MODELING THE RELATIONSHIP OF THE QUALITY OF LIFE AND THE INVESTMENT ATTRACTIVENESS IN GRODNO REGION

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Abstract

Comparative analysis of Grodno region districts competitiveness in 2011 was conducted. The system of indicators characterizing the competitiveness of the Republic of Belarus small administrative units was formed. This system consists of two units: the quality of life and investment attraction. District rating for each unit was built. Grouping of districts based on the values of integral indicators was performed. The relationship of quality of life integral indicators and investment attractiveness was analyzed. The integral indicator of competitiveness was built.

1 Introduction

Countries competitiveness is estimated annually by international non-governmental organization, the World Economic Forum (WEF). The Republic of Belarus has not taken part in the WEF ratings. Improving the Republic of Belarus competitiveness and the participation in the WEF ratings is scheduled for 2011–2015 by the Government program (Republic of Belarus Council of Ministers decree 216, 18.02.2011).

The competitive advantages of the country directly depend on the competitiveness of its regions. In this regard, forming of region competitiveness is the main goal in the task of improving the competitiveness of the country.

The region's competitiveness will mean the ability of the regional economy to stably produce and consume goods and services in competition with the goods and services produced in other regions, while ensuring the continued growth of quality of life [1].

This definition highlights two fundamental directions for providing the growth of the region competitiveness: achieving the high quality of life and improving the region investment attractiveness. Accordingly, the region competitiveness estimate is suggested to be performed based on these two groups of indicators.

2 The system of indicators

The following system of indicators was used.

Quality of population: rate of natural increase; infant mortality rate; age dependency rate; share of workers with higher education (%); number of marriages (per 1000 persons); number of divorces (per 1000 persons); rate of migration increase (%).

Standard of living: changes in real wages (in % to year 2005); population provision with housing (m^2 of total area per 1 resident); paid services for population (in actual prices, one thousand rubles per capita); retail turnover of trade (in actual prices, one thousand rubles per capita).

Quality of social sphere: registered unemployment rate (in % of the economically active population); number of injuries at work including death or disability at 1 day and more (per 1000 workers); availability of doctors in all specialties (per 10000 persons); availability of paramedical personnel (per 10000 persons).

Quality of the environment: air polluting emissions from stationary sources (per 1000 persons, tons); share of the captured air pollutants in the total pollution from stationary sources (%); fresh water use (per 1000 persons, $1000\,m^3$).

Investment attractiveness: fixed capital investments per person employed in the economy (million rubles per person employed in the economy); industrial production volume per capita (million rubles); share of loss-making entities (% of the total number of entities); ratio of exports to imports of products (%); profitability of sales (%); share of the shipped innovative products (works, services) in the total volume of own production by industry enterprises (%).

Official statistics, published in the collections of National Statistical Committee of the Republic of Belarus [2], [3], are used for selected indicators. It should be noted that Grodno district statistics do not include the Grodno city staticstics.

The integral indicator of the Grodno region districts competitiveness was built in [4] according to the 2008–2010 period on the basis of the entire system of 24 indicators.

Such an important factor in investment attractiveness, as the innovative activity of industrial organizations, has been being recorded in the official statistics since 2011. A competitiveness estimation of the Grodno region districts is built here taking into account this factor according to 2011 data. The districts rating for each of the two units is built first. Competitiveness rating of districts is obtained by summing two of these ratings.

A technique based on the methods of applied statistics was used for the construction of integral indicator [5, 6].

3 Quality of life in Grodno region

Original 18 indicators were scaled on the interval $[0, 1]$ for comparability of indicators, measured in different units. The indicators were then transformed according to the principal components method of factor analysis into the 4 principal factors. Thus all the indicators were associated with one of the 4 main factors. The total percentage of variance, saved by them, is 75.06 % (the first factor saves 37.65 % of the variance). The factor loadings values of the first principal factor are listed in table 1.

