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ANALYSIS OF THE CORRELATION BETWEEN SOCIO-ECONOMIC DEVELOPMENT AND LAND PRICES – A STUDY OF THE ZAGNAŃSK MUNICIPALITY

Barbara Prus, Karol Król✉, Karolina Chrobot

Department of Land Management and Landscape Architecture, Faculty of Environmental Engineering and Land Surveying, University of Agriculture in Krakow, ul. Balicka 253c, 30-149 Kraków

ABSTRACT

The aim of the paper was to analyse the correlation between socio-economic development and the prices of undeveloped real estate, as illustrated with the example of the Zagnańsk municipality (Silesia province, Kielce district). The level of the municipality's socio-economic development was evaluated using the zero unitarization method, by means of the normalization of 12 diagnostic variables. The analysis of unit prices of properties was performed on the basis of data from the register of property prices and values, obtained from the District Office (Starostwo Powiatowe) in Kielce. Classification of administrative units was performed using the typology method. In order to determine the correlation between the level of development, and the prices of property as well as features that describe the surveyed object, Pearson's correlation coefficient (also referred to as Pearson's r) was applied. It was demonstrated that improving the conditions of socio-economic development significantly affects the increase in the prices of undeveloped land.

Key words: socio-economic development, real estate market, land property, correlation analysis, typology

INTRODUCTION

Socio-economic development is identified with the process of positive changes in the social, economic, technological, and cultural spheres [Helid and Raszek 2013], including economic and production conditions as well as structures and mechanisms of functioning of the economy, but also the changes that are taking place in the natural environment [Bielska 2012, Król et al. 2016, Semenova et al. 2016]. This phenomenon has a positive impact on the services sector and the infrastructure. Furthermore, it can be considered on different scales: either local or global. Among the categories of factors determining the socio-economic development, we can distinguish the following: (1) location, including the occurrence of valuable elements of the natural environment, natural resources, and cultural elements; (2) socio-economic, including the level of education of the residents, their economic and social activity, and the presence of external investors; as well as (3) technical and organizational, that is, the availability of technical and social infrastructure [Bański and Czapiewski 2008].

Research into the level of socio-economic development at the local level is based on a large number of variables describing, among others, the availability of services and the level of infrastructure provision [Kocur-Bera 2011], the socio-economic activity, and the natural conditions [Bielska et al. 2015], the sources of budget revenues, as well as the housing conditions, including the availability of properties and the value of real estate [Ziemiańczyk 2010, Król 2016]. The choice of variables should be supported by an in-depth analysis of the subject literature, as well as the spatial, temporal, and substantive scope and purpose of the analysis [Salomon 2010].

✉e-mail: k.krol@onet.com.pl

When analysing the relationship between the conditions of socio-economic development and the prices of real estate, we need to consider that the local value of real estate depends on a number of factors related to the characteristics of the property, and its immediate environment [Ustawa… 1997, Kuryj et al. 2000]. Nevertheless, among the factors affecting the value of real estate, we also need to include the considerations that go beyond the characteristics of the real estate itself, such as (geo)political, economic, environmental, and legal conditions. Price factors can be divided into: (1) physical and environmental, describing the characteristics of the natural and anthropogenic environment (including the terrain, the distance from water reservoirs and forests, the size and shape of the plots of land, the available utilities, the presence of access roads, and the flood risk [Kocur-Bera and Dudzińska 2014]); (2) economic, expressing the forces affecting the demand and supply of real estate, and correlations between them (including the state of affluence of the society, the state of economic development, the level of unemployment, and the available forms of crediting); (3) legal, that is, the forms of property ownership and management, the tax system, the spatial development plans, and the environmental protection requirements; (4) demographic, including the structure and size of families, the demographic situation in the region or in the country; (5) political, specifying the investment risk resulting from the political situation of the country; (6) social, such as for instance fashion and habits [Kucharska-Stasiak 2006]. The development of the real estate market also depends on socio-economic factors such as – *inter alia* – the wealth of the society, the level of inflation and savings, as well as the general economic situation and the situation on the labour market [Gawroński et al. 2014].

