OLSZTYN ECONOMIC JOURNAL
Abbrev.: Olszt. Econ. J., 2013, 8(2)

QUALITY OF LOCATION IN REGIONS AND ECONOMIC EFFICIENCY OF PRIVATE COMPANIES IN POLAND*

Wioletta Wierzbicka

Department of Macroeconomics
University of Warmia and Mazury in Olsztyn

K e y w o r d s: economic efficiency, regional diversification, location quality, "soft" and "hard" location factors.

A b s t r a c t

Evaluation of the correlation between the economic efficiency level of private companies in Poland and the quality of location in the regions was the aim of the study. Based on the conducted analyses it was established that the level of sales markets absorptiveness shows the strongest correlation with the level of economic efficiency of the companies surveyed. The majority of regions characterised by absorptive sales markets also recorded good results in economic efficiency of companies located there while voivodships with low internal demand were characterised by definitely lower efficiency. Increasingly strong correlation was also recorded between the economic efficiency level of the companies surveyed and the level of knowledge in the regions. This may be the signal that currently the location factors of "soft" nature present increasing influence on the efficiency of companies and it is not impossible that their importance will continue increasing.

JAKOŚĆ LOKALIZACJI W REGIONACH A EFEKTYWNOŚĆ EKONOMICZNA PRZEDSIĘBIORSTW PRYWATNYCH W POLSCE

Wioletta Wierzbicka

Katedra Makroekonomii
Uniwersytet Warmińsko-Mazurski w Olsztynie

S ł o w a k l u c z o w e: efektywność ekonomiczna, zróżnicowanie regionalne, jakość lokalizacji, „miękkie" i „twarde" czynniki lokalizacji.

* Paper prepared within the statutory subject implemented at the Department of Macroeconomics named the *"Economic and cultural aspects of regional development"* elaborated on the base of the doctoral dissertation on the *"Regional diversification of economic efficiency of private enterprises in Poland"* written under supervision of Dr Hab. Andrzej Buszko, Professor of the UWM, reviewers: Dr Hab. Hanna Godlewska-Majkowska, Professor of the SGH, Dr Hab. Małgorzata Juchniewicz, Professor of the UWM.

Abstrakt

Celem badań była ocena związku między poziomem efektywności ekonomicznej przedsiębiorstw prywatnych w Polsce a jakością lokalizacji w regionach. Na podstawie przeprowadzonych analiz stwierdzono, że najsilniejszy związek z poziomem efektywności ekonomicznej badanych przedsiębiorstw wykazuje poziom chłonności rynków zbytu. W większości regionów charakteryzujących się chłonnym rynkiem zbytu notowano również dobre wyniki w zakresie efektywności ekonomicznej zlokalizowanych tam przedsiębiorstw, z kolei województwa o niskim popycie wewnętrznym cechowała zdecydowanie niższa efektywność. Coraz silniejszy dodatni związek korelacyjny odnotowano także między poziomem efektywności ekonomicznej badanych przedsiębiorstw a poziomem wiedzy w regionach. Może to sygnalizować, że coraz większy wpływ na efektywność przedsiębiorstw wywierają współcześnie czynniki lokalizacji o charakterze "miękkim" i nie wykluczone, że ich znaczenie będzie nadal rosło.

Introduction

Choice of location is a decision of economic nature that influences the later operational conditions, costs and overall efficiency of companies (BUDNER 2007, p. 45). The quality of location in the region has direct influence on the development of investment outlays during the project construction stage as well as later it influences the profitability of operations carried out in a given location (PLAWGO, CHILICKA 2008, pp. 68–69). Every region, offering entrepreneurs less or more favourable location conditions may encourage or discourage undertaking the activity in the given place and influence the later economic standing of entities located there (GODLEWSKA 2001, p. 14). The location quality of the given region is determined by the entire set of factors, both "hard", i.e. factors the size and structure of which at a given time is given, as well as "soft", frequently of immeasurable nature but determining the quality of living in the region. Consequently, the question emerges: *Do "hard" location factors, e.g. transport access to the region or maybe the "soft" factors such as, e.g. the level of knowledge in the region show stronger correlation with the economic efficiency level of companies nowadays?* The answer to the question formulated in that way may be the source of valuable hints for both the companies taking decisions concerning location of operations in the given region as well as the authorities of regions that are interested in creating favourable conditions for operating business activity in a given area.

