

REGIONAL DISPARITIES IN LITHUANIA

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The aim of this study is to identify current pattern specific to the development of the Lithuanian counties by using a comparison approach. The research was based on annual data covering the period 2011–2016. Various aspects of the environmental, social and economic differences between the regions in Lithuania are analysed and discussed. The article focuses on regional disparities but also considers changes over time. In this research there have been applied nonparametric statistical methods and graphical presentation. The results have indicated that there is a clear predominance of three regions – Kaunas, Klaipėda and Vilnius counties. The conducted analysis showed, that there were statistically significant differences in the activity rate, the average disposable income and the number of households that have an internet access comparing by the years.

Key words: counties, disparities, Lithuania, regions.

JEL Codes: R11, R58, I31.

1. Introduction

Regional differences are of interest for a variety of reasons: understanding patterns of population movement and labour force migration, characterizing the poverty, planning development policies etc. Regional development disparities in Lithuania are the result of various factors such as available natural resources, human capital, access to transport, public services etc.

Several studies have analysed differences of regional development in Lithuania. R. Kaledienė and J. Petrauskienė (2000) investigated levels and trends of inequalities in life expectancy in administrative regions of Lithuania during 1988–1996 and analysed possible reasons for regional inequalities. D. Burneika (2007) analysed the general trends of economical development not trying to observe structural changes of economy of Lithuania or its regions. R. Ginevičius and V. Podvezko (2009) discussed three methods (SAW, TOPSIS and COPRAS) in multicriteria evaluation of social and economic development of Lithuanian regions.

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M. Burinskienė and V. Rudzkienė (2010) described an approach for recognition of investment information patterns and the main factors that have a distinct impact on investment using multidimensional statistical methods. R. Ubarevicienė and M. van Ham (2017) explored processes of socio-spatial change and the role of selective migration in Lithuania using individual-level geocoded data from the 2001 and 2011.

We are in agreement with T. Dusek et al. (2014) that “The analysis of the regional inequality is essential for a country and it is also important question whether the inequalities are growing or decreasing”. Of course, there are differences within as well as between regions. Since the state of regions is continually changing, in this context we tried to consider recent situation again and from different perspective.

The **purpose** of this paper is to determine disparities of regions in Lithuania over the years 2011–2016. The research procedure sought to answer the following question: Are there statistically significant differences between regions? The statistical analysis methods and graphical comparison by box-plots were used to assess potential differences in a scale-level dependent variable by a nominal-level variable having more than two categories.

2. Research methodology

There is a large collection of both theoretical and empirical works that discuss problems of evaluation of regional development. V. Surd et al. (2011) focused on regional development in Romania, A. Palevičienė and D. Dumčiuvienė (2016) analysed socio-economic diversity of European regions using factor analysis and principal component analysis methods. J. Kvcialova et al. (2014) investigated economic characteristics associated with the income situation of homes in the Czech Republic and expressed similarities of the regions using cluster analysis method. M. Martić and G. Savić (2001) estimated how well regions in Serbia utilize their resources and ranked the efficient regions using data envelopment analysis and linear discriminant analysis methods.

Choosing the right method depends on the aim of the research and the nature of the right data for the analysis. There are a number of indicators and indices which have been developed on different scales and for different purposes. The basic aim of several researchers in this field is to get single measurements that evaluate the differences between objects (regions) that are studied. Therefore several composite indicators have been constructed, such as the Human Development Index, the Gross National Happiness, the Quality-of-Life Index, the Life Quality Index and the Well-being & Progress Index (D’Acci, 2011). The basis of these indices is targeted to exploring the economic situation of the countries but each index is extended to monitor other areas such as health, education, personal well-being and perception of safety or liberty (Beslerova, 2014).

In our point of view, for the deeper analysis the development of a region cannot be described by a single indicator, since a development is a multidimensional notion and therefore the state of development can be better characterized by several different indicators.

Researchers, examining the problems of regional disparities, suggest different criteria, variables and indicators for evaluation. Variables such as infant mortality, practising physicians per capita, homicide rates, policemen per capita, GDP per capita, life expectancy at birth years, church attendance and unemployment rate have been frequently sampled (Diener, 1997). The role of economic variables in predicting regional disparities in reported life satisfaction was analysed also by M. G. Pittau et al. (2010). The Gross Domestic Product is often used as principal indicator to characterize a regional state and its development (Poldaru, 2014, Dusek, 2014). Several authors also take into account various environmental factors (Glinskiy, 2016, Pissourios, 2013, Wen-Min, 2007). Many authors have revealed the importance of education as a crucial factor in economic development (Hanushek, 2007, Atalay, 2016, Saviotti, 2016).

