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ENTREPRENEURIAL ENVIRONMENT AT REGIONAL LEVEL: THE CASE OF POLISH PATH TOWARDS SUSTAINABLE SOCIO-ECONOMIC DEVELOPMENT

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Abstract. Globalization process creates fovurable conditions for dynamic development of economic centers both at national and regional level. Yet, it may be an obstacle for growth for peripheral countries and regions. In the European Union one can confirm convergence process at national level. However, in Central European countries the convergence of national economies does not support sustainable growth at regional level and regional convergence process. This situation often leads to the problem of draining up of scarce resources from peripheral regions, which negatively affects their entrepreneurship potential and sustainable socio-economic development. In the longer run this unbalanced spatial growth can become a significant obstacle for welfare improvements. In this context, the purpose of the article is to analyze the quality of entrepreneurial environment in Poland at regional level within the context of sustainability framework. The research was done for NUTS 2 regions in the years 2010-2014. The quality of entrepreneurial environment is considered here as a multiple-criteria phenomenon that should be treated as a latent variable. Thus, in the research Structural Equation Modeling (SEM) analysis was applied. Values of the latent variable were assessed based on confirmatory factor analysis, which provided information on the socio-economic development of Polish regions, which determinates the entrepreneurial conditions. In order to group the regions to homogenous subsets natural breaks method was used. The conducted research confirms the process of improvement of entrepreneurial conditions in most of the NUTS 2 regions in Poland. From the perspective of regional convergence process, on the one hand, one can point some positive factors such as noticeable improvements in some underdeveloped regions. However, the dominance of the central region and significant disparities between the NUTS 2 are still relatively stable and extensive. From the methodological perspective the article shows the applicability of SEM methodology to national and regional analysis with application of data from national statistics.

Keywords: Entrepreneurial environment, entrepreneurship at regional level, multiple-criteria analysis, Structural Equation Modeling (SEM), regional sustainability, Poland

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JEL Classifications: C30, C38, O14, Q01

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1. Introduction

Entrepreneurship level is currently considered as one of the most important intangible growth factors in developed countries. It is crucial for building competitive knowledge-based economy. In spite of the fact that the global markets are dominated by multinational corporations in most of the Euopean countries more than 50% of employment and national product are created by small and medium sized enterprises. Thus, in the reality of growing international competition, entrepreneurship is crucial for building effective economy both at national and regional level (Agrawal, 2016; Adamowicz & Machla, 2016; Pietrzak & Balcerzak, 2016a; Saeed et al. 2017; Kljucnikov & Belas, 2016; Mayer et al. 2016; Yan et al., 2017; Melas et al., 2017). This factor is commonly pointed in many national strategies of growth and it was strongly stressed in the Europe 2020 plan. It is an immanent part of socio-economic sustainability or sustainable development concepts and it is crutial for reaching the objectives of improving social capital in an economy (Davis, 2008; Kuc, 2014; Czarniewski, 2016; Strielkowski et al., 2016 Zemlickienė et al, 2017). In the case of countries and regions at the average level of development, which must overcome the risk of middle income trap, the high level of entrepreneurship activity and good quality of entrepreneurial environment, next to high quality of human capital or bulding of effective network infrastructure (Agenor et al., 2012; Balcerzak, 2016a; Kondratiuk-Nierodzińska, 2016; Pietrzak & Balcerzak, 2016b; Żelazny & Pietrucha, 2017; Gajdos, 2014; Gajdos, Żmurkow-Poteralska 2012), are commonly believed to be a condition for overcoming the thread of middle income trap and improving the chances for higher pace of convergence process (Agenor & Canuto, 2015).

However, it is believed that globalization process and international integration of economies create favourable conditions for more dynamic development mostly for economic centers both at national and regional level. In the same time these both factors tend to be an obstacle for growth for peripheral countries and regions. These factors are confirmed for European economy, where in the case of European Union empirical research proofs convergence at national level. On the other hand, in many countries the convergence of national economies does not support socio-economic sustainable growth at regional level, which would lead to regional convergence process (Kuc, 2017a; 2017b). This situation often leads to the phenomenon of draining up of the most valuable resources from the peripheral regions, which negatively affects their entrepreneurship potential and sustainable socio-economic environment. In the longer run this unbalanced spatial growth can become a significant obstacle for improving macroeconomic growth and welfare of national economies.