Given the above, the aim of the studies undertaken was to evaluate the correlation between the economic efficiency level of private companies in Poland and the quality of location in the region.

The surveys were conducted on the complete sample of private sector companies in Poland that maintain accounting ledgers employing in excess of 9 persons. They were conducted according to the system of voivodships, i.e. NUTS II regional level. The timeframe of the studies encompassed the years 1999–2008.

Methodological assumptions for the studies

The synthetic efficiency measure that was built on the base of two selected diagnostic variables: labour productivity indicator and gross trade profitability indicator was applied for evaluation of the regional diversification in economic efficiency of private companies in Poland. Location quality in the regions evaluation was conducted for five location factors which were considered important from the perspective of their potential influence on efficiency of companies in the given region based on the review of the subject literature (see, e.g.: STANIENDA 2006, pp. 24–29; *Atrakcyjność inwestycyjna....* 2010, pp. 15–18; GODLEWSKA-MAJKOWSKA 2011, pp. 16–19). The following were included among those factors:

1. Labour resources and costs;
2. Transport access;
3. Sales market absorptiveness;
4. Economic infrastructure;
5. Level of knowledge in the region.

The four initial factors can be classified as the traditional location factors which is understood as the specific benefit obtained by the entrepreneur from location of the business undertaking in a given location. This benefit is expressed by reduction of investment outlays and savings on costs of operational activities, which facilitates maximisation of profits and improvement of operational efficiency (BUDNER 2004, p. 57). From the perspective of measurability those factors could be icluded as "hard" location factors, i.e. easily measurable and correlated directly to the operation of companies (PLAWGO, CHILICKA 2008, pp. 68–69). The fifth factor in turn, the level of knowledge in the region is a "soft" location factor, difficult to measure and not correlated with operations of the companies directly (BUDNER 2007, p. 48). It represents a conglomerate of characteristics creating the so-called "investment climate" of the region, which, in the environment of the market economy and conditions of disappearance of differences in access to production factors is becoming increasingly important (GODLEWSKA 2001, p. 17).

For the purpose of evaluating the quality of location in the regions each of the location factors was described using the synthetic measure. The choice of diagnostic variables was made with consideration for subject-formal and statistical criteria. The final set of variables contained 44 variables. The list of variables together with the allocated nature and weight given by experts participating in the survey conducted using the Delphi method is presented in the annex.

The variables were synthesised using the methods applying no standards. The procedure for determination of the synthetic measures was preceded by

the appropriate process of transformation of the variables. Unification of the nature of the variables, i.e. stimulation of them was the first step of the transformation. It was conducted according to the following formula (KOLENDA 2006, p. 22):

$$x_{ij}^{*} = x_{\max j} - x_{ij} \qquad i = 1,2,\ldots, n \quad j = 1,2,\ldots, m$$

where:
x_{ij}^{*} – estimated value of the diagnostic variable j for the object i,
$x_{\max j}$ – maximum value of the diagnostic variable j in the set of objects,
x_{ij} – value of the diagnostic variable j possessing the nature of destimulant for object i.