In the first phase of the study the variables have been selected. Then, the research has been focused on both aspects – regional differences and changes over time.

Study uses 13 regional indicators of period 2011–2016, which represent 10 Lithuanian counties classified by NUTS 3 administrative unit. NUTS (Nomenclature of territorial units for statistics) was created by the European Office for Statistics as a single hierarchical classification of spatial units used for statistical production across the European Union. There are ten *regions (counties)* at NUTS 3 level in Lithuania: Alytus County (ALT), Kaunas County (KUN), Klaipėda County (KLP), Marijampolė County (MRJ), Panevėžys County (PNV), Šiauliai County (SUL), Tauragė County (TRG), Telšiai County (TLS), Utena County (UTN), Vilnius County (VLN).

In this study the differences between the counties are analysed looking into economic, environmental and social indices. The research was based on the data of the Statistics Lithuania (<http://www.stat.gov.lt>). For data analyzing there were used statistical and graphical analysis methods. Kruskal-Wallis test (K-W) was used to determine if there are statistically significant differences among counties and years. The Kruskal-Wallis test is the non parametric alternative to the One Way ANOVA. This test does not make assumptions about normality. The box plot is a standardized way of displaying the distribution of data based on the five number summary: minimum, first quartile, median, third quartile, and maximum. The simplicity of the boxplot makes it ideal for assessing and comparing the center and spread of groups at once. Data were analyzed using R software.

3. Research results

Although population density change was statistically insignificant over 2011–2016 years in Lithuania, but there was a downward trend. Only in Vilnius County population density remains stable. The population density by counties is statistically significant. The highest population density is in Vilnius County, where capital city is located. Then follow Kaunas and Klaipėda counties. The lowest population density is in Utena County. Region attractiveness and the quality of life in them usually depend on natural

environment and ecological situation. Forests in Lithuania cover approximately 33% of territory of country. The most forested is Alytus County (49.3%), the least forested is Marijampolė County (22%). The changes of utilised agricultural land area were slight during 2011–2016. In 2016, utilised agricultural land covers approximately 46% of territory of Lithuania. The highest proportion is in Marijampolė County (54%), the lowest – in Vilnius County (32%).

Analyzing indicators by years, it has been found, that the differences in activity rate (K-W = 20.70, $p < 0.001$), the average disposable income (K-W = 40.82, $p < 0.001$), and the number of households, that have an internet access (K-W = 25.75, $p < 0.001$), life expectancy at birth (K-W = 13.07, $p = 0.0227$) were statistically significant. During the analysed period, the indicators were increasing in all counties. The life expectancy at birth was 74.74 years, the activity rate (in percents) was 67.12, and the average disposable income (in EUR per household member per month) was 376.57, the number of households that have an internet access (in percents) was 70.34 in 2016 in Lithuania.

Analyzing indicators by counties, the differences of most of them were statistically significant (Table). The big part of environmental pollution depends on a number of industrial objects and factors. The highest carbon monoxide pollution in average is in Telšiai County (541.0 kg/km²), the lowest – in Tauragė County. The highest sulphur dioxide pollution in average is in Telšiai County (2388.7 kg/km²), and the lowest – in Alytus County (2.2 kg/km²). The highest nitrogen pollution in average is in Telšiai County (385.5 kg/km²), the lowest – in Tauragė County (17.7 kg/km²). During the analysed period sulphur dioxide pollution increased the most in Utena County. Nitrogen oxides pollution decreased the most in Šiauliai County, and increased the most in Vilnius County, but there was a noticeable highest decrease of sulphur dioxide pollution.

The longest life expectancy at birth is predicted in Kaunas county, and the shortest – in Utena County (Figure 1a). Life expectancy at birth between 2011 and 2016 showed the highest increase (1.22 year) in Kaunas County and the lowest increase (0.82 year) in Alytus County, the lowest life expectancy at birth is predicted in Utena County.

