

The Macrotheme Review

A multidisciplinary journal of global macro trends

Multicriteria analysis in the strategic management of the regional development. Measuring and assessing a competitiveness of the Polish regions

Jacek Strojny

Department of Economics, Rzeszow University of Technology, Poland

Abstract

The issue of regional development is a very interesting and popular research topic. It is studied both, from the point of view of economic sciences and management. Optimization of the control processes of regional development is as well an important practical problem. This paper fits into this issue. Its aim is to present the possibilities of using multi-criteria analysis mechanisms in the strategic analysis of regions. Pursuing this goal a brief review of the literature was made in the field of regional development theory and concepts of management in public administration. Then the assumptions of the research were presented. The study used two main analytical approaches – AHP (Analytic Hierarchy Process) and benchmarking. The last one is narrowed in the article mainly to the stage of comparative analysis. The studies have measured and assessed the level of competitiveness of Polish regions using two models of competitiveness TCB model and SEEGI model.

Keywords: strategic management, regional development, multicriteria analysis, comparative analysis, Polish regions

1. Introduction

The globalizing economy forces many types of organizations in order to change the perception of the environment and mechanisms of action. This applies not only to commercial entities, but also institutions of public administration responsible for creating the conditions for socioeconomic development. Functioning of the territorial entities and organizations responsible for their development is a very popular research area, both in economic sciences and management sciences. From the economic perspective the attempts are made to identify the different factors that determine the production capacity of the economy (e.g. Aghion, Howitt 1999, Zienkowski 2003, Oguchi 2004, Alfaro et. al. 2009, Tokarski 2010, McMillan, Rodrik 2011). Often the wider context of the economy is examined, referring to the processes of sustainable socioeconomic development (e.g. Pawłowski 2009, Borys 2010, Kronenberg et. al. 2010, Hall et. al. 2010, Szukiełojć-Bieñkuńska 2011, Dempsey et. al. 2011, Kuik, Verbruggen 2012). From the point of view of management, the new ways of optimizing the strategic and operational processes are identified. There are searched management methods that will improve the efficiency and effectiveness of strategic decision-making processes (e.g. Turkis, Zavadskas 2011, Eden,

Ackermann 2013, Triantaphyllou 2013, Trzaskalik 2014). The article assumes both these perspectives, taking into account both the achievements of economics and management science. The focus is on presenting the application of the selected methods supporting strategic decisions to prepare the information addressed to complex problems related to the management of regional development.

The purpose of this article is therefore to provide the use of multicriteria analysis in the study of the competitiveness of Polish regions. The reference was made mainly to strategic management issues and important stage of this process, which is the strategic analysis. Public administration institutions, preparing plans for the impact on development processes, must identify and evaluate the complex social and economic phenomena. Both, the environment of the territorial unit and its features should be taken into account (Karpiński 2002, Szewczuk et. al. 2011, MRD 2012, Dziemianowicz et. al. 2012). Often there have been a need to measure these phenomena and their evaluation in a general (aggregated) way. Multidimensional analysis is an approach that allows to improve the quality of decision-making by providing structured and aggregated information about territorial units (Ginevičius, Podvezko 2009, Podvezko 2009, Ptaszek, Adamus 2012). A study, presented in the article, therefore, has potentially a practical dimension. In its preparation focused also on the possibility of applying the procedure to real strategic management processes. Some kind of limitation of the research process comes from taking this point of view. First, it is assumed that the approach used in the test (techniques, procedures) must be simple and provide detailed information as possible with a relatively low inputs. Secondly, creating research models must take into account limitations of statistical databases, being desirous of ensuring the measurability of the assumed dimensions of the studied area.

The article uses a comparative multicriteria analysis, using two methods – AHP (Analytic Hierarchy Process) (Saaty 1980) and benchmarking (Balm 1992). The first method was used to build two research models to measure and assess the competitiveness of regions – TCB (Tourists-Citizens-Businesses) and SEEGI (Society-Economy-Environment-Government-Infrastructure). Creating them main groups of stakeholders relevant to the region (customers) were taken into consideration (first model). It was assumed that exist markets of mobile capital (Strojny 2012) and touristic (Nawrot, Zmysłony 2009). Regions, in a sense compete in them, trying to get the interest of their offer and run the beneficial flow. This point of view has its foundations already in an exogenous growth models and modern concepts describing the convergence or polarization. Their attractiveness, the regions may build using features of the endogenous potential. Assessment of this potential is the second of the presented models – SEEGI. The first of these models therefore represents a demand point of view on the phenomenon of competitiveness, while the second describes the supply side.

Realizing the objective of the article first the literature was reviewed in two basic ways. The first concerns the economic concepts that make up the theory of regional development. Both growth theories, as well as selected modern concepts of concentration and competitiveness were included here. The second section of the paper presents assumptions of the study. Here referred to the general concept of strategic management, proposed by the author of the article, embedding in it issues presented in this article. Then presented research questions, described the aforementioned models: TCB and SEEGI and applied research procedure. The next section presents results of studies involving both regional competitiveness measurement and assessment of the trends. The article is finalized by the proposals, referred to the results.

2. The issue of regional development in economics and management sciences – a short literature review

Economic point of view of regional development

The concept of the region is defined in different ways. Isolating the region in economic terms should be taken into account that it is “an area delimited on the basis of the entire set of interrelated economic phenomena” (Wróbel 1965, p.19). It can be also said that it is “a composite part of a larger economic and social space, which differs from other surrounding territories in economic, social, demographic, cultural, natural, and infrastructure systems connected to the material and informational relations” (Snieška, Bruneckienė 2009, p. 46). The region consists of many components that “are linked with each other and with the natural environment by relationships of coexistence and interdependence, and connected to the external environment by the relationship of interdependence with high intensity” (Domański 1972, p.7). In the present study, as in many other regional analyzes the concept of the region is understood as the voivodship¹. This subdivision is the region in terms of geographical and administration coverage (Lisiński 2007). It is the “basic unit of structuring and organizing spatial socioeconomic reality of the country” (Czyż 2002, p.5).

Analyzing the situation in the regions, many authors focus on the issues of competitiveness of them. The literature often mentions a competitive region features such as the ability to (Lisiński 2007, p. 101): (1) seize opportunities in an environment, (2) maintain a competitive advantage in terms of overall development processes, (3) build an environment conducive to innovation, (4) create a climate for entrepreneurship. The concepts aimed to assess the level of competitiveness of the region and identify its determinants fit mainly in the theory of regional development. The starting point here can be cost-effective models of economic growth² presented by P.M. Romer (1994) and R.E. Lucas (1988). They adopted the assumption that the ability to generate production in the economic system (e.g. region) resulting from the process of capital accumulation (human and material) and technological potential existing in the area. Both here and in other models, for example by S. Rebelo (1991), Ph. Aghion, P. Howitt (1998), or O. Galor and D.N. Weil (2000), it is assumed endogenous potential impact on the volume of production. Understanding the endogenous potential mostly comes down to factors directly associated with the production process.