Standardisation of variables, i.e. unification of the range of their variability was the second step in the transformation. It was conducted using the zero unitisation procedure according to which the initial values of diagnostic variables possessing the character of stimulants were transformed according to the following formula (PANEK 2009, p. 39):

$$z_{ij} = \frac{x_{ij} - x_{\min j}}{x_{\max j} - x_{\min j}} \qquad i = 1,2,\ldots, n; \quad j = 1,2,\ldots, m$$

where:
z_{ij} – value of standardised diagnostic variable j for object i,
$x_{\min j}$ $x_{\max j}$ – minimum and maximum value of the diagnostic variable j in the set of objects,
x_{ij} – value of the diagnostic variable j for object i.

As a consequence of the appropriate computations the standardised variables with values belonging to the range of [0; 1] were obtained. After standardization, the value of 1 was allocated to the voivodship with the maximum value of the variable X in the set of voivodships while the value of 0 was obtained by the voivodship in which the X variable assumed the minimal value. The standardised diagnostic variables were subjected to the procedure of synthetizing which according to the assumption of the method without standards was conducted according to the following formula (PANEK 2009, p. 64):

$$s_i = \frac{1}{m} \sum_{j=1}^{m} oz_{ij} \qquad i = 1,2,\ldots, n; \quad j = 1,2,\ldots, m$$

where:
s_i – value of the synthetic variable for object i,
z_{ij} – value of the standardised diagnostic variable j for object i,
m – number of diagnostic variables.

The synthetic variables obtained assumed the values within the range of [0, 1]. This means that the regions for which the value of the synthetic measure is close to unity are characterised by the highest level of the analysed factor. On the other hand, in the regions with the worst situation in that respect the synthetic measure assumes values close to zero. It should be pointed out that to assure the possibility of comparing the voivodships during the given year as well as between years the data on the base of which the synthetic measures were computed were treated as panel data. From the technical perspective that meant that in the formula according to which the unitisation was conducted the minimum and the maximum values of each characteristic were determined for the entire panel of data encompassing all the years and all the voivodships.

Evaluation of the correlation between the economic efficiency level of private companies in Poland and location in the region quality represented the last step of the analysis. Spearman's rank correlation coefficient was used for determination of the direction and strength of that correlation. It was applied because it serves testing correlations between two characteristics in the situation when those characteristics are of quantitative nature and the numerousness of populations is small. Additionally, it is useful in the analysis of data in the set of which the outliers exist. Such outliers could be noticed in the tested population of voivodships. The coefficient value was computed according to the formula (ZELIAŚ et al. 2002, p. 107)[1]:

$$r_z = 1 - \frac{6 \sum_{i=1}^{n} d_i^2}{n(n^2 - 1)}$$

where:
d_i – difference of ranks for the characteristic X and the characteristic Y computed from the formula $d_i = x_i - y_i$,
x_i, y_i – ranks for characteristics X and Y,
n – numerousness of the sample.

[1] The following adjective scale concerning the strength of correlation between the variables was assumed:
– $|r_s| < 0.3$ – weak correlation,
– $0.3 \leq |r_s| < 0.6$ – moderate (average) correlation,
– $|r_s| \geq 0.6$ – strong correlation.

In addition to the discussed statistical methods, the method of literature analysis, sources analysis, Delphi method and induction method were also used during the studies.

Modern location factors

The role of the individual economic activity location factors and the attitude towards them changed with the socioeconomic development. The importance of traditional location factors such as cheap labour, access to raw materials or low transport costs decreased. The "location" lost on importance because the "place" understood as a set of conditions for development not linked directly with the costs of transport and labour but rather the local quality of living, education level and efficiency of the local elites emerged (SZOŁEK 2007, p. 22). PRZYGODZKI (2009, p. 74) describes this change in the following way – the economic activity location factors evolved from the so-called "hard" (quantitative) ones towards the "soft" (qualitative) ones dependent in most cases on the human capital, social capital, quality of services, etc. The quality of location still is the foundation of competitive advantage of companies. That advantage, however, currently depends not on the availability of just the production factors but on the level of efficiency of use of the available resources as well as productivity at a higher level than that of the competitors (PORTER 1998, p. 77). Which is important, also the method of defining the resources of production factors has changed. Currently, those resources encompass (*Rozwój regionalny*.... 2009, p. 22):