The following population quality indicators turned out to be the main indicators determining the quality of live differences in Grodno region districts: age dependency

Table 1: Factor loadings of indicators related to the first principal factor

Indicator	Factor 1
Age dependency rate	**0.96**
Rate of natural increase	**0.92**
Population provision with housing	**−0.86**
Number of marriages, per 1000 persons	**0.86**
Retail turnover of trade, per capita	**0.80**
Rate of migration increase	**0.78**
Share of the captured air pollutants	**0.71**
Number of divorces, per 1000 persons	**−0.68**
Paid services for population, per capita	**0.63**

Table 2: Factor loadings of indicators related to the principal factors

Indicator	Factor 1	Factor 2	Factor 3
Share of loss-making entities, %	0.46	**−0.61**	−0.25
Ratio of exports to imports of products	−0.06	−0.06	**0.95**
Fixed capital investments per employed person	0.01	**0.77**	−0.23
Industrial production volume per capita	0.12	**0.81**	0.02
Profitability of sales, %	**−0.65**	0.11	0.50
Share of the shipped innovative products	**0.97**	0.06	0.02

rate (0.96), rate of natural increase (0.92), number of marriages (0.86), rate of migration increase (0.78), number of divorces (−0.68).

Integral indicator of the quality of life was obtained using the equation

$$Q = 37.65F_1 + 17.03F_2 + 11.42F_3 + 8.96F_4,$$

where Q is the quality of life integral indicator, F_1, F_2, F_3, F_4 — values of the first principal factors. The percentage of the dispersion, saved by them, is taken as weight.

Classification of districts was performed based on the value of integral indicator (table 3). In order to build clusters, k-average method of cluster analysis was applied. The significance of differences of mean values of integral indicator in clusters was tested using Scheffe criterion.

4 Investment attractiveness of Grodno region

Rating of districts on the investment attractiveness was built similarly. In this case 6 indicators were transformed into 3 principal factors. The total percentage of dispersion, saved by them, also amounted to about 75 % (74.76). Table 2 presents the factor loadings of the three principal factors.

The main indicator, that determines the differences in investment attractiveness, is the share of the shipped innovative products (0.97).

Table 3: Ranking and classification of districts according to the quality of life

Districts	Q	Cluster	I	Cluster	R	Cluster
Vawkavysk	63.06	1	78.77	1	141.83	1
Lida	58.72	1	53.97	1	112.69	1
Grodno	56.46	1	14.91	2	71.37	1
Slonim	43.64	1	6.82	2	50.46	1
Smarhon'	41.66	1	14.95	2	56.61	1
Ashmyany	25.26	1	0.90	2	26.16	2
Dzyatlava	9.01	2	−33.29	3	−24.28	2
Navahrudak	4.07	2	67.96	1	72.03	1
Astravyets	−2.86	2	20.80	2	17.94	2
Byerastavitsa	−8.38	2	5.56	2	−2.82	2
Masty	−10.43	2	36.09	1	25.66	2
Voranava	−24.14	2	−73.56	3	−97.70	3
Karelichy	−27.48	2	−62.47	3	−89.95	3
Iwye	−38.17	3	−64.84	3	−103.01	3
Zel'va	−43.99	3	−10.61	2	−54.60	3
Svislach	−67.27	3	−37.74	3	−105.01	3
Shchuchyn	−79.15	3	−18.23	2	−97.38	3

The integral indicator of the investment attractiveness was built using the equation

$$I = 33.01F_1 + 26.77F_2 + 14.98F_3.$$

In this case districts were also grouped into three clusters (table 3).

5 Analysis of the "Quality of life" and "Investment attractiveness" categories relationship

The ranking and classification results of districts are presented in table 3. Integral indicator of competitiveness (R) was built by summing the quality of life and investment attractiveness integral indicators. Here the districts are ordered by the first integral indicator.

Leaders in all categories are Vawkavysk and Lida districts — the most developed districts of the Grodno region. In order to evaluate the relationship between the "Quality of life" and "Investment attractiveness" categories, correlation coefficient for two integral indicators was calculated. It was found to be 0.63, $p < 0.007$ (nonparametric Spearman correlation coefficient equals 0.67). Adjusted determination coefficient $R^2 = 0.35$. Therefore, 35 % of the investment attractiveness variation can be explained by differences in the quality of life in the Grodno region districts.

6 Conclusion

The most important competitiveness growth factors of Grodno region districts for the period under review were revealed (tables 1, 2).

The quality of population: age dependency rate, rate of natural increase, number of marriages, rate of migration increase, number of divorces.

The investment attractiveness: share of the shipped innovative products.

The standard of living: population provision with housing, retail turnover of trade, paid services for population.

The quality of the environment: share of the captured air pollutants.

The same conclusions can be obtained by constructing an econometric model linking integral indicator of competitiveness with the original indicators.

In order to solve the identified problems it is, first of all, necessary to create new jobs and thus attract young working population to districts, as well as to implement a package of measures stimulating the development of small and medium businesses in the fields of material production, innovation and provision of public services.

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