The above mentioned, endogenous theories do not fully explain important aspect, which is the process of capital accumulation. This phenomenon is dependent not only on the internal mechanisms (e.g. investments of entities existing in a given territory), but also on external factors. Between regions, there is a movement of capital, both physical (investments) and human

¹ In Polish administrative system stands out the central level (government) and the regional level (voivodship) and local level (districts and municipalities) (Voivodship Act 1998, District Act 1998, Municipality Act 1998)

² The literature assumes the existence of two processes – development (socio-economic) and growth (economic). It is assumed that the first phenomenon is much broader in nature and can be described by a number of different variables, which are not only connected with directly with a process of production (Murzyn 2010, Wilkin, 2011). Economic growth is a phenomenon that is usually reduced to the form of production processes and is described using variables relating just to the effect of the production, for example GDP – Gross Domestic Product (Murzyn 2010, Wilkin 2011).

(migration). Flows from less developed regions to stronger give rise to the phenomenon of divergence, which is growing polarization of regions. In this way developed the metropolitan systems. This process is explained by a number of ideas proposed, e.g. by: F. Perroux (1950), A.O. Hirschman (1958), J. Friedmann (1986) or M. Castells (1996). They point to the development of growth centers, which lead to increased disparities in development between regions. Flows from strong regions to weak, help the latter entering the path of accelerated economic growth. It reduces the development gap to the leading regions. This phenomenon is known as convergence, thus the process, reducing the variation in the level of socioeconomic development (Linnemann et. al. 1965). Trends observed today tend to find that the dominant factor which is the concentration, particularly based on strong processes of development based on metropolises (Gorzalak 2009).

Taking into consideration both, endogenous and exogenous nature of the phenomena associated with the development of the region, the article attempts to define the concept of competitiveness. It can therefore be assumed that the measure of competitiveness are the characteristics of the region. However, it is important the nature of this potential and its suitability to the expectations of those entities which make decisions about the location of their activity in the given territory. Positive assessment leads to positive flows, which increase the ability of the accumulation of capital in the region. The unfavorable evaluation causes a gradual outflow of capital, hindering its accumulation or even reducing the endogenic potential. The competitiveness, therefore, is also the ability to maintain the capital and even increase its accumulation by obtaining the positive flows. In this context, proposed two definitions of the competitiveness:

- Competitiveness of the region is the level of its endogenous potential with respect to the level of endogenous potential in other units. Endogenous potential is constructed by the attributes of society, economy, environment, public administration institutions and infrastructure. The evaluation of these features can cause changes in the location decisions of citizens or companies. It may also affect the willingness to visit the region by tourists (**Definition 1**).
- Competitiveness of the region is its attractiveness, and therefore the ability to attract mobile capital and tourists. If people choose the territory as a place to live and career development, and companies to invest there and develop innovations, it means that the territory is competitive in the market of mobile capital. If tourists want to visit the territory, it means that it is competitive in the tourism market. If these entities choose the given territory, they build a foundation for socioeconomic development, economic growth and improvement of the standard of living (**Definition 2**).

These definitions form the theoretical basis for the models used in the study of regional competitiveness.

Strategic management in public administration

Creating assumptions of the long-term regional policy, analyzes the situation of a territorial unit, identifying its potential for development. Quality of management both at a strategic and operational level can also be regarded as an important factor affecting the level of competitiveness of the region, especially in the dimension of attractiveness for customers. This paper focuses mainly on the dimension of strategic management. Competitive analysis constitutes the basis for this process. The concept of strategic management is often used in the literature. A significant part of the definition suggests a functional interpretation of it. For example, R.

Krupski defines it as “the process of defining and redefining the strategy in response to changes in the environment or overtaking these changes, and even calling them, and coupled with the implementation process, in which the resources and organization skills are so disposed to realize accepted long-term development goals” (2007, p. 97). According to other definitions of strategic management, it involves three basic steps: (a) strategic analysis, (b) planning, (c) implementation (Dess, Miller 1993, Gierszewska, Romanowska, 1997). A slightly more elaborate description of strategic management represent A. Thompson and A. Stickland (1993) indicating the steps comprising: (a) forming a development vision and mission, b) choosing of long-term objectives of the action, c) developing of strategies, d) implementation and execution of the strategy, e) strategic controlling and modifying strategies. These concepts can of course be also analyzed in the context of actions taken by public administration. For the purpose of this study was assumed the following definition of strategic management:

- Strategic management of regional development, is a set of such, purposeful actions, which in the long run lead to meet the needs of key stakeholders (clients). As a result, the strategic management, conduct to increased likelihood of positive flows to the region in the conditions laid down by other internal and external factors. The launched process of capital accumulation effect of increasing the level of endogenous potential, thereby increasing the production capacity and quality of life (**Definition 3**).

In Poland, a statutory obligation of planning rests solely with regions (CM, 2009). Districts and municipalities can shape this process in a voluntary, although it is common to formalize it through strategic documents. Strategic management at different levels of territorial administration creates a kind of system that includes a national level (long-term and medium-term strategy of the country and functional strategies) and local government level (strategies of the region, district and municipality). It is shown in **Figure 1**.

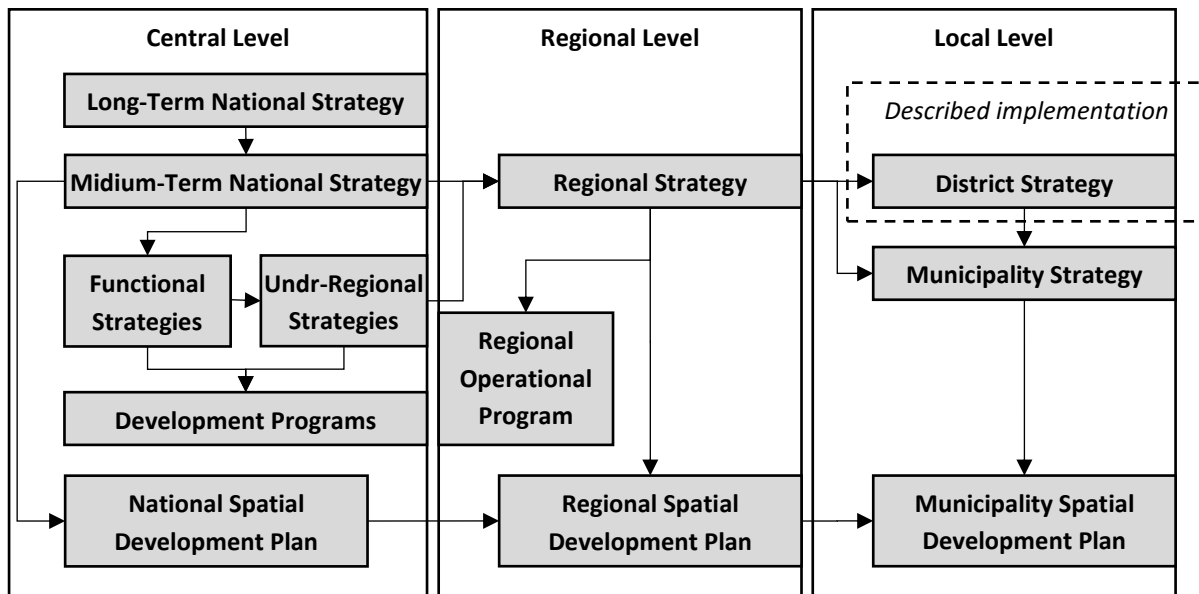


Figure 1. Levels of Strategic Management in Poland

Source: own work based on (CM, 2009).