– human and social capital – determined by the population age structure, size and quality of labour resources, matching the qualifications to the labour market needs, networking between regional entities, cultural traditions, standards of social behaviours and attitudes favouring collaboration;

– knowledge and innovation – including the knowledge-based economy, information society, competitiveness and innovation of companies;

– fixed and financial capital – understood as the level and structure of investment outlays, availability of the sources of financing, including direct foreign investments;

– material (physical) resources of the region – treated as the factor necessary for regional development but insufficient, including appropriate development and spatial organisation that assure transport access to the region and connections to the domestic and international transport systems.

The interesting approach to the contemporary location factors is also proposed by M.E. PORTER (2001, pp. 207, 400). According to him it is a paradox that in the era of globalisation the importance of location increases

and manifests in geographic concentration of leading organisations in the individual countries. He identifies four major characteristics referred to as the Porter's "diamond" that may favour or hinder operation of business and building by it the competitive advantage in specific locations. Those factors are the production factors, character of demand, related and supporting industries and finally the strategies of businesses, structure and competition.

Concluding, the economic system evolution is accompanied by changes in understanding and defining the location factors. New factors emerge that are hard to measure as they are of qualitative nature. Also the relative importance of those factors changes because the requirements of entrepreneurs concerning location attractiveness of a given place change.

Analysis of correlation between the economic efficiency level of private companies in Poland and the quality of location in regions

The strength and direction of correlation between the economic efficiency level of companies surveyed and quality of location in regions were evaluated using the Spearman's rank correlation coefficient. The value of that coefficient together with evaluation of statistical significance of the tested correlation is presented in table 1.

Table 1

Correlation coefficient value between the economic efficiency of companies and the level of selected location factors during the years 1999–2008

Economic efficiency of companies	Correlation coefficient values for individual economic activity location factors				
	labour resources and costs	transport access	sales market absorptiveness	economic infrastructure	knowledge level
1999	0.24	0.16	0.60*	0.29	0.39
2000	0.34	0.23	0.66**	0.30	0.49
2001	0.08	0.00	0.43	0.17	0.20
2002	-0.11	-0.06	0.51*	0.09	0.15
2003	-0.06	-0.07	0.41	0.17	0.36
2004	0.29	0.46	0.50	0.38	0.31
2005	0.16	0.47	0.58*	0.50	0.45
2006	0.28	0.51*	0.66**	0.53*	0.51*
2007	0.20	0.46	0.65**	0.55*	0.46
2008	0.08	0.32	0.53*	0.43	0.51*

* statistically significant correlation (test probability $p < 0.05$)

** statistically highly significant correlation (test probability $p < 0.01$)

Source: WIERZBICKA (2012).

During almost the entire period surveyed we can talk about statistically significant, moderate or strong correlation of the sales market absorptiveness level and the economic efficiency level of private companies according to voivodship. This means that the positive changes that have taken place during that period as concerns the economic efficiency of companies surveyed were correlated the highest with the positive changes taking place in the regional sales markets. Higher absorptiveness of those markets, i.e. higher demand for the products offered by the enterprise allowed the companies generating higher revenues from sales and higher profits. Hence, regions characterised by absorptive sales markets also recorded good results in efficiency of companies located there while regions with low internal demand were characterised by definitely lower efficiency. This finds confirmation in the scatter figure made for 2008 and presented as figure 1.