Any analyses of socio-economic development are most often performed in the spatial context, using a classification procedure that allows a multidimensional, spatial analysis of the phenomena. Taxonomic methods facilitate the grouping of specific objects according to the adopted criteria, and based on selected attributes, into smaller, and more homogenous sets [Prus and Król 2017]. The aim of the present work was to analyse the correlation between the level of socio-economic development and the prices of undeveloped land, as illustrated with the example of the Zagnańsk municipality.

DESCRIPTION OF THE RESEARCH AREA CHARACTERISTICS

Zagnańsk municipality is located in the northern part of the Silesia province (*Voivoship*), in the *poviat* (district) of Kielce (see Figure 1). It covers an area of

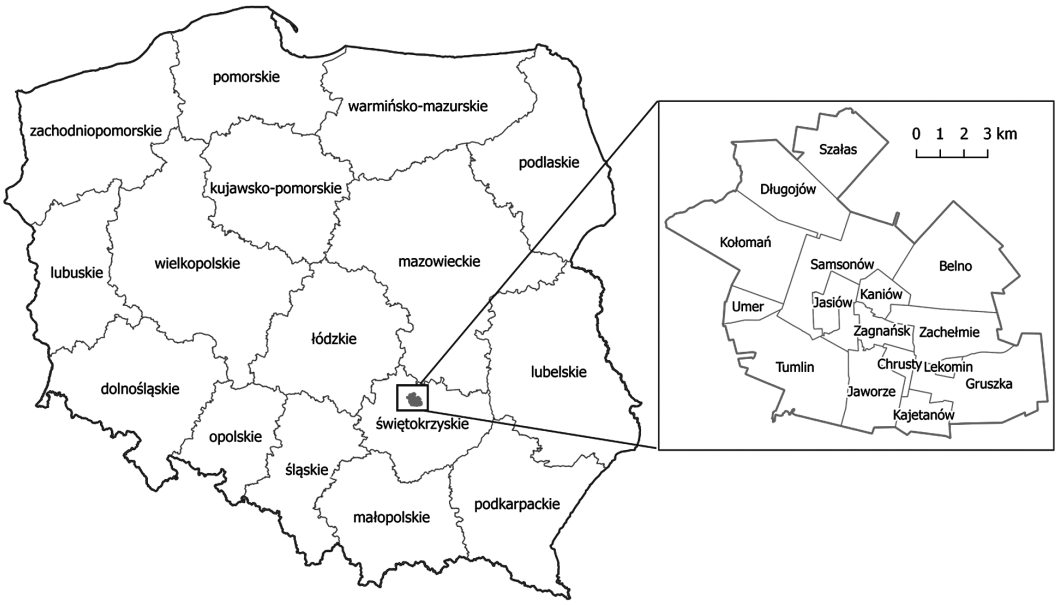

Fig. 1. Location and administrative units of the Zagnańsk municipality

about 124.37 km^2, which constitutes 5.6% of the *powiat*'s area. In 2015, the municipality counted less than 12.8 thousand inhabitants, and the population density amounted to 130 people per one square kilometre.

Forests accounted for 58.6% of the total area of the municipality, whereas agricultural land occupied 33.1%, of which arable land accounted for 62.0%, meadows, 21.0%, pastures, 14.2%, and orchards, 1.5%. The municipality is part of the Kielce Metropolitan Area. The south-eastern edge of the municipality is intersected with the S7 expressway, and the railway line serving the regional passenger traffic.

Poor quality of soils in the municipality (mainly V and VI valuation classes) is the reason behind low level of employment in the agricultural sector (only about 4%), while the high share of forest area led to the development of small-scale wood industry.

MATERIAL AND METHODS

The analysis of socio-economic development in the individual parts of the Zagnańsk municipality, and their dependence on unit prices, was performed based on the twelve variables, describing the demographic, social, and economic conditions as well as the level of technical infrastructure development. Statistical data was obtained from the Zagnańsk Municipal Office. The average unit price per square meter of real estate property was adopted as the thirteenth (dependent) variable (see Table 1).