The number of practising physicians, dentists and nurses had low growth during period of 2011 to 2016. Kruskal-Wallis test (Table) shows statistically significant differences by counties. Fig. 1 (b) compares the number of personnel per 10000 population between counties. The box-plot shows the highest number of practising physicians per 10000 population was in Kaunas County, followed by Vilnius and Klaipėda counties. Actually, there are university hospitals, which are dedicated to provide the highest quality healthcare to patients from all over the country and abroad. The lowest number of practising physicians is in Tauragė County. The box plots of number of practising physicians are comparatively short, hence variety was slight in all counties.

Table. Indicators percentage changes: by NUTS 3 regions, 2011–2016

Indicator (K-W, by region)	County									
	Alytus	Kaunas	Klaipėda	Marijampolė	Panevėžys	Šiauliai	Tauragė	Telšiai	Utena	Vilnius
Carbon monoxide ^a (K-W = 42.19*)	49.0	79.6	13.2	-3.9	51.9	-23.0	-22.7	5.7	43.0	130.4
Nitrogen oxides ^a (K-W = 46.83*)	0,0	-14,0	43,5	32,8	-7,1	69,5	-10,5	-3,5	2,8	-23,0
Sulphur dioxide ^a (K-W = 46.20*)	0.0	-33.2	4.2	10.0	0.0	-48.7	-57.1	-12.5	200.0	-89.8
Life expectancy at birth ^b (K-W = 39.78*)	1.2	1.5	2.3	1.4	1.4	1.4	1.7	2.9	0.8	1.6
Practising physicians ^c (K-W = 57.46*)	13,4	8,9	9,3	4,8	7,3	8,9	14,2	6,7	1,2	6,9
Practising dentists ^c (K-W = 47.75*)	3,3	17,6	1,2	17,5	29,2	20,0	32,7	6,3	9,2	26,2
Practising nurses ^c (K-W = 57.57*)	2,9	2,4	3,3	-4,3	2,9	-0,9	3,4	2,9	3,0	-1,9
Further education of high school graduates ^d (K-W = 42.40*)	1,7	6,1	-4,2	-9,6	-3,8	-5,3	-4,0	8,5	-1,1	-3,7
Households having internet access ^d (K-W = 21.91*)	38,5	21,1	20,8	25,9	20,5	28,0	44,1	51,8	30,4	2,5
Regional GDP at current prices ^e (K-W = 52.31*)	23.2	33.7	17.7	23.1	28.6	28.2	23.3	6.8	16.7	36.1
Material investment ^f (K-W = 46,38*)	-25,3	35,8	23,4	5,2	-3,7	-5,3	0,6	-13,6	-16,8	23,6
Activity rate ^d age 15-64 (K-W = 20.38***)	12,0	16,0	12,7	10,2	21,4	10,4	14,1	23,7	16,2	15,5
Average disposable income ^g (K-W = 14.79**)	55,7	50,5	55,0	53,2	41,5	46,0	68,8	50,9	35,8	73,2

^a in tonnes, ^b in years, ^c number of personnel per 10000 population, ^d in percents, ^e in EUR, thousands per capita, ^f in EUR, per capita, ^g in EUR per household member per month

* p < 0.01, ** p = 0.09695, *** p < 0.05

The highest number of practising dentists per 10000 population is in Kaunas County (Figure 1c). There are only slight differences between number of practising dentists per 10000 populations in Alytus, Šiauliai, Tauragė, Telšiai and Utena counties. The highest increase was in Tauragė County from 5.2 in 2011 to 6.9 (by 32.7%) in 2016.

We can see that the highest number of practising physicians, as much as dentists, is in counties, which universities prepare these types of specialists.

There is a different view analyzing the number of nurses. We can separate it into 2 groups of counties: 1) Kaunas, Klaipėda, Panevėžys, Šiauliai and Vilnius counties, and 2) Alytus, Marijampolė, Tauragė, Telšiai and Utena counties.

The lowest number of practising nurses per 10000 population is in Marijampolė County. Moreover, the highest decrease in number of practising nurses throughout 2011–2016 was observed in this County (by 4.3 percent). In contrast the number of practising nurses increased by 3.4 percent in Tauragė, by 3.3 percent in Klaipėda and by 3.0 percent in Utena County. The changes in other counties were indistinguishable.