The main tool supporting the strategic management is the strategy that should be understood as a long-term plan of action. (Mintzberg et. al. 1998). Generally it is a formal document or set of documents, prepared according to the procedure specified. The main strategic document on the level of local government commonly is referred as a strategy for socioeconomic development. Local governments in Poland apply a format of creation and presentation of this document. Generally speaking, action and content can be divided into: (a) the analytical part and (b) the planning part. In the traditional approach in the framework of strategic analysis, the subdivision is characterized by trends determined in selected areas. The comparative analysis, which was used in this paper, is implemented relatively rarely, and examples thereof do not wear signs of a comprehensive approach. Relatively poorly developed is usually a part of the planning. It is commonly the generic formulation of objectives and a lack of focus on priorities. The author suggests here the use of a new scheme of strategic management (STRAM – Strategy for Administration Model) comprising the following steps:

- Step 1. Preparation of decisions (decision-making) – the method of AHP and benchmarking.
- Step 2. Making decisions: the selection of targets (decision-making) – mainly MBO (Management by Objectives) method.
- Step 3. Planning of the implementation of decision (implementation of the decision) – mainly the method PM (Project Management).
- Step 4. Controlling, modification and final control of the implementation of the decision (implementation of the decision) – method PM.

Diagram of the proposed model approach to the strategic management is presented in **Figure 2**.

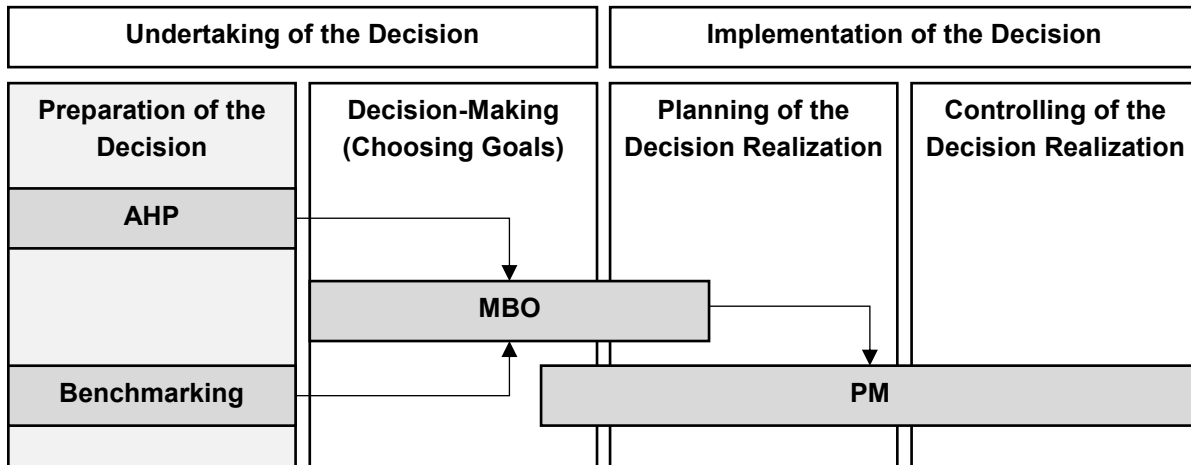


Figure 2. Schemat modelu STRAM.

Source: own work.

Presented in the article analysis of competitiveness refers to the first of the stages of the STRAM model. It covers the process of preparation of the decision. This is very important part of the strategic decision-making process from the practical point of view. The excellence of management in a large part depends on the quality of the information. In the next part of the paper there is presented a procedure of preparing, presenting and interpreting a strategic information of the competitiveness of Polish regions.

3. Assumptions of the research, models of the competitiveness and methodology of investigation

The stated purpose of the article was transformed into research goals (questions). The main research question is as follows:

- GRQ: How is shaping the competitiveness of Polish regions?

This question can be detailed to more specific research issues consisting of the following questions:

- DQ.1. How to measure the competitiveness of regions?
- DQ.2. Which of Polish regions are competitive on the national level and which are not?
- DQ.3. How has the situation changed in investigating regions in a chosen period of time?
- DQ.4. Are there significant differences in the region’s competitiveness measured by indexes resulting models based on various definitions (**Definition 1 and Definition 2**)?
- DQ.5. Does the competitiveness of the regions affects their production capacity?

The answer to the first question (DQ.1) has a methodological character and is presented in this section of the paper. Answers to other questions (DQ.2 – DQ.5), however, refers to the cognitive dimension. They will be presented in the next section describing results of the investigation.

Formulating the answer to the first question, we must consider how to evaluate the competitiveness of regions. This requires a shift from the theoretical level (definitions) to the empirical (measures). For this purpose has been operationalized two definitions of competitiveness presented in above (**Definition 1 and Definition 2**). The AHP method was used here. It was developed by T.L. Saaty in the 70s of the last century (Saaty 1980). It is applied for multi-criteria analysis of preferences, and thus corresponds to the assumptions of this study. In the first place, according to its characteristic scheme of proceedings, hierarchical models of competitiveness were built (Prusak et. al. 2014). The general scheme of such a model is shown in **Figure 3**.

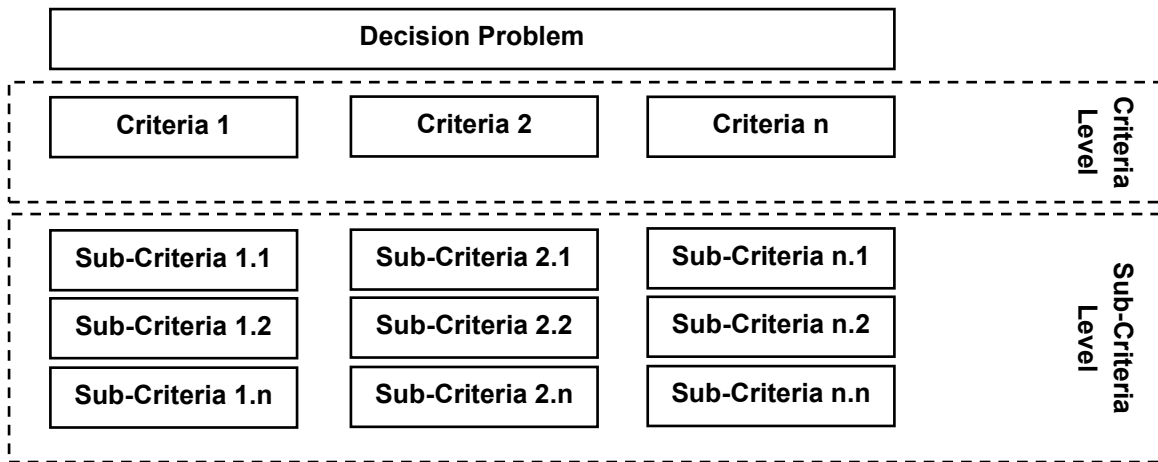


Figure 3. Scheme of AHP Decision-Making Model.