Table 1. The initial set of variables adopted for the analysis of socio-economic development conditions

Villages in Zagnańsk municipality	Population	Area, km^2	Population density number of persons · 1 km^{-2}	Area of arable land, ha	Forest area, ha	Number of unemployed persons	Number of entities registered in the REGON register	Number of households	Number of households connected to the sewage network	Number of households connected to the municipal water supply network	Number of households connected to the gas network	Number of shopping and service facilities	Average unit price, PLN · 1 m^{-2}
	x1	x2	x3	x4	x5	x6	x7	x8	x9	x10	x11	x12	x13
Bartków	581	1.77	328	97.6	8.5	23	87	176	109	174	88	4	48.29
Belno	604	15.04	40	233.0	1171.0	42	49	192	31	188	96	3	27.44
Chrusty	377	4.82	78	73.5	337.1	30	20	111	39	106	55	4	–
Długojów	110	11.52	10	59.4	983.2	22	8	34	0	34	21	1	1.26
Gruszka	803	13.58	59	155.5	979.0	48	66	363	123	352	218	6	37.01
Jasiów	713	3.00	238	183.6	10.0	71	13	214	135	201	128	3	5.17
Jaworze	515	7.04	73	121.3	492.5	15	71	176	92	172	88	2	55.63
Kajetanów	1215	3.49	348	195.7	7.5	97	56	260	125	252	156	8	27.42
Kaniów	1269	2.75	461	155.9	22.1	76	78	386	0	364	212	7	33.84
Kołomań	418	14.73	28	206.0	964.0	21	84	141	0	133	85	4	47.00
Lekomin	269	2.58	104	54.0	173.2	27	12	82	29	77	49	2	–
Samsonów	1183	12.35	96	271.8	648.1	59	64	370	214	359	185	12	31.30
Szałas	519	3.75	138	224.0	7.2	52	22	162	0	156	81	7	4.27
Tumlin	1433	14.82	97	335.9	865.8	36	118	448	181	439	224	12	51.33
Umer	437	2.48	176	131.6	24.2	35	51	132	30	126	79	4	25.02
Zachełmie	576	6.32	91	120.5	413.2	29	74	180	45	170	99	2	47.79
Zagnańsk	1748	4.33	404	35.8	179.4	49	175	564	395	558	284	22	68.20
Total	12770	124.37	103	2655.1	7286.0	732	1050	4093	1547	3861	2148	103	–

The taxonomic typology method was used for the analysis. The initial set of diagnostic variables was standardized using the zero-uniformization method [Kolenda 2006, Kukuła and Bogocz 2014], whereas transformation (1) was applied for stimulant variables, and transformation (2), for deterrent variables. Next, the value of the meta-variable was determined by adding up the values of all standardized diagnostic features. A conventional assumption was made that the synthetic index presents the level of socio-economic development for the individual villages of the Zagnańsk municipality, whereas the higher value of the indicator means a higher level of socio-economic development. This allowed us to subdivide the collection of multi-feature objects into homogeneous subgroups: with very high, and medium, average and low level of development, respectively [Ziemiańczyk 2010].

$$x'_{ij} = \frac{x_{ij} - \min_i \{x_{ij}\}}{\max_i \{x_{ij}\} - \min_i \{x_{ij}\}} \quad (1)$$

$$x'_{ij} = \frac{\max_i \{x_{ij}\} - x_{ij}}{\max_i \{x_{ij}\} - \min_i \{x_{ij}\}} \quad (2)$$

The analysis of unit prices of undeveloped land in the Zagnańsk municipality was made on the basis of data from the register of prices and property values, acquired at the District Office (Starostwo Powiatowe) in Kielce. The analysis encompassed 211 market transactions in the period from January 1, 2010 to December 31, 2015. These transactions covered 300 undeveloped land properties, located in 17 villages of the municipality concerned. The studies did not take into account the delays in the real estate market, in relation to the economic situation. Afterwards, we have conducted an analysis of the correlation between the transaction prices in individual villages and the values of features, which described the phenomenon of socio-economic development. We have calculated the linear correlation coefficients of r-Pearson between the values of the synthetic meta-variable and the average prices of undeveloped land. The results were interpreted using the Guilford scale.