An educated society is influential for the efficient and growing economy. The highest proportion (77.74%) of those who graduated from high school and intended to continue their education can be found in year 2014. In year 2016 the proportion decreased by 4.57 percent points (73.17%), but the difference between regions is statistically insignificant. The comparison of this indicator on the basis of the counties revealed, that the intention to continue education in 2016 has increased in Alytus County by 1.3 percent points, in Kaunas County by 4.4 and in Telšiai County by 6.2 percent points, while in Marijampolė County there was the decrease by 7.1 percent points. Nowadays communication by internet is essential to getting the knowledge, learning, successful business etc. The possibility of using internet has increased in all counties. In 2011, 55.45% of households in Lithuania had internet access, while in 2016 the proportion of households having internet access came up to 70.34%. The largest increase occurred in Telšiai, Tauragė and Alytus counties by 26.4 percent points, 19.4 percent points and 18.2 percent points respectively. In 2016, the highest proportion of households having internet access was in Kaunas County (78.5%) and Telšiai County (77.4%).

In recent years Lithuania has registered a sequential growth of the GDP per capita although the increase was slight and statistically insignificant. On the contrary the differences of the GDP in counties are significant (Table).

In recent years Lithuania has registered a sequential growth of the GDP per capita although the increase was slight and statistically insignificant. On the contrary the differences of the GDP in counties are significant (Table). As shown in the Figure 2 (a), the highest value of GDP per capita was in Vilnius County, and Klaipėda and Kaunas counties follow. The lowest value is in Tauragė County. It has been found that the increase of GDP per capita in counties between 2011 and 2016 was 5.3 in Vilnius County, 3.4 in Klaipėda County, but only 0.6 in Telšiai County (in thousands EUR). Also material investment per capita on average in Lithuania shows annual growth, despite the difference was statistically insignificant.

