

DISPARITY IN THE DEVELOPMENT OF THE HOUSING IN SLOVAKIA IN THE CONTEXT OF THE ECONOMIC SITUATION OF THE POPULATION

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Abstract

This paper presents the analysis of disparity in the number of completed dwellings, starting and under construction dwellings. Next observed attributes are sizing categories of dwellings and a living area of apartments in Slovakia. The observed period is 2002-2011 on a level of NUTS4, i.e. LAU1. A new Herfindahl's demographic index of concentration was introduced by an analogical way such as a geographical Herfindahl's index is constructed. All observed phenomena without average living area indicate the high degree of positive spatial dependency. The Moran coefficient I is significant for level $\alpha \leq 0.001$ for unemployment rate, completed dwellings, starting and under construction dwellings on 1000 inhabitants in Slovakia. The LISA cluster maps for unemployment rate, average number of the starting dwellings on 1000 inhabitants, average number of the under construction dwellings on 1000 inhabitants, average number of the completed dwellings on 1000 inhabitants in Slovakia on LAU1 level (2011) are presented. There is a statistically significant relationship between the overall economic situation of the population and selected indicators of the housing. Spatial error autoregressive models for completed dwellings on 1000 inhabitants, starting and under construction dwellings on 1000 inhabitants and unemployment rate are created.

Key words: housing, unemployment, spatial statistics, Moran coefficient, LISA

JEL Code: JEL R2, JEL R3, JEL C49

Introduction

Housing conditions play a significant role in economic and social prosperity of households. Last but not least a housing availability has a huge influence to possibility of employment. Therefore, it is not surprising that housing is relatively expensive and it presents from 20 to 25

% of average income within the EU. Some authors were interested in a problem with housing and a social level of inhabitants on various hierarchical levels of the territory.

There exist many indicators for assessing of housing construction. It depends on a subject of assessing of the given object of the research or its purpose. There are two basic indicators of housing development of housing construction on a national and local level: a number of completed dwellings on 1000 inhabitants and an average living area of the completed dwellings per capita. According to Jílek and Moravová (2007), the range of the housing fond cannot be quantified just by a number of dwellings. It is necessary to look at other indicators such as a number of living rooms and an overall living area of the dwelling. Housing construction is an important indicator of an economic and social development of regions in Slovakia. Cho et al. (2005) mention that the housing construction is influenced by many localization factors. A spatial variability of localization factors which are linked directly with housing construction and externalities associated with localization of housing construction. These externalities are unemployment (Saks, 2008; (Ferragina & Pastore, 2008)) and migration (Hughes & McCormick, 1981, Michálek & Podolák, 2011).

1 Material and methods

Data resource about a number of starting dwellings to the date 31.12., about a number of the under construction dwellings to the date 31.12., about a number of the completed dwellings and average living area of completed dwelling, in years 2002-2011 on a level of NUTS4, i.e. LAU1 is reported by Statistical Office of the Slovak Republic. The NUTS statistical territory unit is a standard of hierarchical division of territory areas of the states within the EU for regional statistics purposes. LAU 1 and it corresponds with the districts in the Slovak Republic.

According to the methodology of Statistical Office of the Slovak Republic, a dwelling is a living room or a group of living rooms connected together with other dwellings creating a building with its own closing facility designated for a permanent living. The completed dwellings in the year are those ones which have the ability of usage after completion of the building was confirmed by the issue of a housewarming decision. Completed dwellings include the dwellings built by new construction, reconstruction or by another construction method. The under construction dwellings are those ones whose construction began and it was not completed to the end of the given period. The dwellings in a starting phase are those ones whose construction has started in a given year on the basis of the issued construction

permission. A number of the completed dwellings is shown on a housewarming decision. Average living area of completed dwelling is the sum of area of all rooms in m².

Unemployment is an imbalance in the labor market. According to the methodology of Statistical Office of the Slovak Republic, the registered unemployment rate is calculated according to the following formula: number of disposable job applicants divided by number of economically active persons for a previous year from the Labour Force Sample Survey. The unemployment rate thus characterizes the labor market situation and, by extension, the economic situation of the population.

