COMPENSATION FOR REAL PROPERTIES ACQUIRED FOR ROADS IN DIFFERENT PROCEDURES - COMPARATIVE ANALYSIS

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Abstract [1]

Real properties acquired for the so-called public purpose, such as road investments, generate a one-off financial indemnity in the form of compensation paid to the expropriated owner. Due to the different possible modes of expropriation (pursuant to the Real Estate Management Act or the Special Road Act), the amount of the compensation due may be determined in different ways, which entails a variety of results. The article compares the compensation levels determined in two possible procedures: basing on the predominant use of the adjacent areas or on data from the transactions of real properties intended for public roads.

The conducted analyses demonstrated that the differences between these two types of compensation for land intended for development, established under two different expropriation procedures, are insignificant.

1. Introduction

Land acquisition for public purpose in Poland is regulated by law and the rules of real estate valuation. The article (ŹRÓBEK, WALACIK 2008b) introduces the procedures of land acquisition for public road construction. The problem of determining the compensation level in the real estate expropriation procedure for the so-called important public purpose is often a complex one. The occurring difficulties may arise, for example, from the possible complexity of the legal status of the expropriated real property or difficulty in determining its market value which, according to the provisions of law, is intended to provide the basis for compensation. In this publication, the legal aspect is omitted in order to concentrate on the very question of the valuation of real estate which becomes the property of the State Treasury or the local government unit as part of the process of land acquisition for public roads.

The consolidated text of the so-called Special Road Act *on the special rules for the preparation and implementation of investment in public roads* of 22 October 2008 (Journal of Laws No. 193, item 1194), introduced a new type of decision – authorizing the implementation of a road investment (the so-called ZRID decision). This decision has replaced several separate administrative procedures and, after (TREMBECKA 2011a), is a type of a consolidated administrative decision which results in the

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following consequences:
- – determines the location of a road investment,
- – approves property subdivision,
- – transfers property rights to real properties within the investment boundaries,
- – approves a construction design and grants building permission,
- – restricts the use of neighboring properties in order to rebuild the infrastructure and roads of other categories.

As noted by the author in the publication (TREMBECKA 2011b), the emerging issues concern, e.g. the determination of the amount of compensation for the acquisition of real estate, compensation for the expiry of limited rights in rem to the acquired real estate and increasing the compensation level. The amount of compensation is determined according to the state of the property on the date of issuing the decision authorizing the implementation of a road investment. This applies both to the legal status and the technical and functional condition of the expropriated property and its surroundings. Due to the possible considerable time lapse (even as many as 30 days) between the issuance of the decision and the determination of the amount of compensation, the condition of the real estate often changes significantly as a result of works commenced by the investor. It is, therefore, necessary to rely on a reliable survey report describing the condition of the structure on the date the decision authorizing the implementation of a road investment was issued, as the valuation carried out at that time may prove to be ineffective due to, inter alia, the possibility of appealing it.

Detailed rules for determining the amount of compensation for expropriated properties are set out in Section 5, Chapter III of the *Real Estate Management Act*. From these records it follows that the amount of compensation is equal to the value of the ownership rights, perpetual usufruct rights or limited rights in rem, which the deprived person is entitled to. If the limited rights in rem are established on the expropriated property, the compensation level is reduced by their value.

2. The principles of determining the amount of compensation for the land intended for public roads

It is a standard procedure that the compensation is determined by the district governor as part of the expropriation decision. However, there are some exceptions to this rule: one is the parceling out of land for public roads, when a separate decision on compensation is issued. Pursuant to Art. 134 of the Real Estate Management Act, the basis for determining the compensation level is the market value of the real property, calculated according to the type, location, use, intended purpose and condition of the property. The detailed rules for determining the value of the land intended for public roads are set out in §36 of the Regulation of the Council of Ministers of 21 September 2004 *on the valuation of real estate and preparing an appraisal report* (Journal of Laws No. 207, item 2109, as amended).

Before 26 August 2011, in order to estimate the market value of land intended for public roads, it was required to use the comparative analysis of real estate valuation referring to the prices of real property with the same use. In the absence of similar transactions, it was necessary to base such value on the value of the land which the land had been parceled out from (or the adjacent land). However, when their value was lower (e.g. in the case of agricultural land), the result was to be increased by 50%.