Source: own work based on (Saaty, Forman 1992).

It was assumed that the created models will include three levels of detail:

- Main level. It defines main dimensions of competitiveness: the endogenous potential and attractiveness to customers.
- Criteria level. Here were operationalized the concept of endogenous potential and the concept of attractiveness, referring to Definition 1 and Definition 2. In this way, in each of the models the sub-dimensions were created.
- Sub-criteria level. Here were assigned the statistical variables describing each of the sub-dimensions of endogenic potential and each of the sub-dimensions of the attractiveness. When choosing them, it were taken into account: the availability of official statistics, the length of time series.

The first, constructed model (**Table 1**) refers to the **Definition 1** and describes the endogenous potential of the region (P). There were identified five sub-dimensions of it (P_i). For each of the five sub-dimensions the statistical variables are assigned (P_{ij}). The name of the model – SEEGI (Society-Economy-Environment-Government-Infrastructure) formulated taking into account the names of the identified sub-dimensions.

Table 1. The model of endogenic potential (SEEGI Model).

ENDOGENIC POTENTIAL OF THE REGION (P)			
P_s	Society	P_{s1}	Number of associations, social organizations and foundations to 10 thous. inhabitants
		P_{s2}	Share of the working age population in the total population
		P_{s3}	Share of pre-working age population in the total population
		P_{s4}	Natural increase per 1 thous. inhabitants
		P_{s5}	Average number of medical and dental consultations per capita
P_{ec}	Economy	P_{ec1}	Share of people working in the group of people of working age
		P_{ec2}	Share of unemployed people in a group of people of working age
		P_{ec3}	Gross salary
		P_{ec4}	Gross value of fixed assets of companies on the entity
		P_{ec5}	Total industrial production sold per capita
P_{en}	Environment	P_{en1}	Emission of gas and dust pollutants per km ²
		P_{en2}	Discharge of industrial wastewater per km ²
		P_{en3}	Waste generated in the industry per km ²
		P_{en4}	Share of legally protected area in total area
		P_{en5}	Number of natural monuments on the 100 km ²
P_g	Government	P_g1	Own revenues of local and regional government per capita
		P_g2	Revenue from EU funds of local and regional government per capita
		P_g3	Investment expenditures of local and regional government per capita
		P_g4	Current expenditures on salaries of local and regional government per capita
		P_g5	Expenditures for debt service of local and regional government per capita
P_i	Infrastructure	P_i1	Length of paved local and regional roads per capita
		P_i2	Average share of the population using the media networks in the total population
		P_i3	Number of inhabitants per 1 bed in general hospital
		P_i4	Number of beds in tourist accommodations per 1 thous. inhabitants
		P_i5	Museums including branches per 100 km ²

Source: own work.

The second model (**Table 2**) refers to the **Definition 2** and describes the attractiveness of the region with respect to selected groups of customers (A). Here defined three main groups of clients (A_i) and statistical variables (A_{ij}), which show in the best possible way their interest in the studied

regions. The name of the model – TCB (Tourists-Citizens-Business) formulated taking into account the identified groups of customers

Table 2. The model of attractiveness (TCB Model).

COMPETITIVENESS OF THE REGION (A)			
A_t	Attractiveness in respect to the tourists	A_{t1}	Number of Polish tourists
		A_{t2}	Number of foreign tourists
		A_{t3}	Average duration of the tourist stay
		A_{t4}	Expenditures in gastronomy per capita
A_c	Attractiveness in respect to the citizens	A_{c1}	Net international migration per 100 thous. inhabitants
		A_{c2}	Net inter-voivodships migration per 100 thous. inhabitants
		A_{c3}	Number of occupied housing per 1 thous. inhabitants
		A_{c4}	Number of live births per 1 thous. inhabitants
A_b	Attractiveness in respect to the business	A_{b1}	Investments by private sector per entity
		A_{b2}	Number of commercial companies per 1 thous. inhabitants
		A_{b3}	Number of commercial companies with foreign capital per 1 thous. inhabitants
		A_{b4}	Total expenditures on R&D per entity in economy

Source: own work.

On the basis of models constructed a questionnaire were prepared. It was used to gather judgments of experts regarding the significance of various elements of the endogenous potential and attractiveness from the point of view of development processes in Polish regions. In the study, according to the AHP method, pairwise comparisons were used. At the level of criteria and sub-criteria within a given criterion each element was compared to the others, using a 9-point scale Saaty (Figure 4).

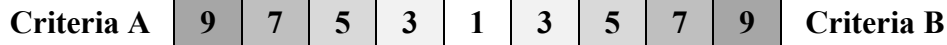


Figure 4. Scheme of Saaty’s scale.

Source: own work based on (Saaty 1990).

On the basis of the comparison obtained local weights of criteria (W_i) and sub-criteria (W_{ij}). **Table 3** shows the results of the analysis for SEEGI model, while **Table 4** – TCB model. They demonstrate the level of significance of individual elements of the models tested.

Table 3. Weights of elements of the endogenic potential (SEEGI Model).

Indexes	P_s	P_{ec}	P_{en}	P_g	P_i	P_{s1}	P_{s2}	P_{s3}	P_{s4}	P_{s5}	P_{ec1}	P_{ec2}	P_{ec3}	P_{ec4}	P_{ec5}
Weights (W_i, W_{ij})	0.21	0.27	0.18	0.18	0.16	0.08	0.38	0.23	0.23	0.08	0.29	0.16	0.11	0.14	0.30
Indexes	P_{en1}	P_{en2}	P_{en3}	P_{en4}	P_{en5}	P_{g1}	P_{g2}	P_{g3}	P_{g4}	P_{g5}	P_{i1}	P_{i2}	P_{i3}	P_{i4}	P_{i5}
Weights (W_i, W_{ij})	0.29	0.28	0.23	0.12	0.08	0.34	0.20	0.23	0.09	0.14	0.28	0.26	0.25	0.12	0.09

Source: own work.

Table 4. Weights of elements of the attractiveness (TCB Model).

Indexes	A_t	A_c	A_b	A_{t1}	A_{t2}	A_{t3}	A_{t4}	A_{c1}	A_{c2}	A_{c3}	A_{c4}	A_{b1}	A_{b2}	A_{b3}	A_{b4}
Weights (W_i, W_{ij})	0.16	0.28	0.56	0.13	0.28	0.30	0.29	0.19	0.16	0.18	0.47	0.10	0.21	0.32	0.37

Source: own work.