Herfindahl's geographic index of concentration (Tiepoh et al., 2004) is considered (Michálek, 2012) to be an ideal and trustworthy measurement of the geographical concentration because it takes into account differences in a size of regions. It can be defined as follows:

$$HHGI = \sum_{i=1}^N (y_i - a_i)^2 \quad (1)$$

where N is a number of the regions, y_i ($i = 1, 2, \dots, n$) is a share of the region on the observed character (income, production, employment), a_i ($i = 1, 2, \dots, n$) is a share of the area of the region on the territory of the country. We introduce new Herfindahl's demographical index of concentration by an analogical way:

$$HHDI = \sum_{i=1}^N (y_i - p_i)^2 \quad (2)$$

where N is a number of the regions, y_i ($i = 1, 2, \dots, n$) is a share of the region on the observed character (a number of the completed dwellings, a number of the dwellings under construction, employment), p_i ($i = 1, 2, \dots, n$) is a share of the region of the inhabitants and also on the overall number of inhabitants of the evaluating area. Index HHDI has the values from interval $\langle 0, 1 \rangle$. In our case, if a share of the completed dwellings is equal to a share on a number of inhabitants, then a value of the index HHDI is equal to zero, which means that there is no concentration and no differences between LAU1 in this indicator.

Moran coefficient I (Ripley, 2005) is used to measure and test spatial autocorrelation. Moran coefficient indicates the degree of spatial dependency in an observed phenomenon. The significance of Moran coefficient can be assessed in the usual fashion by means of a randomization approach. Local spatial autocorrelation analysis is based on the Local Moran LISA statistics (Ord & Getis, 2002). Spatial clusters are locations with positive local spatial autocorrelation, i.e., locations showing up on the cluster map as high-high or low-low

locations. These are observations which have a similar value of the variable of interest as their neighbors. Spatial outliers are locations with negative local spatial autocorrelation, i.e., locations showing up on the cluster map as high-low or low-high locations.

Spatial error autoregressive model (Sanders, 2010) is following:

$$y = a + b x + u$$

$$u = cWu + \varepsilon$$

where a, b, c are unknown coefficients, y is dependent variable, x is independent variable, W is connectivity matrix, ε is random error.

GeoDa software was used.

2 Results and discussion

The situation with the starting dwellings shows an increasing trend after 2008. In this year, it is interesting to observe that an increase between the previous year and 2008 is almost by 10000 starting dwellings. This reality indicates a boom in a construction industry. A building trend is increasing in 2008 onwards which continues as a result of the economic crisis.

Tab. 1: Completed dwellings, starting and under construction dwellings in Slovakia (number)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Starting dwellings	14607	14065	16586	19796	20592	18116	28321	20325	16211	12740
Under construction dwellings	46271	39593	43981	48874	54086	55259	66122	67597	66596	64734
Completed dwellings	14213	13980	12592	14863	14444	16473	17184	18834	17076	14608
Average living area	76.6	71.8	78.5	73.4	71	70.2	70.2	70.2	71.5	71.8

Source: Statistical Office of the Slovak Republic

The most uniformity is reached in the starting dwellings and the least uniformity is achieved in the completed dwellings on the level LAU1. In 2002, the unevenness was at the same level in the completed dwellings and a under construction dwellings. However, with time, this difference between uniformity of the completed dwellings and under construction dwellings is increasing.

Tab. 2: Herfindahl's demographical index of concentration for completed dwellings, starting and under construction dwellings in Slovakia

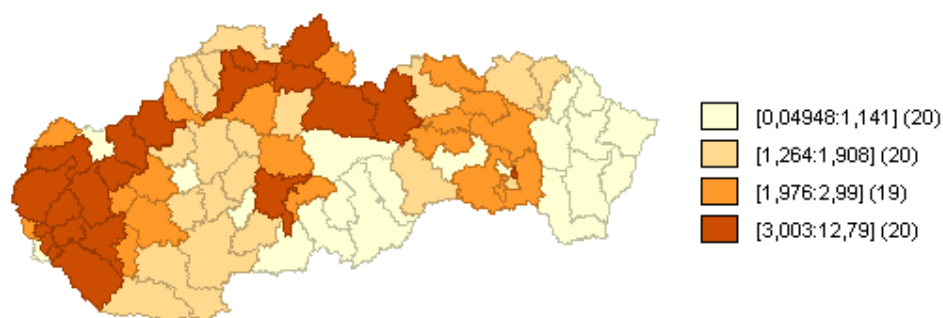
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Starting dwellings	0.0022	0.0029	0.0040	0.0058	0.0046	0.0028	0.0047	0.0021	0.0014	0.0008
Under construction dwellings	0.0194	0.0203	0.0214	0.0237	0.0247	0.0234	0.0232	0.0216	0.0213	0.0208

Completed dwellings	0.0199	0.0212	0.0244	0.0308	0.0330	0.0328	0.0302	0.0299	0.0282	0.0275
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Source: own calculations

In the picture Fig. 1, we can see that the lowest number of completed dwellings on 1000 inhabitants is in the east of Slovakia between the years 2002 and 2011. Most probably, it is caused by a worse economic situation of these LAU1 than in other parts of Slovakia which is a high unemployment rate.