In the above mentioned context the main objective of the article is to propose a method and to measure the quality of entrepreneurial environment at regional level in Poland in the years 2010-2014. Polish economy can be considered as an interesting case study for the proposed scientific problem, as it is the biggest economy in Central Europe that is considered to be an example of relatively effective transformation from centrally-planned to market-oriented economy. Poland has been able to take advantage of convergence process with the developed European economies, but it is currently considered as a country facing the problem of middle income trap. Thus, improving the quality of enterprenerial environment at regional level is currently considered as one of the main objectives of regional policy for Polish government.

The entrepreneurial environment is analyzed here as a multiple-criteria latent phenomenon within the context of sustainable development objectives and socio-economic sustainability framework. As a result, Structural Equation Modeling (SEM) methodology was used here.

The paper is organized as follows. In the next section the methodology of the Structural Equation Modeling used for assessing the measure of quality of entrepreneurial environment is presented. In this part the assumptions applied in the process of selecting potential diagnostic variables are given. This section is finished with presentation of hypotheses for empirical part. The next part is devoted to the presentation of the empirical model and assessing its statistical quality. Then, the two following sections concentrate on the analysis of the obtained

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results in regard to changes of ratings and groupings of the regions in the analyzed period. Finally, the paper ends with the conclusions, discussion of its limitations and prospects for two potential directions for future research.

2. Assumptions, methodology and hypothesis of the empirical research

Based on the literature review regarding factors influencing entrepreneurial activity and entrepreneurial environment there are two main assumptions of the empirical contribution. First of all, it is assumed that the entrepreneurial conditions, especially at the regional level, are strictly related to the socio-economic development of regions (Barkowiak-Bakun, 2017; Pietrzak, 2017). This assumption was crucial from the perspective of selection of potential diagnostic variables. Then, from the perspective of the possibilities of measurement of the quality of entrepreneurial environment at regional level, it was assumed that it should be considered as a multiple-criteria latent variable (see: Kawiorska 2016; Knatko et al. 2016; Mayer et al., 2016; Kot et al. 2016; Balcerzak, 2016b; Ključnikov et al., 2016; Dobeš et al., 2017; Ivanova, 2017; Balcerzak & Pietrzak, 2017).

Based on the above mentioned assumptions, it was possible to apply Structural Equation Modeling (SEM) in the analysis (Loehlin 1987; Bollen, 1989; Kaplan, 2000; Brown, 2006). SEM methodology is commonly used in the empirical research, which is based on the survey data (see Kooshki & Zeinabadi, 2016; Ebrahimi & Mirbargkar, 2017; Kozubíková et al. 2017; Smaliukienė et al., 2017). However, it can be also effectively used in the case of research that is based on aggregated macroeconomic or regional data coming from public official statistics (Pietrzak et al., 2012; Balcerzak & Pietrzak 2016a; 2016b). When the research is limited to the identification process and measurement of latent variables, SEM methodology enables to conduct confirmatory factor analysis. In that case only the external model (measurement model) is applied, which can be given with equations 1 and 2:

$$\mathbf{y} = \mathbf{C}_y \boldsymbol{\eta} + \boldsymbol{\varepsilon}, \tag{1}$$

$$\mathbf{x} = \mathbf{C}_x \boldsymbol{\xi} + \boldsymbol{\delta}, \tag{2}$$

where:

$\boldsymbol{\eta}$ - the vector of endogenous latent variables,

$\boldsymbol{\xi}$ - the vector of exogenous latent variables,

$\mathbf{y}$, $\mathbf{x}$ - the vector of observable variables,

$\mathbf{C}_y, \mathbf{C}_x$ - matrices of factor loadings,

$\boldsymbol{\varepsilon}, \boldsymbol{\delta}$ - measurement error vectors.