Next to building a statistical database, contained variables used in the models SEEGI and TCB and after calculation of weights for all elements of the model started to construct measures of competitiveness. Due to the different units of primary variables (V_{ij}), applied the normalization process, achieving normalized variables (N_{ij}). This paper presents results based on normalization using the zero-unitarisation formula (Walesiak 2014, Jarocka 2015). It allows to bring the value of studied statistical variables in the given region to form $N_{ij} \in \langle 0; 1 \rangle$, taking into account the highest value in the group of regions (V_{ijmax}) and the lowest (V_{ijmin}). Depending on the nature of the variable (stimulant or destimulant) used here respectively **Formula 1** and **Formula 2**.

$$N_{ij} = \frac{V_{ij} - V_{ijmin}}{V_{ijmax} - V_{ijmin}} \quad (1)$$

$$N_{ij} = \frac{V_{ijmax} - V_{ij}}{V_{ijmax} - V_{ijmin}} \quad (2)$$

Standardized variables used to construct the aggregated indexes (I) on the level of criteria of the model (I_i) – that is, P_i and A_i , as well as the general index (I_g) – that is P and A . The first case relates **Formula 3**, and the second – **Formula 4**.

$$I_i = \sum_{j=1}^n V_{ij} \cdot W_{ij} \quad (3)$$

$$I_g = \sum_{i=1}^n I_i \cdot W_i \quad (4)$$

Formulas of normalization, including used in the study zero-unitarization make it possible to reference the situation in one region in relation to the other. Such action has a character of comparative analysis, which is the analytical foundation for benchmarking. This method is nowadays used not only in companies but also in public administration (e.g. Bowerman et. al. 2001, 2002). There was thus obtained measures of competitiveness, which are the answer to the first research question and opens the way to answer the second question (presented in the next section).

The answer to the third question requires the identification of trends in individual measures over time. For this purpose a single-bases indexes (I_s) were prepared. They are calculated for any year (y) in the time series (T_s) relative to the base year (y_0). The examination of trends was conducted for $y_0 = 2009$. The indices construction jednpodstawowych used **Formula 5** (for variables standaryzowane), **Formula 6** (for indexes describing the criteria) and the **Formula 7** (for the main index).

$$I_s(N_i) = \frac{N_i(y_i)}{N(y_0)} \quad (5)$$

$$I_s(I_i) = \frac{I_i(y_i)}{I_i(y_0)} \quad (6)$$

$$I_s(I_g) = \frac{I_g(y_i)}{I_g(y_0)} \quad (7)$$

In response to the fourth and fifth research question was used the correlation analysis based on Pearson's coefficient – $r(x,y)$. This article presents an analysis of the relationships between all the indexes describing the endogenous potential and the attractiveness for the studied group of regions. A study was conducted for the last year in the time series ($y=2013$) and for the average value of the entire time series $T_s \in \langle y=2009; y=2013 \rangle$. Answering the fourth question there were analyzed associations between indexes of competitiveness (endogenous potential and attractiveness) and indexes describing the productivity of the regions – *GDP* (Gross Domestic

Product) and GDP_{pc} (Gross Domestic Product per capita). Here, the analysis was also done for the last year in the series and for the average of the time series.

The procedure described above was applied to obtain the results shown in the next section of the article. Description of effects achieved is also an attempt to answer research questions from DQ.2 to DQ.4.

4. Research results – the comparative analysis of competitiveness of Polish regions

Analysis of competitiveness of Polish regions takes into consideration the two dimensions, mentioned in the previous section – endogenous potential and attractiveness to customers. Presentation of the results, due to the limited size of the paper, was limited to general indexes and indexes on the level of criteria. These are shown in **Table 5**. On the basis of it responded to the second research question.

Table 5. Indexes of competitiveness of Polish regions in 2013.

Nr	Region	Indexes of the competitiveness									
		Indexes of endogenic potential (P, P_i)						Indexes of attractiveness (A, A_i)			
		P	P_s	P_{ec}	P_{en}	P_g	P_i	A	A_t	A_c	A_b
1	ŁÓDZKIE	0.40	0.16	0.38	0.64	0.46	0.45	0.31	0.11	0.53	0.26
2	MAZOWIECKIE	0.62	0.49	0.94	0.60	0.51	0.41	0.94	0.69	0.97	1.00
3	MAŁOPOLSKIE	0.51	0.63	0.37	0.77	0.41	0.41	0.49	0.59	0.74	0.34
4	ŚLĄSKIE	0.54	0.43	0.76	0.28	0.59	0.55	0.33	0.25	0.50	0.27
5	LUBELSKIE	0.39	0.41	0.11	0.77	0.36	0.45	0.21	0.08	0.45	0.13
6	PODKARPACKIE	0.49	0.69	0.17	0.84	0.45	0.44	0.33	0.15	0.48	0.31
7	PODLASKIE	0.44	0.51	0.13	0.85	0.46	0.43	0.19	0.07	0.43	0.11
8	ŚWIĘTOKRZYSKIE	0.32	0.28	0.09	0.53	0.40	0.46	0.13	0.13	0.31	0.04
9	LUBUSKIE	0.48	0.71	0.25	0.86	0.33	0.32	0.28	0.08	0.55	0.20
10	WIELKOPOLSKIE	0.55	0.67	0.59	0.68	0.43	0.34	0.40	0.15	0.78	0.28
11	ZACHODNIOPOMORSKIE	0.48	0.66	0.14	0.64	0.51	0.63	0.34	0.55	0.51	0.20
12	DOLNOŚLĄSKIE	0.57	0.52	0.53	0.64	0.66	0.52	0.44	0.50	0.51	0.39
13	OPOLSKIE	0.42	0.52	0.26	0.70	0.28	0.41	0.10	0.05	0.13	0.11
14	KUJAWSKO-POMORSKIE	0.48	0.59	0.21	0.83	0.51	0.38	0.24	0.24	0.54	0.10
15	POMORSKIE	0.55	0.71	0.41	0.85	0.51	0.31	0.47	0.37	0.81	0.33
16	WARMIŃSKO-MAZURSKIE	0.49	0.82	0.04	0.90	0.44	0.41	0.19	0.16	0.47	0.05

Source: own work.

Among the Polish regions, MAZOWIECKIE has the highest endogenous potential. It is also the most attractive for customers. It is a region, where develops the largest metropolitan area in the country, including the capital city (Warsaw) and the surroundings. It is the growth center of supra-regional influence, especially draining regions of Eastern Poland (LUBELSKIE, PODLASKIE and even PODKARPACKIE). The other regions with a quite high level of competitiveness are: MAŁOPOLSKIE, POMORSKIE and DOLNOŚLĄSKIE. The weakest regions are ŚWIĘTOKRZYSKIE and OPOLSKIE. It is worth noting that the analysis using indexes of endogenous potential shows less variation of competitiveness, than in the case of the attractiveness. In 2013 $P_{max} - P_{min} = 0.30$, while $A_{max} - A_{min} = 0.84$. In the case of endogenous potential the biggest difference concerns the economic potential (P_{ec}): $P_{ecmax} - P_{ecmin} = 0.90$. Whereas, differences in attractiveness to customers are significant in every market – the largest is in the market of companies (A_b), while the smallest on the tourism market (A_t)

The competitive position of regions in 2013, due to the trends in individual elements of the model. The article presents an investigation of trends since 2009 to 2013. For this purpose a single-base indices were used. They are presented in **Table 6**. On this basis, answered the third research question.