Fig. 1: Average number of the completed dwellings on 1000 inhabitants in Slovakia on LAU1 level (2011)



Source: own calculations

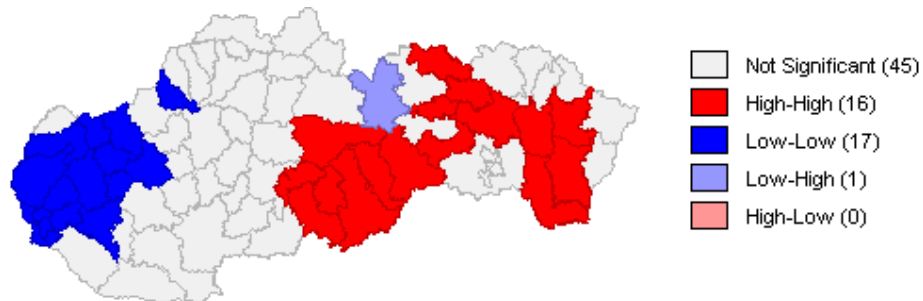
The Moran coefficient I is significant for level $\alpha \leq 0.001$ for unemployment rate, completed dwellings, starting and under construction dwellings on 1000 inhabitants in Slovakia. But there is no spatial autocorrelation for average living area.

Tab. 3: Moran coefficient for unemployment rate, completed dwellings, starting and under construction dwellings on 1000 inhabitants, average living area in Slovakia

Moran coefficient I	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Unemployment rate	0.6918	0.7156	0.7170	0.6991	0.7072	0.6758	0.6795	0.6626	0.6682	0.6800
Starting dwellings on 1000 inhabitants	0.3168	0.4084	0.3718	0.6063	0.6331	0.5513	0.5547	0.3647	0.5030	0.2491
Under construction dwellings on 1000 inhabitants	0.2103	0.3599	0.3243	0.4718	0.5133	0.5718	0.5696	0.5904	0.5782	0.5171
Completed dwellings on 1000 inhabitants	0.3163	0.2925	0.5019	0.5240	0.4886	0.5186	0.3154	0.5685	0.5660	0.4684
Average living area	0.0864	0.1750	0.0381	-0.0417	0.1297	0.0173	0.1385	0.1408	0.0218	-0.0378
P value for Moran I for average living	0.102	0.013	0.237	0.364	0.032	0.312	0.025	0.026	0.281	0.376

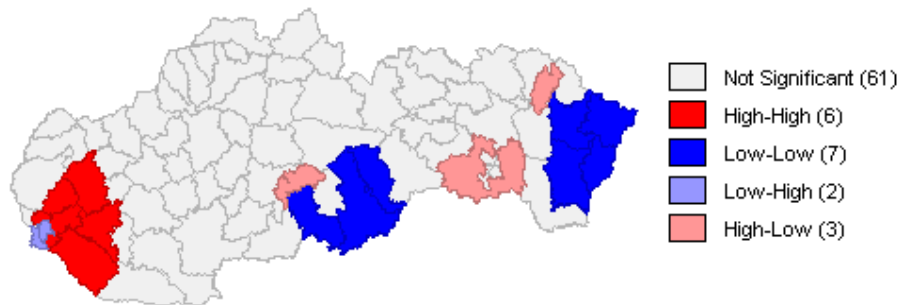
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Fig. 2: LISA cluster map for unemployment rate in Slovakia on LAU1 level (2011)



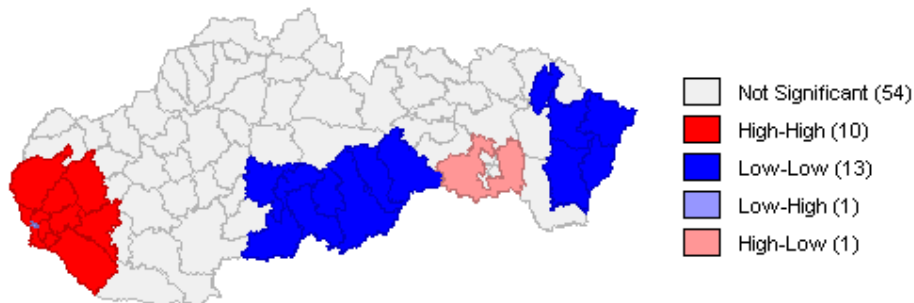
Source: own calculations

Fig. 3: LISA cluster map for average number of the starting dwellings on 1000 inhabitants in Slovakia on LAU1 level (2011)