The parameters of the model are usually estimated with application of maximum likelihood method, generalized least squares method and asymptotically distribution-free method. In the case of the normal distribution for the observable diagnostic variables the maximum likelihood method should be applied. Otherwise, the two mentioned remaining methods are used (Balcerzak & Pietrzak 2016a; 2016b).

After estimation, the model is verified in regard to the significance of parameters and a degree of fit of the obtained model to empirical data (Bollen, 1989; Kaplan, 2000). The verification of the model is based on the comparison of the obtained model with a saturated and an independent model. There are to most commonly applied measures for this purpose: *IFI* (*Incremental Fit Index*) and *RMSEA* (*Root Mean Square Error of Approximation*).

The values of the *IFI* measure should fulfill the condition $0 < IFI < 1$. In the case of models which are based on the survey data, it is commonly assumed that its value should be higher than 0,9, which means that the model can be considered as the one with sufficient fit to empirical data.

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For *RMSEA* measure it is assumed that the lower value of the *RMSA* estimated for the given model, the better degree of the empirical model is obtained. Thus, it is commonly assumed that RMSA < 0,1 indicates that the model is well fitted to empirical data.

However, it should be emphasised that in the case of models estimated for aggregated data obtained from macroeconomic or regional statistics, the above mentioned limits are usually less restrictive (Balcerzak & Pietrzak 2016a; 2016b).

Based on the previous preliminary research of the authors (see Pietrzak & Balcerzak, 2016c; Pietrzak, 2017) the following two empirical hypotheses were proposed:

1. In the years 2010-2014 the quality of entrepreneurial environment in Polish regions has improved.
2. Significant disparities of quality of entrepreneurial conditions between central and peripheral regions in Poland are relatively stable in time.

3. The empirical model

The research study was devoted to the measurement of quality of entrepreneurial environment at regional (NUTS 2) level in Poland in the year 2010 and 2014. The short period of the analysis is restricted with the comparable data at regional level, which is provided by Central Statistical Office of Poland. The data were available in two bases: Local Data Bank (https://bdl.stat.gov.pl/BDL/start#) and Sustainable Development Indicators / Regional module (http://wskaznikizrp.stat.gov.pl/).

The three assumed pillars of quality of entrepreneurial environment at regional level, which were the theoretical base for selection of potential diagnostic variables, are given at figure 1. The pillars were indetified on the basis of the previous literature review in the field (see more Pietrzak & Balcerzak, 2016c; Pietrzak, 2017). One can expect that there are interrelations between the pointed pillars. However, in current model, which should enable to assess the applicability of the separate diagnostic variables for measurement purposes, these potential interrelations were not modeled deliberately. As a result table 1 provides specific information on the diagnostic variables applied for the model. The diagnostic variables were classified as stimulants and dis-stimulants. The stimulants fulfill the condition: $x^s_{i,j} > x^s_{k,j} \rightarrow O_i \succ O_k$ for X^s_j for every two values $x^s_{i,j}$, $x^s_{k,j}$ that refer to objects O_i, O_k, where $\succ$ means that object O_i is preferred to O_k. Thus, for stimulants a maximum value of variable is preferred. The dis-stimulants fulfill the condition: $x^s_{i,j} < x^s_{k,j} \rightarrow O_i \prec O_k$ for X^s_j for every two values $x^s_{i,j}$, $x^s_{k,j}$ that refer to objects O_i, O_k,, where $\prec$ means that object O_k is preferred to object O_i. This means that a minimum value of variable is preferred (Balcerzak & Pietrzak, 2016b; Kruk & Waśniewska, 2017).