RESEARCH RESULTS AND DISCUSSION

In 2010–2015, 211 transactions of purchase and sale of undeveloped land were recorded in the Zagnańsk municipality, covering a total of 300 plots of land. The subject of one transaction was usually one plot at one time (it was so in 75% of cases). There was only one case of a transaction involving six plots of land at the same time. The highest real estate turnover was recorded in the year 2011, and then in the year 2014. In these two years, a total of about 51% of all transactions were carried out, and almost 50% of all land properties subject to transactions in the analysed period were sold (see Table 2).

Table 2. Characteristics of the purchase transactions concerning undeveloped land in the years 2010–2015 in Zagnańsk municipality

Year of transaction		2010	2011	2012	2013	2014	2015
Total number of transactions		28	49	31	21	58	24
Area of land properties being sold, in hectares		13.4964	20.3727	9.7092	8.8102	20.0571	8.6748
Average area of land property, in hectares		0.4820	0.4158	0.3132	0.4195	0.3458	0.3615
Unit transaction prices	Average PLN · 1 m^{-2}	43.93	39.27	28.28	39.76	48.19	32.6
	Standard deviation σ	48.10	54.06	28.99	29.92	43.06	31.61
	Minimum	0.67	0.15	0.24	0.95	1.24	1.40
	Maximum	183.4	254.42	119.4	115	166.67	103.57
	Coefficient of variation %	109.50	137.65	102.49	75.27	89.37	96.96

When analysing the transactions in individual years, it is noticeable that their number remained relatively constant (see Table 3). Each year, an average of 35 land properties were disposed of. Unit prices of these properties ranged from 0.15 to 254.42 PLN per one square metre. The trend line indicates that the price level in 2010–2015 slightly decreased, while maintaining some stability (see Figure 2).

Table 3. Analysis of purchase transactions conducted in the villages of Zagnańsk municipality

The villages of Zagnańsk municipality	Number of transactions	Total area of land properties being sold in hectares	Average plot size in hectares	Average unit price, PNL · 1 m^{-2}
Bartków	10	1.7881	0.1788	48.29
Belno	9	7.0199	0.7800	27.44
Chrusty	0	–	–	–
Długojów	1	2.7900	2.7900	1.26
Gruszka	22	8.4056	0.3821	37.01
Jasiów	4	2.2125	0.5531	5.17
Jaworze	12	4.4906	0.3742	55.63
Kajetanów	13	4.6507	0.3577	27.42
Kaniów	10	2.0009	0.2001	33.84
Kołomań	18	4.8447	0.2692	47.00
Lekomin	0	–	–	–
Samsonów	22	11.1902	0.5086	31.30
Szałas	14	10.9886	0.7849	4.27
Tumlin	24	4.8776	0.2032	51.33
Umer	9	10.9982	1.2220	25.02
Zachełmie	23	2.8735	0.1249	47.79
Zagnańsk	20	1.9893	0.0995	68.20

The agricultural land was the most expensive of all the properties bought and sold in the analysed period. It achieved an average unit price of PLN 52.25 per 1 square metre. Relatively small average area of the sold plots of land indicates that they were often purchased for land with intention of building on. Properties for the construction purpose require a relatively small area, however, they are sold at much higher prices. This hypothesis is confirmed by the trends presenting in the real estate designated for development other than farming. As part of these transactions, relatively small real estate properties were sold (with an average area of 0.2221 ha), reaching average unit prices of 44.78 PLN per 1 square metre.

The highest unit prices were found in the villages of Tumlin (PLN 51.33 · 1 m^{-2}), Jaworze (PLN 55.63 · 1 m^{-2}), and Zagnańsk (PLN 68.20 · 1 m^{-2}). It can be concluded that the proximity of Kielce town, and the high level of socio-economic development, play an important role here. This is also linked to the sale of more real estate properties with a smaller plot area, intended for development, because the aforementioned areas are not agricultural in character.

According to the division presented by Hopfer and Kowalczyk [2001], the development phases of the real estate market include: the initial phase (rapid price increase, no periodic fluctuations); development phase (lower rate of price increase, occurrence of periodic fluctuations, upward trend); and free market phase (stoppage of the price increase). The test results lead us to the conclusion that the Zagnańsk municipality in the analysed period was in the transition phase between the development phase and the free market phase – as the level of unit prices began to decline, although, average prices fluctuated greatly.