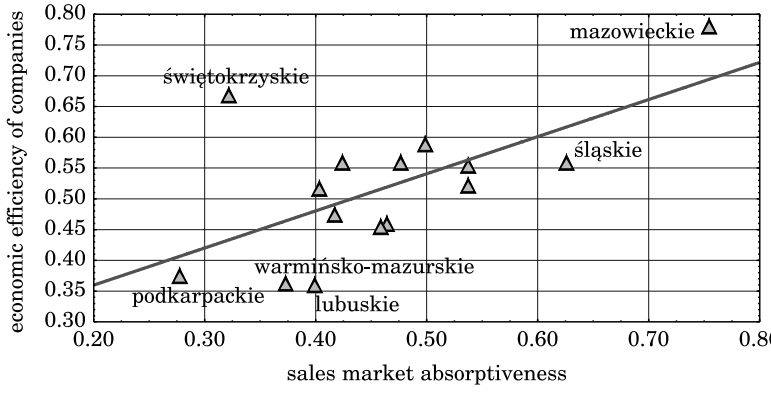

Fig. 1. Economic efficiency of private companies and the absorptiveness of the local sales markets in 2008 – the scatter figure

Source: WIERZBICKA (2012).

Analysing the presented figure, it can be concluded that the results obtained by voivodships as concerns the economic efficiency level of the companies surveyed and the absorptiveness level of their sales market were characterised by relatively strong linear correlation in 2008. The leader in market absorptiveness, Mazowieckie voivodship, was also the leader in the companies' economic efficiency level. Voivodships representing low efficiency levels, for example Podkarpackie and Warmińsko-Mazurskie, belonged in turn to the group of voivodships with low internal demand. Świętokrzyskie voivodship represented an exception as despite the relatively low absorptiveness of the local sales market, it was characterised by relatively high level of companies' economic efficiency.

Which is interesting, the private companies' economic efficiency level showed weak and also statistically insignificant correlation with the level of labour resources and costs in the region. Already during the first year covered by the analysis it could be observed that voivodships characterised by similar labour market situation recorded very clearly diversified results in economic efficiency level of private companies located within their area. This situation continued throughout the entire period covered. This can be confirmed by the scatter figure prepared for 2008 presented as figure 2. It allows noticing that there is no clear linear correlation between the level of labour resources and costs and the level of economic efficiency of companies located there. For example, Podlaskie and Mazowieckie voivodships were characterised by the identical level of labour resources and costs in 2008 while their situations concerning economic efficiency of the companies surveyed were definitely different. Mazowieckie voivodship was the leader in economic efficiency of companies surveyed while Podlaskie voivodship was characterised by medium level efficiency. The medium level of efficiency was also characteristic for private companies located in Śląskie voivodship although the level of labour resources and costs in that voivodship was more than twice higher than in Podlaskie voivodship.

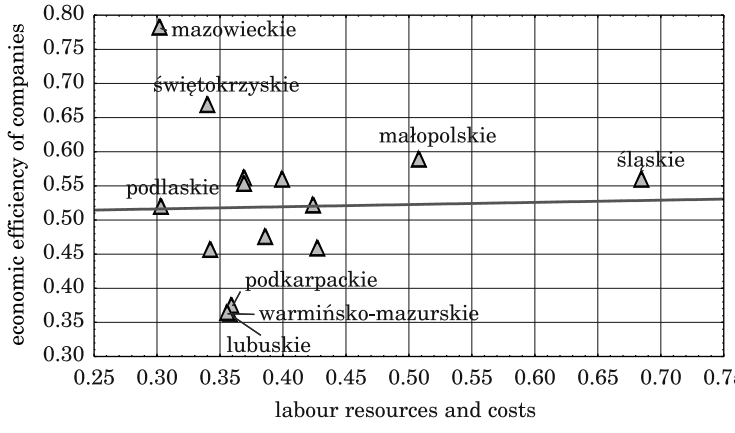

Fig. 2. Economic efficiency of private companies and the labour resources and costs in the regions 2008 – the scatter figure

Source*:* WIERZBICKA (2012).