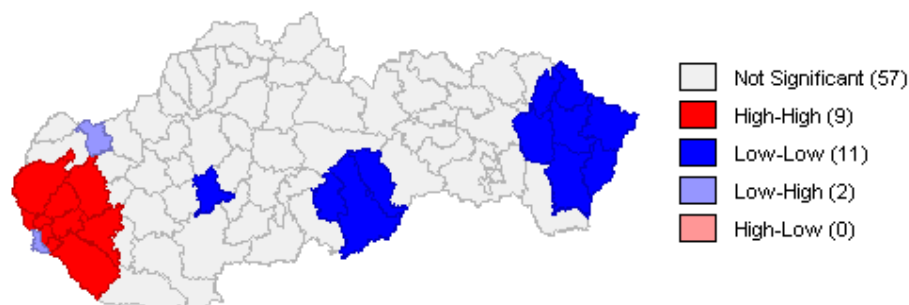
Source: own calculations

Fig. 4: LISA cluster map for average number of the under construction dwellings on 1000 inhabitants in Slovakia on LAU1 level (2011)



Source: own calculations

Fig. 5: LISA cluster map for average number of the completed dwellings on 1000 inhabitants in Slovakia on LAU1 level (2011)



Source: own calculations

Coefficients, its standard error, P-value and coefficient of determination for spatial error autoregressive model for starting dwellings on 1000 inhabitants ($= y$) and unemployment rate ($= x$) is in the table 4, for spatial error autoregressive model for under construction dwellings on 1000 inhabitants ($= y$) and unemployment rate ($= x$) is in the table 5, for spatial error autoregressive model for completed dwellings on 1000 inhabitants ($= y$) and unemployment rate ($= x$) is in the table 6. We see that all coefficients are statistically significant OKREM model or under construction dwellings on 1000 inhabitants. Coefficient of determination is higher than for classical regression, ie. the spatial aspect is significant in the analysed phenomena. For for starting dwellings on 1000 inhabitants is POMERNE N=IYKZ.

Tab. 4: Spatial error autoregressive model for starting dwellings on 1000 inhabitants (2011)

R-squared : 0,200020				
Variable	Coefficient	Std. Error	z-value	Probability
CONSTANT	3,446042	0,4873695	7,070696	0,0000000
UN11	-0,08139791	0,02938495	-2,770054	0,0056048
LAMBDA	0,306238	0,1447648	2,115418	0,0343942

Source: own calculations

Tab. 5: Spatial error autoregressive model for under construction dwellings on 1000 inhabitants (2011)

R-squared : 0,457153				
Variable	Coefficient	Std. Error	z-value	Probability
CONSTANT	13,86046	2,497587	5,54954	0,0000000
UN11	-0,1985662	0,1329401	-1,493651	0,1352668
LAMBDA	0,6301812	0,09989499	6,308437	0,0000000

Source: own calculations

Tab. 6: Spatial error autoregressive model for completed dwellings on 1000 inhabitants (2011)

R-squared : 0,402411				
Variable	Coefficient	Std. Error	z-value	Probability
CONSTANT	3,950974	0,7255922	5,445172	0,0000001
UN11	-0,1082577	0,0412009	-2,627557	0,0086001
LAMBDA	0,5230518	0,1171763	4,463804	0,0000081

Source: own calculations

Conclusion

The importance of housing in a long run highlights that most of the European countries support housing policy and contribute a certain percentage from GDP usually from 1 to 4 percent.

In the article, we evaluate a development of a number of completed dwellings from 2002 to 2011 on LAU1 level which corresponds to 79 districts of Slovakia depending on a social situation of inhabitants which depends on an unemployment rate. A new Herfindahl's demographic index of concentration was introduced by an analogical way such as a constructing geographical Herfindahl's index. This index highlights unevenness of a number of the completed dwellings depending on a number of inhabitants – potential buyers/tenants of the flats. We created spatial error autoregressive models for completed dwellings on 1000 inhabitants, starting and under construction dwellings on 1000 inhabitants.

Acknowledgment

This work was supported by the Slovak Scientific Grant Agency as part of the research project VEGA 1/0127/11 Spatial Distribution of Poverty in the European Union.

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