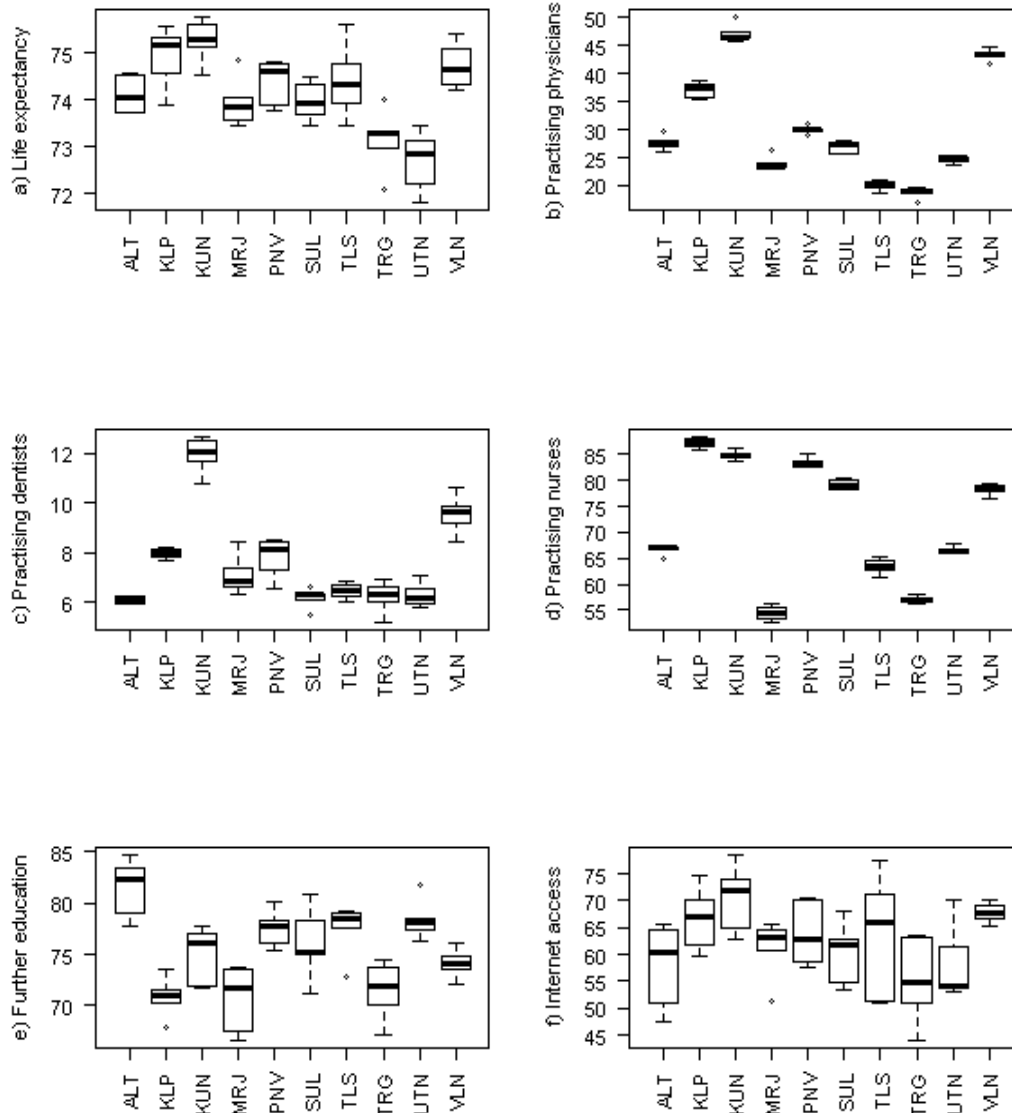


Fig. 1. The differences between the counties (Alytus/ Klaipėda/ Kaunas/ Marijampolė/ Panevėžys/ Šiauliai/ Telšiai/ Tauragė/ Utena/ Vilnius County) by various indicators: a) Average life expectancy at birth, in years; b) Number of practising physicians per 10000 population; c) Number of practising dentists per 10000 population; d) Number of practicing nurses per 10000; e) Further education of high school graduates, in percents; f) Households having internet access, in percents.

As illustrated Figure 2 (b), the highest material investment was in Vilnius County, then Klaipėda County follows, while Tauragė County had the lowest. Between 2011 and 2016, Kaunas, Klaipėda, Marijampolė, Tauragė, Vilnius were the counties where investment per capita increased. However other five counties showed a decrease

(Table). From Fig. 2 (c) can be seen that the highest activity rate, age 15–64, was in Vilnius, Klaipėda and Kaunas counties. Telšiai County showed the highest growth from 2011 in activity rate of 12.5 percent points. The lowest growth was in Marijampolė County (5.8 percent points).

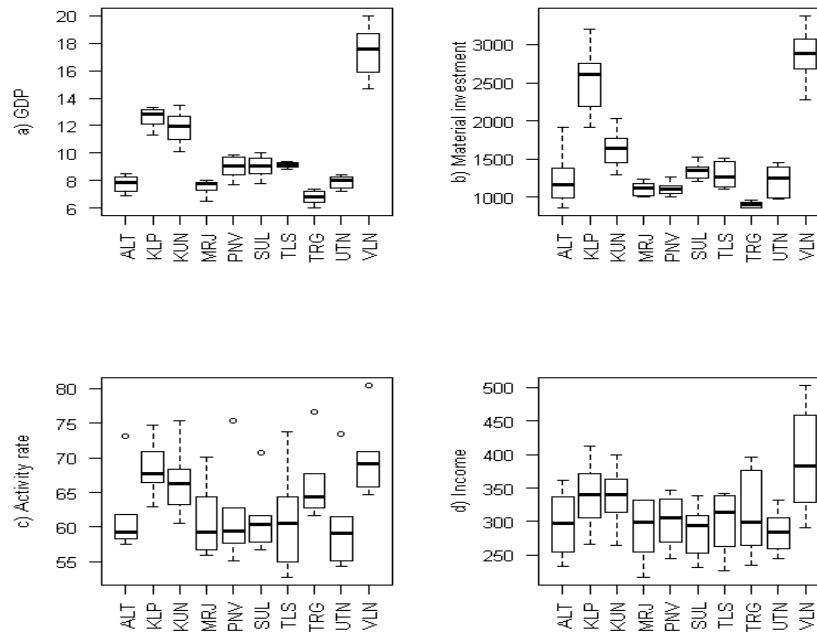


Fig. 2. The differences between the counties (Alytus/ Klaipėda/ Kaunas/ Marijampolė/ Panevėžys/ Šiauliai/ Telšiai/ Tauragė/ Utena/ Vilnius County) by various indicators: a) Regional GDP at current prices thousands per capita, in EUR; b) Material investment per capita, in EUR; c) Activity rate of inhabitants (age 15–64); d) Average disposable income in EUR per household member per month.