Due to some doubts regarding both the first case (decreasing number of real estate transactions involving road properties and not exactly a market-based nature of these transactions) and the second case (imposed value increase factor), as of 26 August 2011, an amendment of the Regulation *on the valuation of real estate and preparing appraisal* entered into force. The main change relates to the acceptance of the real property expropriated from its current use for the valuation, without taking into account the decision authorizing the implementation of a road investment, with respect to the order of its determination: from the local zoning plan, through the study of conditions and directions of development or the zoning permission, to the actual use of the land. On the other hand, the value increase factor was determined to be no more than 50%. This method makes it possible to in fact bring the value of the expropriated property closer to the value of road properties during the real estate valuation process. In this study, the correction factor was calculated from the market data as follows:

$$K = \left(\frac{\hat{c}_{dr}}{\hat{c}_n} - 1\right) \cdot 100\% \tag{1}$$

where:

$\hat{c}_{dr}$ – the average value of the unit price of road properties,
$\hat{c}_{n}$ – the average value of the unit price of the land subjected to parceling.

The above definition of *K* is the result of the idea of bringing the determined market value of real estate closer to the prices of the properties intended for roads. In some situations, it is justifiable to additionally decrease or increase the amount of compensation. This may be due, e.g., to the limited rights in rem assigned to the expropriated property, which, as had been mentioned above, justify the reduction of compensation (the amount of compensation for the expiry of limited rights in rem is paid to persons entitled to them) or a quick release of the real estate, which allows for its increase. However, the examples analyzed in this paper do not take these situations into account, assuming their proportionally equal influence on the final amount of compensation determined in various variants.

3. Research topic

The first objective of this study is the valuation of two different undeveloped real properties, occupied for public roads, located in different parts of Krakow (Nowa Huta and Podgorze) - for the purpose of calculating the amount of due compensation, in two legally permitted ways. The second objective of the work is the statistical analysis of the obtained results and their comparison.

The first variant assumes the acquisition of the real estate basing on the decision to authorize a road investment. The second variant involves expropriation based on the decision on the location of a public purpose, as part of the administrative expropriation procedure required by the Real Estate Management Act. The parcelling out of land for public roads is one of the main public purposes set out in Article 6 of the Act. The performed calculations demonstrate how the expropriation procedure affects the amount of possible compensation. According to the local land use plan, both real properties are intended for single family housing, and their use is predetermined in the variant which allows for the existing land use to be taken into account.

The most frequent base for compensation is market value (in special situations - cost value) estimated by qualified property valuers. The most common way of estimating the value is the pair sales comparison method, which is one of the methods of the sales comparison approach (Źróbek, Walacik 2008a). The market values of the expropriated properties were estimated in the comparative approach using modified paired comparison analysis. In this algorithm, the unit market value of real estate is calculated according to the following formula:

$$w = \hat{c} + \sum_{i=1}^{m} \Delta c_{ij} \cdot (\bar{a}_i - \hat{a}_i) \qquad (2)$$

where:
$\hat{c}$ – the average value of unit prices of the real properties being compared,
m - the number of the analyzed, price-determining attributes of premises,

$\Delta c_{i/j} = \frac{k_i \cdot (c_{max} - c_{min})}{a_{j_{max}} - a_{j_{min}}}$ – the quota influence of the unit of a given attribute on the spread of prices of properties being compared,

k_i – the weight of the *i*-th attribute in the price spread determined at the stage of market analysis,

c_{max}, c_{min}, $a_{j_{max}}$, $a_{j_{min}}$ – extreme values of the analyzed variables,

$\bar{a}_i$ – the value of the *i*-th attribute of the real property being valued,

$\hat{a}_i$ – the average value of the *i*-th attribute of the real properties being compared.

3.1. Estimating the amount of compensation for the real property expropriated under the Special Road Act - Variant I

During the acquisition of a real property under the Special Road Act, in order to determine the amount of compensation, the valuation may be based on the value of the land which the parcel was separated from, or the value of adjacent land if the intended use of the real estate, in line with the purpose of expropriation, increases its value. This forms the grounds for relying on the prices of land intended for development, since this was the primary purpose of the expropriation.

As a result of the analysis of the local market of land intended for development, four key attributes of real properties were selected: **location** with respect to the city center, also including the immediate

surroundings, the **surface area** of the real property, **access,** taking into account the type of access road and the convenience of reaching the city center, and the **technical infrastructure**. These attributes were used to describe 16 plots of land collected in the database of undeveloped real estate intended for development, compiled in Table 1.