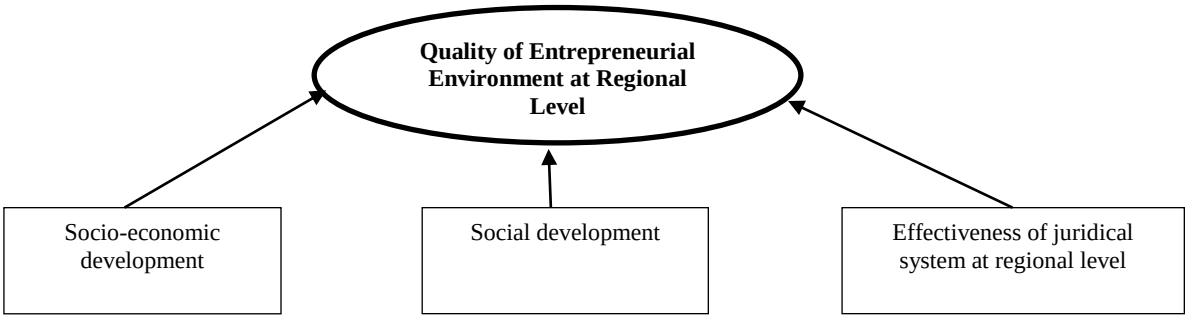

Fig. 1. Factors influencing quality of entrepreneurial environment at regional level

Source: own work

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Table 1. A set of factors affecting quality of entrepreneurship environment within sustainability framework

Socio-economic development	
Area 1– Fundamental economic conditions	
X_1 – Gross domestic product per capita at regional level. It presents the final result of the activity of all entities of the national economy. GDP is the sum of gross value added generated by all national institutional units, increased by taxes on products and decreased by subsidies on products.	stimulant
X_2 – Investments outlays per capita. It presents the value of total investment expenditure in the private and public sector per 1 inhabitant. Investment expenditures include financial or material outlays which aim is to create new fixed assets or improve (extension, reconstruction or modernization) of existing objects of fixed assets, as well as expenditure on so-called first investment equipment.	stimulant
Area 2 – Effectivness of labour market	
X_3 – Employment rate by age. It shows the share of total employed in the total population of a given category aged 15 and more (average annual data based on Labour Force Survey (see detailed explanation for X_4 variable).	stimulant
X_4 – Unemployment rate (Labour Force Survey). It is a representative survey conducted on a quarterly basis using the continuous observation method, which means that economic activity is examined each week throughout the entire quarter (in each of the 13 weeks of the quarter 1/13 part of the quarterly sample). The results from the sample are generalized to the whole population based on the national census. The results of quarterly surveys are translated into average data for the year. The study covers persons aged 15 and more who are members of households - the study does not cover persons staying outside the household (eg they were abroad) 12 months or more (up to 2Q 2012 it was over 3 months.	dis-stimulant
Area 3– Innovativeness	
X_5 – Expenditure on R&D activity in relation to GDP. Research and development (R & D) is a systematic creative work carried out in order to increase the stock of knowledge and to find new uses for this knowledge).	stimulant
Social development	
Area 1 – Demography	
X_6 – Ratio of balance of permanent migration person at working age (Intervoivodship migration). It is a difference between inflow (immigration) and outflow (emigration) of the population for permanent residence in relation to the working-age population.	stimulant
Area 2 – Poverty and Social Exclusion	
X_7 – At-risk-of-poverty rate after social transfers. The percentage of people whose disposable income (when taken into account social transfers) is less than the poverty line of 60% of median equivalent disposable income in a given country.	dis-stimulant
X_8 – People in households benefiting from the social assistance at domicile in percentage of the total population. Measured as the share of people in households benefiting from community social support in the general population. The community social assistance is granted as financial, material assistance or assistance in the form of service aid through a social assistance center.	dis-stimulant
X_9 – Average monthly available income per capita in private households. Household disposable income is the sum of current household income from individual sources minus the value of taxes and the value of social security and health insurance contributions.	stimulant
Area 3 – Education	
X_{10} – Adult persons participating in education and training. Measured as the share of people aged 25-64 studying and training in the total population in the same age group (within four weeks before the survey – Labour Force Survey).	stimulant
X_{11}– Children covered by pre-school education in percentage of the total number of children at the age 3-5	stimulant
Effectiveness of juridical system	
X_{12} – Rate of detectability of the delinquents of ascertained crimes. The index is calculated as the ratio of the number of crimes detected in a given year (including those detected after redemption) to the number of offenses found in a given year, plus the number of offenses identified in the proceedings and remitted in previous years due to non-detection of perpetrators.	stimulant

Note: a precise description of the variables and the methodology for data collection is available at http://wskaznikizrp.stat.gov.pl/.