Table 6. Single-based indexes for indexes of competitiveness of Polish regions in 2013 with respect to 2009.

Nr	Region	Single based indexes for indexes of the competitiveness									
		Single based indexes for indexes of endogenic potential (P, P_i)						Single based indexes for indexes of attractiveness (A, A_i)			
		$I_s(P)$	$I_s(P_s)$	$I_s(P_{ec})$	$I_s(P_{en})$	$I_s(P_g)$	$I_s(P_i)$	$I_s(A)$	$I_s(A_t)$	$I_s(A_c)$	$I_s(A_b)$
1	ŁÓDZKIE	0.93	0.61	1.02	0.95	0.92	1.01	0.92	0.82	0.93	0.91
2	MAZOWIECKIE	1.02	1.00	0.98	1.03	1.06	1.15	1.03	0.99	1.12	1.00
3	MAŁOPOLSKIE	1.06	1.12	0.99	1.01	1.24	0.99	1.04	1.01	1.06	1.04
4	ŚLĄSKIE	1.01	0.88	0.96	1.01	1.30	1.00	0.91	0.89	1.02	0.84
5	LUBELSKIE	1.13	1.07	1.02	1.00	2.16	1.05	0.86	0.81	0.93	0.78
6	PODKARPACKIE	1.14	1.18	1.07	1.01	1.46	1.11	1.48	0.98	1.08	2.30
7	PODLASKIE	1.00	1.29	0.90	1.00	0.87	0.91	1.02	0.97	0.93	1.26
8	ŚWIĘTOKRZYSKIE	0.94	0.90	0.97	1.00	0.86	1.00	0.62	1.14	0.79	0.27
9	LUBUSKIE	0.92	0.92	1.20	1.01	0.61	0.89	0.80	0.57	0.85	0.78
10	WIELKOPOLSKIE	0.96	0.94	1.06	1.04	0.92	0.76	0.90	0.76	1.07	0.76
11	ZACHODNIOPOMORSKIE	1.01	0.91	1.06	1.02	1.22	0.99	0.88	0.94	0.90	0.81
12	DOLNOŚLĄSKIE	1.07	0.91	1.06	1.05	1.39	1.05	0.97	1.07	0.88	1.01
13	OPOLSKIE	1.01	1.01	1.02	1.06	0.76	1.23	0.74	0.62	1.06	0.64
14	KUJAWSKO-POMORSKIE	1.10	0.95	0.97	1.00	2.05	1.09	0.70	0.98	0.92	0.37
15	POMORSKIE	1.01	0.94	1.01	1.01	1.15	0.97	0.93	1.02	0.95	0.89
16	WARMIŃSKO-MAZURSKIE	1.08	1.04	0.82	1.00	1.51	1.10	0.70	0.82	0.78	0.42

Source: own work.

Dynamics of changes in different regions are significantly different. In terms of changes in the endogenous potential, the highest growth rate in 2009-2013 was recorded in PODKARPACKIE ($I_s(P)=1.14$). Other regions of so-called Eastern Poland also have a good dynamics of improving competitiveness. These are for example: LUBELSKIE ($I_s(P)=1.13$), WARMIŃSKO-MAZURSKIE ($I_s(P)=1.08$). These regions, mainly improved the efficiency of activity of local governments and potential of society as well. In the latter dimension, analyzing trends in demographics, it can be expected a significant reduction of growth in the coming years. The potential of some regions has declined during the period considered (2009-2013). This is mostly visible in: LUBUSKIE ($I_s(P)=0.92$), ŁÓDZKIE ($I_s(P)=0.93$) and ŚWIĘTOKRZYSKIE ($I_s(P)=0.94$).

When it comes to improving the attractiveness to customers, PODKARPACKIE also have the highest dynamic in Poland ($I_s(A)=1.48$). No other region has improved so significantly its competitive position. It is worth noting that PODKARPACKIE stands out mainly in the market of companies. Evidence of this dynamic at the level of the index A_b ($I_s(A_b)=2.30$). This situation in said region is due primarily to: high growth in corporate investments, foreign investments, and increases in expenditures on R&D. The fastest its attractiveness loses ŚWIĘTOKRZYSKIE ($I_s(A)=0.62$). Here the situation is reversed than in PODKARPACKIE, because the biggest decrease concerns the market of companies ($I_s(A_b)=0.27$).

The answer to the fourth question is very interesting both from a cognitive and methodological point of view. This article presents two views on the phenomenon of competitiveness. The first, concerning the potential of endogenous (SEEGI model) represents the supply side, which is measured by what the region has to offer. Second, regarding the attractiveness in selected markets (relative to selected groups of customers) measures the demand side, it means how customers locate their activities in the area of the given region. It is therefore very interesting to compare how these two dimensions are interrelated. Answer attempted obtained by using a simple tool in the form of the Pearson coefficient. **Table 7** contains the measurements on the level of the indexes of competitiveness. Compared here all indexes constructed for the endogenous potential and for the attractiveness. Measurements were done for the last year of the analysis (2013) and the arithmetic mean of indexes in the time series $T_s \in \langle y=2009; y=2013 \rangle$.

Table 7. Correlation between the indexes of endogenous potential and attractiveness to customers (coefficient r-Pearson).

		Indexes of endogenic potential					P_i
		P	P_s	P_{ec}	P_{en}	P_g	
Indexes of attractiveness	2013						
	A	0.78*	0.08***	0.78*	-0.17***	0.43*	-0.08***
	A_t	0.65*	0.16***	0.52*	-0.21***	0.55*	0.28***
	A_c	0.74*	0.25***	0.63*	0.05***	0.36**	-0.34**
	A_b	0.72*	-0.03***	0.81*	-0.23***	0.36**	-0.05***
	T_s						
	A	0.78*	0.11***	0.78*	-0.16***	0.50*	-0.12***
	A_t	0.65*	0.19***	0.55*	-0.23**	0.54*	0.24***
	A_c	0.76*	0.30***	0.58*	0.10***	0.47*	-0.28***
	A_b	0.72*	-0.02***	0.82*	-0.24***	0.43*	-0.13***
	*p=0.05, **p=0.10, ***nieistotne statystycznie						

Source: own work.

The results of the correlation indicate that there is a clear relationship between economic potential (P_{ec}) and the attractiveness in respect to companies (A_b). The Pearson's coefficient $r_{2013}(P_{ec}, A_b) = 0.81$. A similar strength has been observed at the level of the main indexes $r_{2013}(P, A) = 0.78$. With all the attractiveness indexes clearly correlate P and P_{ec} and poorly P_g . However, from indexes P_s , P_{en} and P_i there is no statistically significant correlation. There are also no significant differences between correlations counted for 2013, or the average in the time series T_s .

Recent research question also concerned the relationships between variables. This time, however, the indexes of competitiveness confronted with data on the production potential of regions. Used here the most common indexes, which are GDP and GDP per capita. The analysis was performed for variables in 2013 and for the time series T_s . Results are shown in **Table 8**.