The correlation observed does not mean, however, that the situation in the labour market is entirely uncorrelated with the companies' level of economic efficiency. Availability of labour resources in the region and costs of obtaining them are obviously important from the perspective of companies, although they do not determine the efficiency of their operation. It could be

said that the appropriate level of labour resources and costs in the region was the condition necessary for development of companies, but insufficient one for the current times. This probably results from the fact that the scope of labour perception as a factor of location was subject to important changes and not so much the size of labour resources available but the appropriate qualifications of that labour force is important.

The important thing is that as of 2003, the correlation of moderate and additionally increasing force has been observed between the surveyed companies; economic efficiency level and the level of knowledge in the regions, i.e. a "soft" location factor. Graphic presentation of that correlation in 2008 is presented in figure 3.

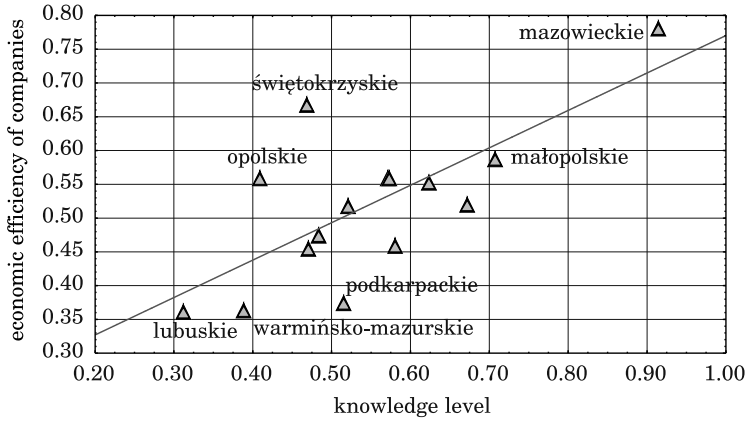

Fig. 3. Economic efficiency of private companies and the level of knowledge in the regions in 2008 – the scatter figure

Source*:* WIERZBICKA (2012).

In case of the majority of voivodships, a relatively strong correlation of linear character was observed concerning that factor. Voivodships characterised by a higher level of knowledge recorded also better results in the level of economic efficiency in companies located there and the other way round. Świętokrzyskie voivodship was the exception as despite not the best situation as concerns the level of knowledge in the region it was characterised by the very high level of surveyed companies' economic efficiency. Not quite typical situations and, consequently a deviation from the linear trend outlined were also observed in Opolskie and Podkarpackie voivodships. Opolskie voivodship recorded a relatively good situation concerning the surveyed companies' economic efficiency with the relatively low level of knowledge in the region. The average knowledge level in Podkarpackie voivodship was not high enough for the private companies located within its area to achieve also the

average level of economic efficiency. Despite those unusual cases, the correlation between the level of knowledge in the region and the economic efficiency of private companies located there proves statistically significant meaning that it was not an incidental result but that it is a consequence of more general regularity in the entire population. This may indicate that the importance of the knowledge level as a "soft" location factor is increasing and that it is possible that it will continue increasing.

Conclusion

The quality of location in the region has undoubted influence on the level of economic efficiency of companies located there. The strength of correlation between the individual location factors and the efficiency of companies may, however differ and may change over time. Some location factors may loose on importance while others may become increasingly important. The conducted studies indicate that the strongest positive correlation with the surveyed companies' economic efficiency level was presented by the sales market absorptiveness level. Hence the opportunities for private companies' economic efficiency level improvement in Poland and decreasing the regional disproportions in that respect should be seen in various types of activities aiming at stimulating the internal demand from households, companies and public institutions situated within the given region. More extensive opportunities of selling the products and services offered would allow companies generating higher revenues from sales and, consequently, will influence improvement of their economic efficiency. The important thing is that increasingly strong correlation with companies' economic efficiency is currently presented by location factors such as the economic infrastructure level and knowledge level in the region treated as "soft" location factors. Consequently, it can be expected that during the coming years the increasing level of economic efficiency of companies will be characteristic for the regions within the area of which the development level of the widely understood business environment infrastructure, level of education, innovation and information and communication technologies is high. Under those circumstances, the actions taken in the individual regions should be focused on those location aspects. Poorly developed business environment institutions' network, low level and quality of education in the region, small number of innovation projects undertaken by companies, absence of the effective network of cooperation between the science and the economy of the region, insufficient level of the network society development are just some problem areas for many voivodships limiting the potential for economic efficiency level improvement in the private companies located there.