Source: own elaboration

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Based on the diagnostic variables from table 1 confirmatory factor analysis was conducted. For the selected diagnostic variables Alfa-Cronbacha (see Cronbach, 1951) coefficient was assessed. The value of Alfa-Cronbacha equal to 0,71 for the twelve pointed diagnostic variables indicates that the diagnostic variables should properly describe the latent variable. The hypothetic SEM model applied in the research study is given in figure 2.

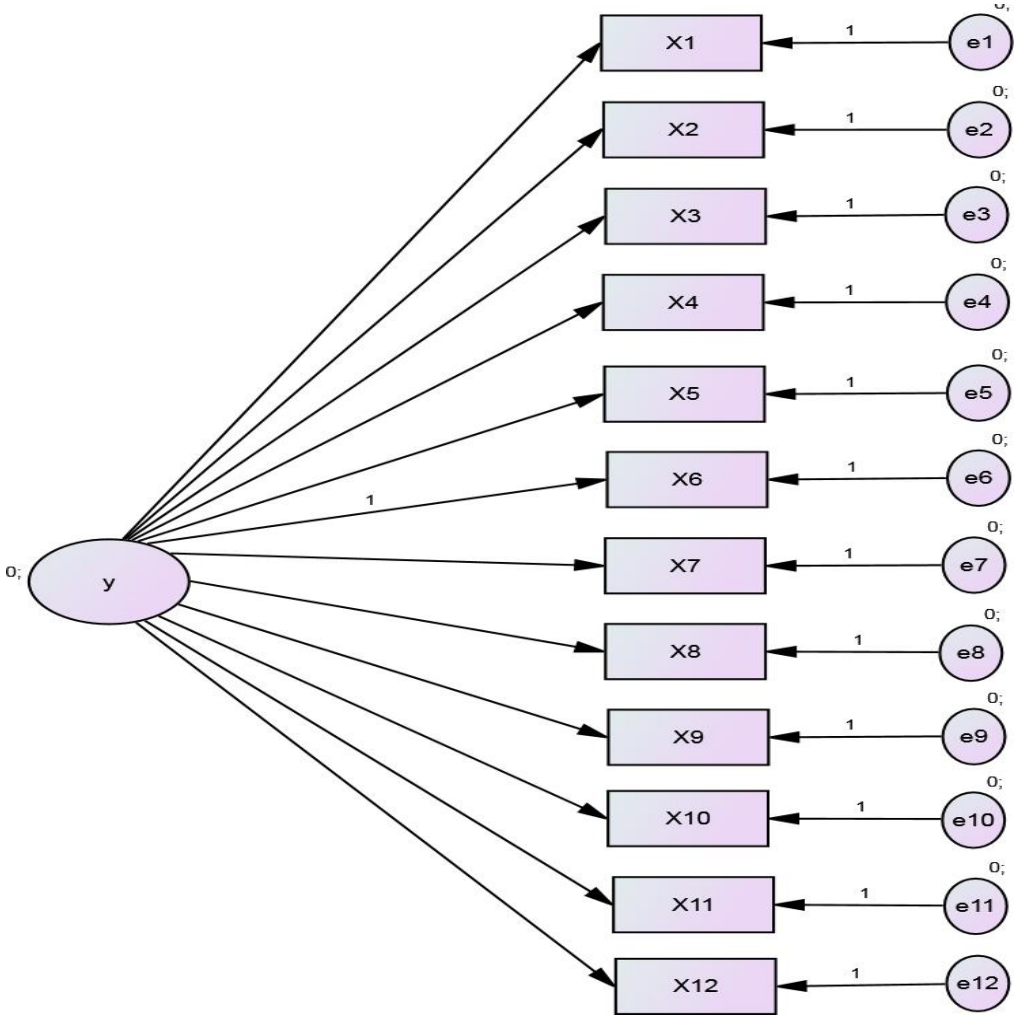

Fig. 2. Hypothetic SEM model for estimation of quality of entrepreneurial environment at regional level in Poland

*Source: o*wn elaboration

The estimation of the parameters of the model was done in the AMOS package. In the case this research study some of the variables did not fulfill the condition of normal distribution. Thus, in order to estimate the parameters of the model, asymptotically distribution-free (ADF) method was used. The results of the estimation procedure are given in Table 2.