Table 8. Correlation between the indexes of competitiveness and indexes of production (coefficient r-Pearson).

		Indexes of endogenic potential					Indexes of attractiveness				
		<i>P</i>	<i>P_s</i>	<i>P_{ec}</i>	<i>P_{en}</i>	<i>P_g</i>	<i>P_i</i>	<i>A</i>	<i>A_t</i>	<i>A_c</i>	<i>A_b</i>
Indexes of production	2013										
	GDP	0.71*	-0.15**	0.93*	-0.50*	0.48*	0.05**	0.88*	0.65*	0.71*	0.90*
	GDP_p	0.74*	-0.12**	0.93*	-0.44*	0.49*	-0.01**	0.89*	0.66*	0.69*	0.91*
	c										
	<i>T_s</i>										
	GDP	0.71*	-0.13**	0.94*	-0.50*	0.48*	0.05** *	0.88*	0.66*	0.66*	0.91*
GDP_p	0.76*	-0.06**	0.92*	-0.45*	0.59*	-0.01**	0.89*	0.68*	0.65*	0.93*	
c											
*p=0.05, **nieistotne statystycznie											

Source: own work.

Both models explain the phenomenon of production. At a general level (indexes *P* and *A*) r-Pearson coefficient is quite high or high. The highest $-r(x,y) > 0.9$ was observed in the relations between production indexes and indexes related to the economy (*P_{ec}*) and attractiveness for business (*A_b*). Clearly, these results are not surprising, as the negative correlation between the indexes of the production and potential of the environment. Factor values are not very high, but indicate a serious and real dilemma that concerns the development of each region. With the development of economic potential and infrastructure inevitably grows anthropopressure on the environment.

5. Conclusions

The article presents an attempt to analyze the competitiveness of Polish regions using the method of AHP and benchmarking. Results obtained allowed to formulate answers to all questions formulated in the taken research issues. Below, there is a brief conclusion from the resulting outcomes of the study.

- DQ.1. How to measure the competitiveness of regions?

In the study suggested measures of competitiveness with regard to two of its dimensions – a supply potential (endogenous) and the demand (attractiveness to customers). Such an approach seems reasonable and correct. Between the main indexes, constructed on the basis of both models, there is a clear relationship. At the same time both models describe different dimensions of reality and provide an interesting strategic information. It is worth noting that the proposed procedure for measuring competitiveness is relatively simple and can be applied in practice with relatively little outlays.

- DQ.2. Which of Polish regions are competitive on the national level and which are not?

The results of measurement coincide with the results of many studies conducted within Polish regions. It should be noted, however, that the differences between regions are much more relevant regarding to attractiveness. Here MAZOWIECKIE obtains a permanent and significant advantage over other Polish regions. More developed regions, like MAŁOPOLSKIE, POMORSKIE, DOLNOŚLĄSKIE or WIELKOPOLSKIE have a much lower attractiveness.

MAZOWIECKIE dominance over the other can be seen especially in terms of attractiveness for business. Model of endogenous potential gives a much more sustainable results, due to the differences in the dimensions included there. In this model, economically weaker regions are gaining in other dimensions, e.g. the environment. That's why they may gain a better evaluation.

– DQ.3. How has the situation changed in investigating regions in a chosen period of time? Interesting in terms of cognitive is also an analysis of changes over time. The study assumed short time series covering the period 2009-2013. This is an interesting time because of the dynamic situation in both economic and political dimensions, especially on a global scale. In the analyzed period, the biggest progress has been made in PODKARPACKIE. The region has significantly increased its attractiveness, especially in the market of companies. Its potential in relation to regions where are large agglomerations is still low. However, the dynamics of positive changes in recent years are very high. This applies also to the improvement of endogenous potential. Strategic actions, not only at the regional level, but also locally led to the creation of good conditions for business development, especially for industries of high technology.

– DQ.4. Are there significant differences in the region's competitiveness measured by indexes resulting models based on various definitions (**Definition 1 and Definition 2**)? Both models describe different dimensions of reality of regions and that is their role. At a general level they are interrelated. In contrast, it is worth noting that some elements of the endogenous potential do not translate into attractiveness. Interestingly, the attractiveness of the tourism market is associated more with economic potential than the clean environment. This is an observation that should be translated into a way of defining strategic objectives, particularly in regions with a high potential for the environment.

– DQ.5. Does the competitiveness of the regions affects their production capacity? The production capacity of the region is associated with both the endogenous potential and attractiveness, particularly in areas directly related to the economy. We can also see a negative impact on the environment productivity. This last aspect must be taken seriously into consideration, especially in the phase of formulating strategic objectives. It should be borne in mind that industrial development will block the implementation of environmental goals, which is extremely important for regions with high potential of the environment, e.g. WARMIŃSKO-MAZURSKIE or LUBUSKIE.

Literature

- Aghion Ph., Howitt P. (1999), *Endogenous Growth Theory*, London: MIT Press,.
- Aghion Ph., Howitt P.W. (1998), *The Endogenous Growth Theory*, Cambridge: MIT Press.
- Alfaro, L., Kalemli-Ozcan S., Sayek S. (2009), FDI, productivity and financial development, *The World Economy* 32(1), 111-135.
- Balm, G.J., (1992), *Benchmarking. A practitioner's Guide for Becoming and Staying Best of the Best*, Schaumburg: QPMA Press
- Borys, T. (2010), Dekada edukacji dla zrównoważonego rozwoju-polskie wyzwania, *Problemy Ekorozwoju: studia filozoficzno-socjologiczne*, 5, 59-70.
- Bowerman, M., Ball, A., Francis, G., (2001). Benchmarking as a tool for the modernization of local government. *Financial Accountability & Management*, 17(4), 321-329.
- Bowerman, M., Francis, G., Ball, A., Fry, J. (2002), The evolution of benchmarking in UK local authorities, *Benchmarking: An International Journal*, 9(5), 429-449.
- Castells M. (1996), *The Rise of Network Society*, Oxford: Blackwell Publishers,.

