country i .

Sabonienė (2010) presents the following method for calculating this index:

$$CI_T^i = \frac{\sum_j^n (X_j^i I_j^i)}{\sum_j^n X_j^i}, \quad (3)$$

where CI – the Index of the Long Term Income Potential of Industry Structure, i – a country, j – the industry, n – the

total number of manufacturing industries, I – the value of the overall composite industry rank, X – exports.

If manufacturing exports were equally divided across industries, then the value of X_j^i may be calculated in the following manner:

$$X_j^i = \frac{X_T^i}{n} = \frac{\sum_j X_j^i}{n}, \quad (4)$$

where X_T^i - total manufacturing exports for country i .

In this case, index CI_T^i is the following:

$$CI_T^i = \frac{\sum_j \left[\left(\frac{\sum_j X_j^i}{n} \right) I_j \right]}{\sum_j X_j^i} = \frac{\sum_j X_j^i \sum_j I_j}{n \sum_j X_j^i} = \frac{\sum_j I_j}{n} = \overline{CI_T} \quad (5)$$

$$\overline{CI_T} = \frac{\sum_j I_T}{n} = \frac{I_T}{n}, \quad (6)$$

where CI_T – the average value of Income Potential; I_T – the sum of the values of overall composite industry rank for all manufacturing industries.

The value of CI_T can be used as a basis for benchmarking the value of the Index of Income Potential:

$$RCI_T^i = \frac{CI_T^i}{\overline{CI_T}} = \frac{\sum_j (X_j^i I_j)}{\left(\sum_j X_j^i \right) \overline{CI_T}}, \quad (7)$$

where RCI – the Rebased Index of Long Term Income Potential of Industry Structure.

III. SUGGESTED APPROACH TO THE QUANTITATIVE ASSESSMENT OF THE INDUSTRY STRUCTURE OF A COUNTRY (REGION)

The conducted analysis of the available methods for the assessment of industry structure allows us to draw the following conclusions, which are important to the improvement of the methods.

The main conclusion is that though all suggestions maintain that industry structure is analysed, the actual analysis covers not the industry structure itself but rather its changes and effect on the results of activities. And these indices are derivative values of the industry structure.

It is difficult to support statements that the potential of industry structure is reflected by changes to its significant branches and values. First of all, the industry structure reflects all branches.

Changes of industry measured both by the level of specialization and single index systems actually reflect the qualitative aspect of branches of a country's industry. Especially since the said groups of indices are focused on the income of residents of a country. While the assessment of industry structure is first and foremost a quantitative assessment, it should not cover the resultant, i.e. the derivative indices of activities, but rather the base parameters on which the resultant indices are based.

Currently available industry indices C_i and CI_i^T are also essentially derivative values of the industry structure of a country reflecting its competitiveness.

Thus we can conclude that we still lack a method for the complex quantitative assessment of the industry structure of a country or region.

IV. CONCLUSIONS

Recently we have seen more attempts to analyse the different aspects of regional development: what are the objectives of regional development, what should the strategic planning of regional development look like, what ensures sustainable development, etc. The reason being that the competitiveness of a region depends on the practical realization of all these aspects of regional development. Competitiveness transforms into the object of functioning from a condition to functioning, the object of regional development.

Then as competitiveness is viewed as the object of regional development, industry plays an important role. Its efficiency depends greatly on the structure and nature of the economic entities operating in the region. Therefore we face both a theoretical and practical problem – the assessment of the industry structure of a region. Conducting this allows the analysis of its changes, their effect on the results of activities, and to determine the direction for further development of structures, etc.

Various aspects of the industry structure of a country or region are analysed. It is thought that such analysis will help identify those branches of industry the achievements

of which are best in comparison to other branches. The identification of significant branches of industry also allows the potential of its structure to be assessed. The main objectives of such analysis besides the aforementioned are: to determine the activities on which the industry of a country (region) are focused; to determine which branches of industry are competitive under the conditions of economic integration; to determine the potential of industry; to determine the reasons for structural changes, etc.

The listed objectives show that a direct objective to conducting a quantitative assessment of the industry structure of a country or region is not set. The goal is to suggest methods of analysis of structural changes and the quantitative assessment thereof. For this purpose, the specialization index is calculated, which allows assessing the level of specialization of a country (region) in exporting production of a certain branch (group of branches) of industry. In essence, the index shows to what degree the export of goods is concentrated in those branches that stress research and development.

A different assessment of changes of industry structure is based on a single system of indices, which actually reflects not industry structure, but the efficiency of its branches. This is proven by the content of groups of indices: added value per employee; wages per employee; export growth; export intensity of branches of industry; and scope of research and development.

The analysis of available methods of assessment of industry structure show that the actual analysis covers not the industry structure itself, but rather its changes and effect on the results of activities. And these indices are derivative values of the structure of industry. Changes of industry measured both by the level of specialization and single index systems actually reflect the qualitative aspect of the industry structure of a country, while qualitative assessment of industry structure should be accompanied by quantitative analysis. Therefore we can maintain that we still lack a method for the complex quantitative assessment of the industry structure of a country or region.

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