Concluding, the stronger correlation with the economic efficiency level of private companies in Poland, show the "hard" location factors, such as: sales market absorptiveness and economic infrastructure. However, the role of "soft" location factors increases and it is possible that their importance will continue increasing.

Translated by JERZY GOZDEK

Accepted for print 22.04.2013

References

BUDNER W. 2004. *Lokalizacja przedsiębiorstw: aspekty ekonomiczno-przestrzenne i środowiskowe*. Wydawnictwo Akademii Ekonomicznej w Poznaniu, Poznań.

BUDNER W. 2007. *Czynniki lokalizacji inwestycji a możliwości rozwoju ekonomicznego gmin w Polsce*. Acta Sci. Pol., Administratio Locorum, 6(3): 43–58.

Atrakcyjność inwestycyjna województw i podregionów Polski 2010. 2010. Red. M. Nowicki. Instytut Badań nad Gospodarką Rynkową, Gdańsk.

GODLEWSKA H. 2001. *Lokalizacja działalności gospodarczej. Wybrane zagadnienia*. Wydawnictwo Wyższej Szkoły Handlu i Finansów Międzynarodowych, Warszawa.

GODLEWSKA-MAJKOWSKA H. 2011. *Przedsiębiorczość regionalna i atrakcyjność inwestycyjna regionów jako zjawisko ekonomiczno-społeczne*. In: *Atrakcyjność inwestycyjna a przedsiębiorczość regionalna w Polsce*. Ed. H. Godlewska-Majkowska. Oficyna Wydawnicza Szkoły Głównej Handlowej w Warszawie, Warszawa, p. 13–23.

KOLENDA M. 2006. *Taksonomia numeryczna. Klasyfikacja, porządkowanie i analiza obiektów wielocechowych*. Prace Naukowe nr 1106 Akademii Ekonomicznej im. Oskara Langego we Wrocławiu, Wrocław.

PANEK T. 2009. *Statystyczne metody wielowymiarowej analizy porównawczej*. Wydawnictwo Szkoły Głównej Handlowej w Warszawie, Warszawa.

PLAWGO B., CHILICKA E. 2008. *Lokalizacyjne uwarunkowania konkurencyjności przedsiębiorstw sektora rolno-spożywczego w województwie podlaskim*. In: *Rozwój regionalny a rozwój zrównoważony*. Ed. A.F. Bocian. Wydawnictwo Uniwersytetu w Białymstoku, Białystok.

PORTER M.E. 1998. *Clusters and the new economics of competition*. Harvard Business Review, 76(6): 77–90.

PORTER M.E. 2001. *Porter o konkurencji*. PWE, Warszawa.

PRZYGODZKI Z. 2009. *Znaczenie kapitału ludzkiego w budowaniu innowacyjnych regionów*. In: *Budowanie zdolności innowacyjnych regionów*. Ed. A. Nowakowska. Wydawnictwo Uniwersytetu Łódzkiego, Łódź.

Rozwój regionalny w Polsce. Raport 2009. 2009. Ministerstwo Rozwoju Regionalnego, Warszawa.

STANIENDA J. 2006. *Determinanty rozwoju i konkurencyjności przedsiębiorstw w regionie*. Małopolska Wyższa Szkoła Ekonomiczna, Tarnów.

SZOŁEK K. 2007. *Zmiany paradygmatów rozwoju jako uwarunkowania regionalnych i lokalnych polityk innowacji w Polsce*. Prace Naukowe Dolnośląskiego Centrum Studiów Regionalnych. Seria Konferencje, 7: 21–26.