- CM (Council of Ministry) (2009), *Założenia Systemu Zarządzania Rozwojem*, Warszawa: Rada Ministrów.
- Dempsey, N., Bramley, G., Power, S., & Brown, C. (2011), The social dimension of sustainable development: Defining urban social sustainability, *Sustainable development*, 19(5), 289-300.
- Dess, G. and Miller, A. (1993), *Strategic Management*, New York: McGraw-Hill.
- District Act (1998), Warsaw: Parliament.
- Domański R., *Kształowanie otwartych regionów ekonomicznych*, PWE, 1972
- Dziemianowicz, W., Szmigiel-Rawska, K., Nowicka, P., Dąbrowska, A. (2012). *Planowanie strategiczne. Poradnik dla pracowników administracji publicznej*, Warszawa: Ministry of Regional Development.
- Eden, C., & Ackermann, F. (2013). *Making strategy: The journey of strategic management*. Sage.
- Friedmann J. (1986), The world city hypothesis, *Development and change*, 17(1), 69-83.
- Galor O., Weil D.N. (2000), Population, Technology and Growth, *American Economic Review*, 90(4), 806-828.
- Gierszewska, G. and Romanowska, M., 1997. *Analiza strategiczna przedsiębiorstwa*, Warsaw: Polskie Wydawnictwo Ekonomiczne.
- Ginevičius, R., & Podvezko, V. (2009), Evaluating the changes in economic and social development of Lithuanian counties by multiple criteria methods. *Technological and Economic Development of Economy*, (3), 418-436.
- Gorzela, G. (2009), Fakty i mity rozwoju regionalnego, *Studia regionalne i lokalne*, 36(2), 5-27.
- Hall, J. K., Daneke, G. A., & Lenox, M. J. (2010), Sustainable development and entrepreneurship: Past contributions and future directions, *Journal of Business Venturing*, 25(5), 439-448.
- Hirschman A.O. (1958), *The strategy of economic development*, Vol. 58., New Haven: Yale University Press.
- Jarocka, M. (2015), Wybór formuły normalizacyjnej w analizie porównawczej obiektów wielocechowych. *Economics and Management*, 1/2015, 113-126.
- Karpiński A. (2002), *Jak tworzyć długookresową strategię dla kraju i regionu*, Warszawa: Komitet Prognoz Polska 2000 plus.
- Kronenberg, J., Bergier, T., & Sendzimira, F. (2010), *Wyzwania zrównoważonego rozwoju w Polsce*. Wrocław: Fundacja Sendzimira.
- Krupski, R. (2007), *Zarządzanie strategiczne. Koncepcje – metody*, Wrocław: Akademia Ekonomiczna we Wrocławiu.
- Kuik, O. J., & Verbruggen, H. (Eds.) (2012), *In search of indicators of sustainable development* (Vol. 1). Springer Science & Business Media.
- Linnemann H., Pronk J.P., Tinbergen J. (1965), *Convergence of economic systems in East and West*, Rotterdam: Netherlands Economic Institute.
- Lisiński M. (Ed.) (2007), *Słownik podstawowych terminów samorządu terytorialnego*, Dąbrowa Górnicza: Wyższa Szkoła Biznesu w Dąbrowie Górniczej.
- Lucas R.E. (1988), On the Mechanics of Economic Development, *Journal of Monetary Economics*, 22, 3–42.
- McMillan M.S., Rodrik D. (2011) *Globalization, structural change and productivity growth*, No. w17143. National Bureau of Economic Research.
- Mintzberg, H., Quinn, J.B., Ghoshal, S. (1998), *The Strategy Process*. London: Prentice Hall.
- MRD (Ministry of Regional Development). (2012). *Zarządzanie strategiczne rozwojem*. Warszawa: Ministerstwo Rozwoju Regionalnego. Departament Koordynacji Polityki Strukturalnej.
- Municipality Act (1990), Warsaw: Parliament.
- Murzyn, D. (2010), *Polityka spójności Unii Europejskiej a proces zmniejszania dysproporcji w rozwoju gospodarczym Polski*. Wydawnictwo CH Beck.
- Nawrot, Ł., & Zmysłony, P. (2009). *Międzynarodowa konkurencyjność regionu turystycznego. Od programowania rozwoju do zarządzania strategicznego*, Kraków: Proksenia.
- Oguchi N. (Ed.) (2004), *Total Factor Productivity Growth*, Tokyo: Asian Productivity Organization.

- Pawłowski, A. (2009). Teoretyczne uwarunkowania rozwoju zrównoważonego. *Rocznik Ochrona Środowiska*, (11), 985-994.
- Perroux F. (1950), Economic space: theory and applications, *The Quarterly Journal of Economics*, 89-104.
- Podvezko, V. (2009). Application of AHP technique. *Journal of Business Economics and Management*, (2), 181-189.
- Prusak A., Strojny J., Stefanów P. (2014), Analityczny Proces Hierarchiczny (AHP) na skróty – kluczowe pojęcia i literatura, *Humanities and Social Sciences*, 4/2014, p. 179-192.
- Ptaszek, P., & Adamus, W. (2012), Modele rozwoju gmin w ujęciu wielokryterialnego procesu decyzyjnego. *Studia Regionalne i Lokalne*, 49(3), 85-106.
- Rebelo S. (1991), Long-Run Policy Analysis and Long-Run Growth, *Journal of Political Economy*, 99, 500-521.
- Romer P.M. (1994), The Origins of Endogenous Growth, *Journal of Economic Perspectives*, 8, 3–22.
- Saaty T.L. (1990), How to make a decision: the analytic hierarchy process, *European Journal of Operational Research*, 48(1), 9-26.
- Saaty, T.L. (1980), *The Analytic Hierarchy Process*, New York: McGraw-Hill.
- Saaty, T.L., Forman, E.H., (1992), *The Hierarchon: A Dictionary of Hierarchies*. Pittsburgh: RWS Publications.
- Snieška V., Bruneckienė J. (2009), Measurement of Lithuanian regions by regional competitiveness index, *Inžinerine Ekonomika–Engineering Economics*, 61(1), 45-57.
- Szewczuk, A., Kogut, M., & Ziolo, M. (2011), *Rozwój lokalny i regionalny. Teoria i praktyka*, Warszawa: Wydawnictwo CH Beck.
- Szukielójć-Bieńkuńska, A. (2011), Statystyczny pomiar postępu społeczno-gospodarczego w zmieniającym się świecie, *Wiadomości Statystyczne*, (7-8), 9-29.
- Thompson, A., Strickland, A. (1993), *Strategic Management. Concepts and Cases*. Burr Ridge: IRWIN.
- Tokarski, T. (2010), Przestrzenne zróżnicowanie łącznej produktywności czynników produkcji w Polsce, *Gospodarka Narodowa*, 3, 23-38.
- Triantaphyllou, E. (2013). *Multi-criteria decision making methods: a comparative study* (Vol. 44), Springer Science & Business Media.
- Trzaskalik T. (2014), Wielokryterialne wspomaganie decyzji. Przegląd metod i zastosowań, *Zeszyty Naukowe Politechniki Śląskiej, OIz 74*, 239-263
- Turskis, Z., & Zavadskas, E. K. (2011), Multiple criteria decision making (MCDM) methods in economics: an overview. *Technological and economic development of economy*, (2), 397-427.
- Voivodship Act (1998), Warsaw: Parliament.
- Walesiak, M. (2014). Przegląd formuł normalizacji wartości zmiennych oraz ich własności w statystycznej analizie wielowymiarowej, *Przegląd Statystyczny*, 4/2014, 363-372.
- Wilkin, J. (2011), Wielofunkcyjność wsi i rolnictwa a rozwój zrównoważony, *Wieś i rolnictwo*, (4 (153), 27-39.
- Wróbel A. (1965), *Pojęcie regionu ekonomicznego a teoria geografii*, Warszawa: PWN.
- Zienkowski L. (Ed.) (2003), *Wiedza a wzrost gospodarczy*, Warszawa: Wydawnictwo Naukowe SCHOLAR.