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Table 2. Estimations of parameters of SEM model for quality of entrepreneurial environment at regional level

Variable	Parameter	Estimate	Standardized estimate	p-value
X_1	α_1	44.907	0.934	~0.00
X_2	α_2	4.853	0.807	~0.00
X_3	α_3	6.929	0.635	~0.00
X_4	α_4	1	0.597	-
X_5	α_5	70.307	0.844	~0.00
X_6	α_6	-11.982	-0.548	~0.00
X_7	α_7	-7.085	-0.655	~0.00
X_8	α_8	682.236	0.889	~0.00
X_9	α_9	3.356	0.591	~0.00
X_{10}	α_{10}	16.569	0.527	~0.00
X_{11}	α_{11}	-4.383	-0.584	~0.00
X_{12}	α_{12}	17.468	0.715	~0.00
Model	**IFI**	**RMSEA**		
Default	0.766	0.194		
Independence	0.000	0.359		

Source: own estimation based on data form Central Statistical Office of Poland: Local Data Bank (https://bdl.stat.gov.pl/BDL/start#) and Sustainable Development Indicators / Regional module (http://wskaznikizrp.stat.gov.pl/)

The parameters of the estimated model are statistically significant. It can indicate proper selection of diagnostic variables for the latent variable. The verification of the quality of the model in regard to the degree of fit to empirical data was based on *IFI* and RMSEA measures, which are also given in table 2. In that case *IFI* was equal to 0,766, and *RMSEA* was equal to 0,194. In spite of the fact that these values do not fulfill the limits usually applied for SEM models based on survey data, they can be accepted in the case of models for aggregated data from official national statistics.

Table 3. Factor Score Weights for the SEM model

Latent variable	Observable variables					
	X_1	X_2	X_3	X_4	X_5	X_6
Socio-economic development	0.021	0.054	0.081	0.015	0.006	-0.006
	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}
	-0.015	0.001	0.024	0.003	-0.018	0.009

Source: own estimation

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In the next step of the research the values of latent variable (quality of entrepreneurial environment at regional level) for the year 2010 and 2014 were assessed based on the sum of product of values of Factor Score Weights (table 3) and the values of observable variables. Based on the obtained results it was possible to propose a ranking of the NUTS 2 regions for both years (see table 4). Additionally, with application of Natural Breaks method the regions were grouped into four relatively homogenous classes, where class four includes the NUTS 2 regions with the best entrepreneurial environment, while class 1 encompass these which achieved worst results. The final results are presented in table 4 and figure 3.

Table 4. Ranking and grouping of NUTS 2 regions in regard to quality of entrepreneurship environment

Quality of entrepreneurial environment at regional level in Poland							
2010				2014			
NUTS 2 region	SEM	rank	class	NUTS 2 region	SEM	rank	class
mazowieckie	0.744	1	4	mazowieckie	0.925	1	4
wielkopolskie	0.425	2	3	dolnośląskie	0.576	2	3
dolnośląskie	0.423	3	3	pomorskie	0.519	3	3
śląskie	0.422	4	3	wielkopolskie	0.500	4	3
pomorskie	0.410	5	3	małopolskie	0.468	5	3
małopolskie	0.394	6	3	śląskie	0.464	6	3
łódzkie	0.356	7	3	łódzkie	0.449	7	3
lubuskie	0.309	8	2	opolskie	0.369	8	2
opolskie	0.303	9	2	zachodniopomorskie	0.359	9	2
kujawsko-pomorskie	0.276	10	2	kujawsko-pomorskie	0.311	10	2
zachodniopomorskie	0.254	11	2	podlaskie	0.307	11	2
podlaskie	0.226	12	1	lubuskie	0.301	12	2
świętokrzyskie	0.187	13	1	podkarpackie	0.238	13	1
podkarpackie	0.184	14	1	lubelskie	0.222	14	1
lubelskie	0.180	15	1	warmińsko-mazurskie	0.208	15	1
warmińsko-mazurskie	0.163	16	1	świętokrzyskie	0.190	16	1