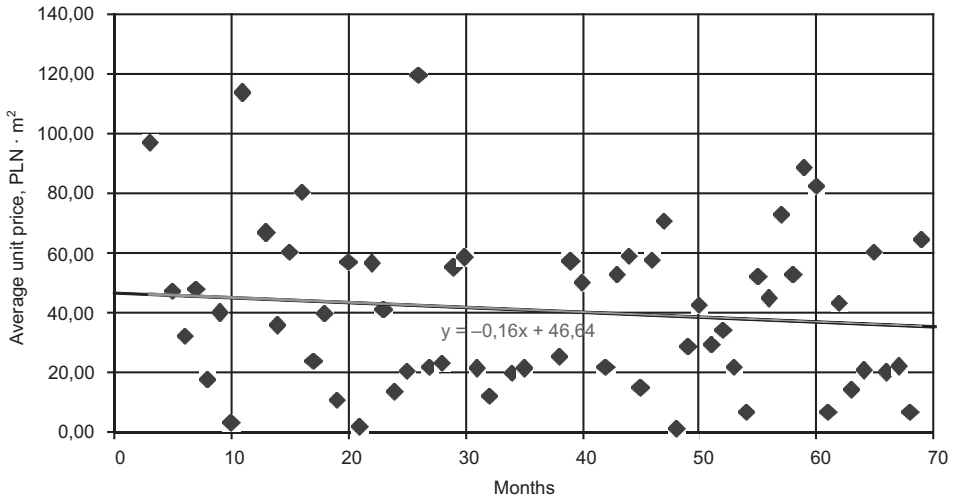

Fig. 2. Distribution of unit prices in the analysed period (in months)

The synthetic index describing the conditions of socio-economic development, based on the adopted set of 12 diagnostic variables, has assumed values between 1.85 and 8.80. This indicates large discrepancies in the socio-economic development between the particular villages. The most numerous are the type of villages with an average level of development (8 villages). Furthermore, when analysing the spatial distribution of villages according to the meta-indicator of development, one can notice a large dispersion of their respective types. Villages at a high level of development are located in the central part of the municipality, and near its south-western border, which may be conditioned by the close proximity of Kielce town. The weakest development conditions were recorded in the smallest towns, located in the central part of the municipality (see Figure 3).

The analysis of r-Pearson linear correlation coefficients showed a strong correlation between the price, and the number of business entities registered in the REGON statistical register. According to the Guilford scale, the correlation coefficient of 0.905 indicates an almost complete correlation. This may mean that the large number of business entities strongly affects the price of undeveloped land properties in the local real estate market. High, positive correlation was also recorded between the prices, and the number of farms, which means that with the increase in the number of farms in the given village, the price of the undeveloped land is growing (as there is an increase in demand). The average positive correlation

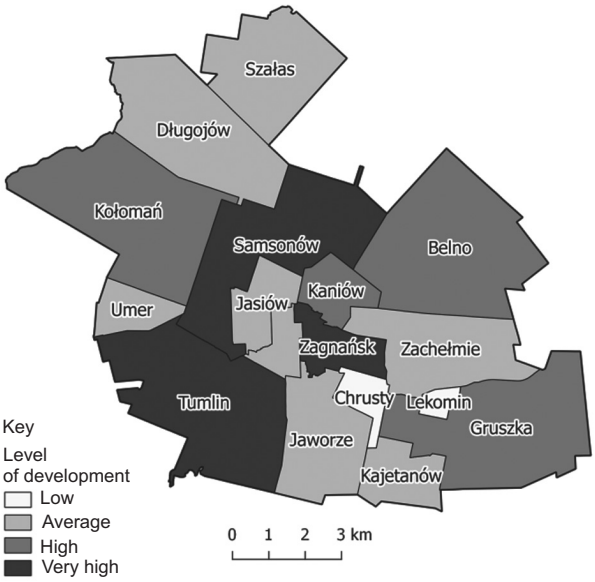

Fig. 3. Socio-economic development conditions in the villages of Zagnańsk municipality

also occurs in the case of the first variable (population size), which means that the price of land properties is higher in towns with a larger population and such towns, in which there are commercial and service facilities – variable x12 (0.452). The value of real estate decreased along with the increase in the number of unemployed persons, as indicated by the average negative value of the correlation coefficient (–0.309, see Table 4).