WIERZBICKA W. 2012. *Regionalne zróżnicowanie efektywności przedsiębiorstw prywatnych w Polsce*. Uniwersytet Warmińsko-Mazurski w Olsztynie, Olsztyn (praca doktorska).

ZELIAŚ A., PAWEŁEK B., WANAT S. 2002. *Metody statystyczne. Zadania i sprawdziany*. Polskie Wydawnictwo Ekonomiczne, Warszawa.

Annex

List of diagnostic variables describing the individual location factors

Diagnostic variables	Character of variable*	Weight
1	2	3
1. Labour resources and costs in the region		
Number of people working in the national economy per 1 km^2 of the total area	S	0.25
Registered unemployment rate	S	0.14
Percentage of long-term unemployed in the total number of the registered unemployed	D	0.16
Average gross monthly wages in the national economy	D	0.17
Number of graduates from basic vocational schools per 100 km^2 of the total area	S	0.04
Number of graduates from general secondary schools per 100 km^2 of the total area	S	0.03
Number of graduates from higher schools per 100 km^2 of the total area	S	0.21
2. Transport access to the region		
Density of normal gauge operated railway lines in km per 100 km^2 of the total area	S	0.14
Density of hard surface public roads in km per 100 km^2 of the total area	S	0.32
Indicator of immediate refurbishment works demand	D	0.17
Share of people working in section H in the total population working in the national economy	S	0.13
Availability of airports	S	0.06
Availability of maritime ports	S	0.05
Location in relation to the western border	S	0.13
3. Absorptiveness of the regional sales market		
Population density per 1 km^2 of total area	S	0.20
Birth rate per 1000 residents	S	0.14
Average monthly disposable income per capita in household	S	0.42
Investment outlays of territorial government units per capita	S	0.08
Investment outlays per capita	S	0.16
4. Economic infrastructure of the region		
Density of water supply network in km per 100 km^2 of the total area	S	0.14
Density of sewers network in km per 100 km^2 of the total area	S	0.11
Population serviced by wastewater treatment plants as % of the total population	S	0.20
Entities of national economy section J and K per 10,000 residents	S	0.25
Number of special economic zones	S	0.12
Number of exhibition facilities per 10,000 entities of national economy registered with the REGON register	S	0.18

cont. Annex

1	2	3
5. Level of knowledge in the region		
5.1. Education		
Net scholarization index of basic vocational schools' students as % of the population aged 16-17	S	0.16
Net scholarization index of secondary general school students as % of the population aged 16-18	S	0.20
Number of higher schools' students per 1000 residents	S	0.30
Number of postgraduate students per 1000 residents	S	0.08
People learning English as compulsory subject at schools for children, youth and post-secondary schools per 1000 residents	S	0.11
Public outlays on education as 5 of the GDP	S	0.15
5.2. Innovation system		
Number of higher schools per 100,000 residents	S	0.11
Doctoral students per 10,000 residents	S	0.04
Outlays on innovation activities in industry per capita	S	0.14
Number of units conducting R&D activities per 10,000 entities of national economy registered with the REGON register	S	0.12
Scientific research workers employed in R&D activities at the EPC per 1000 professionally active persons	S	0.10
Outlays on R&D activities per capita	S	0.11
Share of human resources for science and technology (HRST) in professionally active population	S	0.20
Percentage of external outlays on R&D provided to the higher schools	S	0.18
5.3. Information and telecommunication technologies (ICT)		
Percentage of households equipped with computers	S	0.44
Number of computers for process control and supervision in industry per 1000 companies in the industry	S	0.35
Population per 1 library	D	0.05
Television subscribers per 1000 residents	S	0.09
Telephone lines per 1000 residents	S	0.07

* S – stimulant, D – destimulant