Source: own estmation based on data form Central Statistical Office of Poland: Local Data Bank (https://bdl.stat.gov.pl/BDL/start#) and Sustainable Development Indicators / Regional module (http://wskaznikizrp.stat.gov.pl/)

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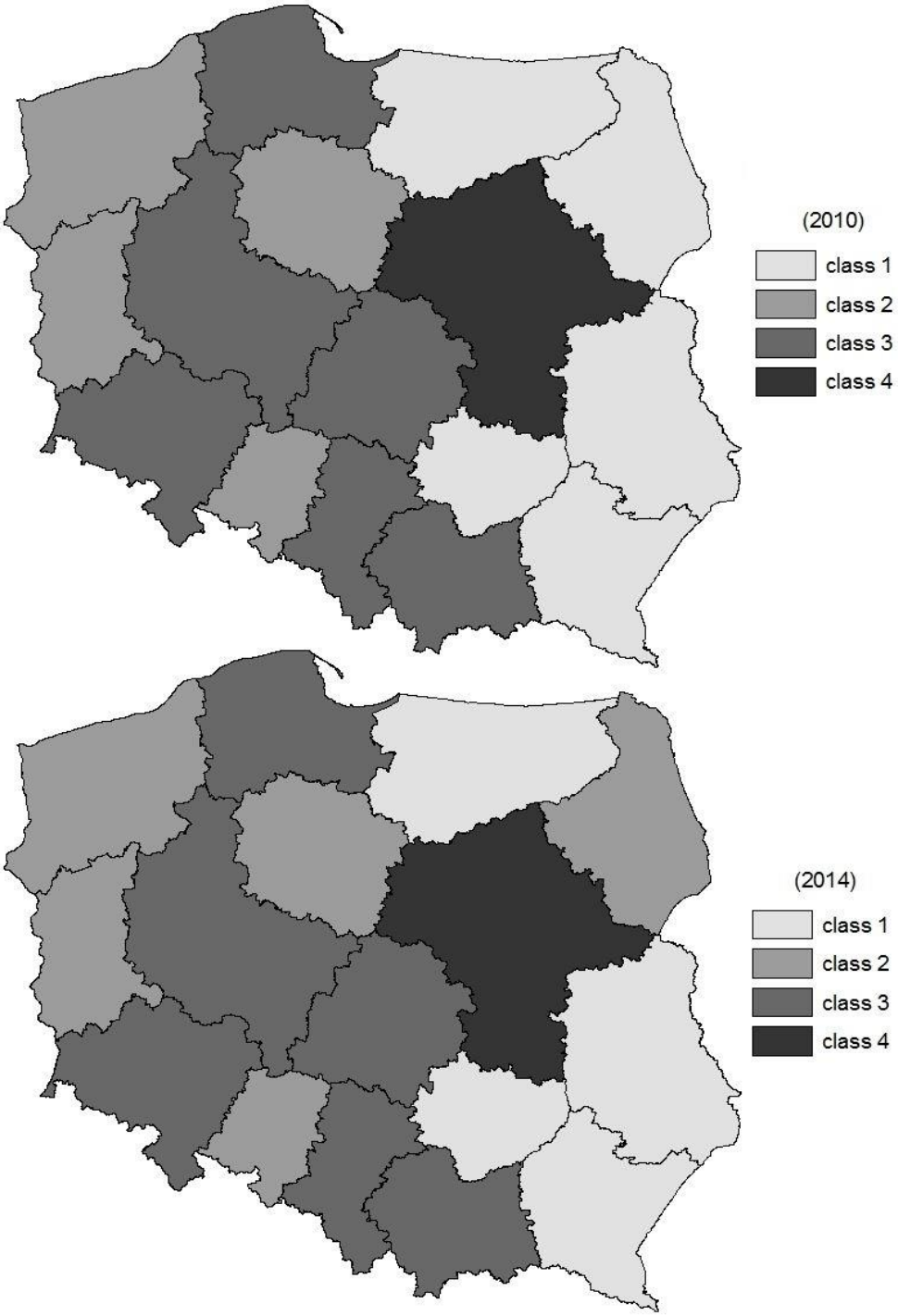

Fig 3. The NUTS 2 regions grouped based on quality of enterprenerial environment in Poland in the years 2010 and 2014

Source: own estmation based on data form Central Statistical Office of Poland: Local Data Bank (https://bdl.stat.gov.pl/BDL/start#) and Sustainable Development Indicators / Regional module (http://wskaznikizrp.stat.gov.pl/).