Table 1

Database of land property intended for development

No.	Cadastral unit, plot number	Surface area [m²]	Location	Access	Technical infrastructure	Transaction price c_{n_i} [PLN/m²]	$c_{n_i} - w_1^I$	$c_{n_i} - w_2^I$	$c_{n_i} - \hat{c}_n$
1	Nowa Huta 99/10	159	2	2	2	230.19	3.93	41.97	39.77
2	Nowa Huta 270/5	105	0	1	1	166.45	-59.81	-21.77	-23.97
3	Nowa Huta 240/12	302	0	0	0	129.14	-97.12	-59.08	-61.28
4	Nowa Huta 156/14	499	2	2	2	230.46	4.20	42.24	40.04
5	Nowa Huta 32/4	123	0	1	1	178.50	-47.76	-9.72	-11.92
6	Nowa Huta 256/2	406	2	2	2	214.26	-12.00	26.04	23.84
7	Nowa Huta 257/2	402	2	2	1	214.20	-12.06	25.98	23.78
8	Nowa Huta 258	438	2	2	2	215.34	-10.92	27.12	24.92
9	Podgórze 106	388	1	0	1	154.64	-71.62	-33.58	-35.78
10	Podgórze 513/10	418	0	0	0	149.04	-77.22	-39.18	-41.38
11	Nowa Huta 261	381	2	1	1	198.82	-27.44	10.60	8.40
12	Nowa Huta 255/2	479	2	2	1	216.15	-10.11	27.93	25.73
13	Nowa Huta 58/9	373	2	2	2	233.65	7.39	45.43	43.23
14	Podgórze 150/5	388	1	1	0	154.64	-71.62	-33.58	-35.78
15	Podgórze 178	89	2	1	2	157.30	-68.96	-30.92	-33.12
16	Nowa Huta 551/1	162	2	2	2	204.01	-22.25	15.79	13.59
	average value	**319.5**	**1.375**	**1.313**	**1.250**	**190.42**			
N_1	Podgórze 268/7	172	2	2	2	X			
N_2	Nowa Huta 481	242	1	1	2	X			

Source: own study.

The author of this paper did not wish to focus on the methodology of market analysis, which she had already described in various previous publications, and, therefore, only one aspect was mentioned: that correlation and regression analysis were used to study the influence of particular attributes on the price of building land. As a result, it was found that the volatility of prices during the analyzed period (October 2014 to March 2016) was negligible. On the other hand, the weights of particular land attributes in determining their transaction prices were as follows: location - 0.30, access - 0.43, technical infrastructure - 0.27. The surface area turned out to be negligible.

Table 2

Calculating market values of real estate basing on building land

Denotations	Location	Access	Technical infrastructure
Real property N_1: $\bar{a}_i$	2	2	2
Real property N_2: $\bar{a}_i$	1	1	2
$\hat{a}_i$	1.375	1.313	1.250
k_i	0.300	0.428	0.272
$a_{j_{max}} - a_{j_{min}}$	2	2	2
$\Delta c_{i/j}$	15.68	22.36	14.21
N_1: $\bar{a}_i - \hat{a}_i$	0.63	0.69	0.75
N_2: $\bar{a}_i - \hat{a}_i$	-0.38	-0.31	0.75
Unit market value of the real estate	w_1^I = 226.26 [PLN/m²] w_2^I = 188.22 [PLN/m²]		

Market value of the real property being valued	W_1^I = 38 917 [PLN]	W_2^I = 45 549 [PLN]

Source: own study

Table 2 demonstrates the results of the subsequent stages of calculation related to the application of the modified Paired Comparison Analysis for the valuation of the two selected real properties.

Due to the fact that the correction factor K is calculated from the market data and demonstrates the relation between the prices of the land intended for roads and the land intended for the analyzed use (here: for development) in the local market - data on real estate transactions involving road parcels are needed as well. Taking into account the main objective of these considerations: a comparison of the amount of compensation determined in two variants of the expropriation mode, a database of road parcels from the same market was collected. If there was no possibility of collecting sufficient amounts of such data, the correction factor K could be estimated on the basis of data sets from another, similar market. Table 3 contains information on real estate transactions involving road parcels. It covers transactions concluded between March 2014 and March 2016. Following market analysis, two attributes were considered to be price-determining: **the value of neighboring land**, which informs us about the value of the land surrounding the property being valued, and **location** relative to the city center. These attributes determine the price of road properties, with weights of 0.58 and 0.42, respectively.