Table 4. Comparison of correlation coefficients between the average unit price (X_{13}) and the variables describing the conditions of socio-economic development

Variable	X13	X12	X11	X10	X9	X8	X7	X6	X5	X4	X3	X2	X1
Correlation coefficient	1	0.452	0.498	0.547	0.515	0.538	0.905	–0.309	0.083	–0.134	0.188	0.098	0.478

Source: own study employing the Numerical Taxonomy software

The correlation coefficient calculated for the value of synthetic meta-variable and the level of average prices in villages reached the value of 0.712, which according to the Guilford scale means high positive correlation. The calculations we have carried out demonstrate that the improving conditions of socio-economic development have a strong impact on the increase in the prices of undeveloped land in the municipality concerned.

In the areas with weak conditions of socio-economic development, no buy-sell transactions were recorded, which may indicate a low interest of buyers in these areas.

CONCLUSIONS

In the analysed period, the real estate market in the Zagnańsk municipality remained in the transition phase between the development phase and the free market phase. This is due to periodic fluctuations in unit prices and a slow decline in their level. Despite disproportions in terms of conditions for socio-economic development in the individual villages of the Zagnańsk municipality, the latter remains attractive to investors. The highest numbers of transactions were recorded in the villages of Tumlin (24), Zachełmie (23), Gruszka (22), Samsonów (22), and Zagnańsk (20). Villages of Zagnańsk, Tumlin, and Samsonów belong to the group of areas with a high level of economic development, thus attracting large numbers of investors. The role played by the location is also evident – the areas located in the southern part of the municipality are closer to the capital of the province, which is the town of Kielce.

The dependence of the unit price on the surface area in the case of transactions for each type of property shows similar trends: the smallest-sized properties reached the highest unit prices.

The correlation coefficient between the unit price of the property and the synthetic coefficient describing the socio-economic development has reached a high value. The unit price of real estate is strongly correlated with the number of business entities registered in the REGON system. The increase in the number of business entities causes an increase in demand for real estate, and it fosters the development of the services and infrastructure sectors. This affects the increase in the attractiveness of the areas, and a further increase in property prices. The creation of new enterprises generates new jobs, which in turn increases the demand for real estate. The increase in socio-economic development is therefore associated with an increase in unit prices of real estate properties.

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ANALIZA ZALEŻNOŚCI POMIĘDZY ROZWOJEM SPOŁECZNO-GOSPODARCZYM A CENAMI NIERUCHOMOŚCI GRUNTOWYCH – STUDIUM GMINY ZAGNAŃSK

ABSTRAKT

Celem pracy była analiza zależności pomiędzy stopniem rozwoju społeczno-gospodarczego a cenami nieruchomości gruntowych niezabudowanych na przykładzie gminy Zagnańsk (woj. śląskie, powiat kielecki). Stopień rozwoju społeczno-gospodarczego gminy oceniono z wykorzystaniem unitaryzacji zerowanej w drodze normalizacji 12 zmiennych diagnostycznych. Analizę cen jednostkowych nieruchomości wykonano w oparciu o dane z rejestru cen i wartości nieruchomości, pozyskane w Starostwie Powiatowym w Kielcach. Klasyfikację jednostek administracyjnych wykonano metodą typologii. W celu określenia zależności pomiędzy stopniem rozwoju a cenami nieruchomości i cechami opisującymi badany obiekt zastosowano współczynnik korelacji liniowej r-Pearsona. Wykazano, że poprawiające się warunki rozwoju społeczno-gospodarczego silnie wpływają na wzrost cen nieruchomości gruntowych niezabudowanych.

Słowa kluczowe: rozwój społeczno-gospodarczy, rynek nieruchomości, nieruchomości gruntowe, korelacja, typologia