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4. Results

Based on the obtained results it can be concluded the quality of entrepreneurial environment at regional level has generally improved. This positive picture can be seen in the differences in grouping the regions in the year 2010 and 2014. In the first year of the analysis in the first class there were five NUTS 2 regions, whereas in the last year of the research only four regions could be found. Thus, one should stress the progress obtained by the podlaskie region, which managed to move from the first class in the year 2010 to the second class in the year 2014. In the case of the region with the best conditions for entrepreneurship in both years one can find mazowieckie NUTS 2 region, which in both years of the research makes the class 4. This region with the capital city metropolis is also considered as the best economically developed part of Poland. In the third class with relatively high quality of enterpenerial environment one can find dolnośląskie, wielkopolskie, pomorskie, łódzkie, śląskie and małopolskie NUTS 2 reions. In the year 2014 in the second class with average quality of entrepreneurial environment there are the following NUTS 2 regions zachodniopomorskie, podlaskie, opolskie, kujawsko-pomorskie and lubuskie. In the first class with the worst conditions for entrepreneurship in the year 2014 one could find warmińsko-mazurskie, podkarpackie, lubelskie and świętokrzyskie NUTS 2 regions.

5. Discussion

As it has been already mentioned in the previous section the obtained results confirmed that in the analyzed period the quality of entrepreneurial environment at regional level has significantly improved, which enables to confirm the first hypothesis of the research. It is especially important when one takes into consideration the fact the analyzed period has been still influenced by the negative consequences of the global financial crisis from the years 2008-2009.

However, one should also stress that in spite of this progress there are still significant disparities at regional level, which can be seen especially in the level of obtained value for the latent variable in both analyzed years. This result is consistent with the previous research of the authors in the field (see Pietrzak, 2017; Pietrzak. M. B. & Balcerzak, 2016c) and recent research on the convergence process at national and regional level conducted by Kuc (2017b). The results can be considered as strong arguments in favour of the second empirical hipotehes of the article. The empirical contribution can indicate significant challenges for Polish policy makers and decision makers at regional level, as the constant disparities between the regions can be the source of instability of the whole economy and the factor negatively influencing its growth potential. In longer run that situation negatively affects socio-economic sustainability of the whole economy.

Conclusions

The presented research study was devoted to the problem of quality of entrepreneurial environment at regional level in Poland in the context of regional sustainability framework. In the research structural equation modeling was applied. From the methodological perspective most of the research in the field is based on taxonomic or multiple-criteria analysis tools. However, this research due to applying SEM methodology treats the analysed phenomenon as a latent variable, which can be considered as a value added in the field. Additionally, it enables to assess the applicability of potential diagnostic variables in the research concerning quality of entrepreneurial environment at regional level, which can be important information for standard multiple-criteria and taxonomic research, where the selection of diagnostic variable is arbitral or is based on taxonomic information value criteria.

However, one should be aware of important litmitation of curent empirical proposal. First of all, the choice of the diagnostic variables used in the research can be the source of discussion and critics. However, this factor is mostly the result of availability of comparable data at regional level, which can be the source of important information in the given sphere. The second most important limitation of the research is attributed to the short period of the empirical analysis, which is mostly the result of availability of comparable data at regional level.

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There are also important possibilities for future research in the field. First of all, as it was mentioned one should be aware that there are interrelations between the pillars of quality of entrepreneurship environment at regional level: a) socio-economic development, b) social development, c) quality of juridical system, which were not analysed in the current article. This empirical gap should be the next step in the modelling process of changes in the case of entrepreneurial environment in Poland.

The second direction of empirical research could be found in the comparison of the results obtained based on aggregated data form national statistics as it was done in current analysis, with a perception of entrepreneurial environment at regional level measured with application of survey research conducted among entrepreneurs.

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