It has been found, that the average disposable income per household member per month has an upward trend. We note from the Table that the differences by year are statistically significant, however the difference by counties are statistically insignificant. During the analysed period, the highest values were recorded in Vilnius County. In 2011, the lowest disposable income per household member per month was in Marijampolė County. In 2015, the lowest level was in Utena County, and in 2016 in Marijampolė County again. Importantly, the growth rate was not equal in counties. The gap (*range*) between Vilnius County and other counties with the lowest disposable income per household member per month has increased from 74.3 EUR in 2011 to 171.9 EUR in 2016. It can be seen an overwhelming domination of the capital, so the gap between counties is in continuous growing, furthermore it can lead to an economic instability.

4. Conclusions

1. The conducted analysis showed, that there was a statistically significant difference of the activity rate, the average disposable income and the number of households, that have internet access, comparing by years (from 2011 to 2016) in counties. During the analysed period, these indices were increasing in all of the counties.

2. From the research that has been carried out, it is possible to conclude that regional contrasts in Lithuania are still strong. Summing up the results of the analysis, there is a clear predominance of three regions – Kaunas, Klaipėda and Vilnius counties. The values of nine economic and social indices were above of country average in mentioned regions. Only the value of the proportion of those who graduated from high school and intended to continue their education was below of country average.

3. The results of the research have indicated that the worst environmental situation is in Telšiai County. Evaluating healthcare indices, we can see that the highest concentration of medical personnel is in the counties, which have university hospitals. The decrease of such indicators as the number of those young people who intend to continue their education after high school is concerning in Marijampolė County. Appreciating a desire to learn the best situation is noticeable and the highest improvement in using information technology was in Telšiai County.

4. Analysing economic situation, we can clearly see, that the highest GDP is in Vilnius County. The highest number of investments was in Vilnius and Klaipėda counties. The activity rate increased the most in Telšiai County. We see that the disposable income was growing unevenly in the counties. Comparing 2016 and 2011 years, the difference between the highest disposable income of Vilnius County and the lowest disposable income of another county has doubled.

5. Efforts to diminish regional inequality are one of the basic tasks of regional policy. The research on regional disparities in Lithuania has shown that present regional policy should be revised. The disparities in the level of regions contrasts in the population living standards can lead to social tension.

6. The research can be a reference point for a more detailed multi-criteria assessment of status of the counties. The complex point of view can reveal problematic areas and can suggest methods of a decrease of the differences between the counties. We regret to say, that the picture is still incomplete, but we believe that our findings will be helpful for future researches.

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LIETUVOS REGIONŲ SKIRTUMAI

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Tradiciškai regioninė politika yra orientuota į skirtumų tarp regionų ir jų viduje mažinimą. Todėl aktualu nuolat analizuoti ir vertinti vykstančius pokyčius. Straipsnio tikslas – pateikti tarpreigioninių skirtumų Lietuvoje vertinimą, išryškinant problemines sritis. Tyrimui naudoti 2011–2016 metų Lietuvos apskričių duomenys. Darbe duomenų palyginimui naudojama grafinė analizė (Boxplot) ir Kruskal-Wallis testas, aptariami ekologinių, socialinių ir ekonominių skirtumų tarp regionų aspektai, atsižvelgiama ir į jų pokyčius laiko atžvilgiu. Galima pažymėti, kad išlieka ryškus trijų regionų – Kauno, Klaipėdos ir Vilniaus apskričių dominavimas. Analizuojant pagal metus nustatyta, kad statistiškai reikšmingai pakito gyventojų užimtumo lygis, namų ūkių, turinčių interneto prieigą skaičius, vidutinės disponuojamos pajamos. Atliktas tyrimas rodo, kad esama regioninė politika turi būti peržiūreta, egzistuojantys tarpreigioniniai skirtumai gali kelti socialinę įtampą. Straipsnyje pateikti rezultatai gali būti atspirties tašku detalesniems tyrimams, daugiakriteriniam vertinimui.

Raktiniai žodžiai: apskritys, Lietuva, regionai, skirtumai.

JEL kodai: R11, R58, I31.