Table 3

Database of land properties intended for roads

No.	Cadastral unit, plot number	Surface area [m²]	Worth	Location	Transaction price c_{dr_i} [PLN/m²]	$c_{dr_i} - w_1^{II}$	$c_{dr_i} - w_2^{II}$	$c_{dr_i} - \hat{c}_{dr}$
1	Krowodrza 274/1	863	0	2	254.08	-93.60	-26.60	-18.35
2	Krowodrza 273/1	57	3	3	516.05	168.37	235.37	243.62
3	Podgórze 148/4	27	3	2	300.00	-47.68	19.32	27.57
4	Podgórze 42/23	398	2	3	193.78	-153.90	-86.90	-78.65
5	Podgórze 230/10	516	3	3	537.06	189.38	256.38	264.63
6	Podgórze 235/20	1543	3	3	593.00	245.32	312.32	320.57
7	Podgórze 234/15	3104	3	3	592.78	245.10	312.10	320.35
8	Podgórze 247/2	57	3	3	328.07	-19.61	47.39	55.64
9	Nowa Huta 42/1	211	2	1	248.99	-98.69	-31.69	-23.44
10	Nowa Huta 239/1	134	1	1	200.00	-147.68	-80.68	-72.43
11	Nowa Huta 546/24	205	3	0	487.80	140.12	207.12	215.37
12	Podgórze 78/1	635	0	1	152.05	-195.63	-128.63	-120.38
13	Podgórze 66/1	3667	0	1	165.13	-182.55	-115.55	-107.30
14	Podgórze 73/10	82	3	2	364.00	16.32	83.32	91.57
15	Nowa Huta 101/12	179	0	0	121.84	-225.84	-158.84	-150.59
16	Podgórze 178/2	11	3	3	534.09	186.41	253.41	261.66
17	Krowodrza 168/1	18	0	2	228.61	-119.07	-52.07	-43.82
18	Podgórze 256/15	113	2	2	218.12	-129.56	-62.56	-54.31
19	Podgórze 66/2	216	0	0	122.79	-224.89	-157.89	-149.64
20	Podgórze 67/2	231	0	0	122.79	-224.89	-157.89	-149.64
21	Podgórze 374/8	233	2	2	195.11	-152.57	-85.57	-77.32
22	Podgórze 82/4	236	0	0	113.65	-234.03	-167.03	-158.78
23	Podgórze 216/1	509	0	0	111.00	-236.68	-169.68	-161.43
24	Krowodrza 844/7	859	3	2	316.64	-31.04	35.96	44.21
25	Podgórze 217/1	235	0	0	111.00	-236.68	-169.68	-161.43
26	Podgórze 218/1	259	0	0	111.00	-236.68	-169.68	-161.43
27	Podgórze 50/2	388	3	3	250.00	-97.68	-30.68	-22.43
28	Podgórze 200/1	610	0	0	111.00	-236.68	-169.68	-161.43
29	Podgórze 363/4	124	2	3	300.00	-47.68	19.32	27.57

		average value	542.1	1.517	1.552	272.43
N_1	Podgórze 268/7	172	2	2	X	
N_2	Nowa Huta 481	242	2	1	X	

Source: own study.

After the valuation was carried out basing on the original intended use (prior to expropriation) and, at the same time, the predominant use of adjacent areas, the correction factor was calculated according to the following formula (1):

$$K = \left(\frac{\hat{c}_{dr}}{\hat{c}_n} - 1\right) \cdot 100\% = \left(\frac{272.43}{190.42} - 1\right) \cdot 100\% = 43\% \tag{3}$$

Therefrom, the final amount of compensation for the expropriation of each of the two real properties amounts to:

$$w_1^{oI} = w_1^I \cdot 1.43 = 323.55 \text{ [PLN/m}^2] \qquad w_2^{oI} = w_2^I \cdot 1.43 = 269.15 \text{ [PLN/m}^2]$$

$$W_1^{oI} = W_1^I \cdot 1.43 = 55\,651 \text{ [PLN]} \qquad W_2^{oI} = W_2^I \cdot 1.43 = 65\,134 \text{ [PLN]}$$

3.2. Analysis of the accuracy of the result in the first variant

In order to reliably compare the amounts of compensation for the same real property determined in different ways, in the next stage of the calculations standard deviations of the obtained values were estimated with respect to the market data. As $w^o = w \cdot (1 + K)$, from the law of propagation of variance, the formula for the variance of the amount of compensation is determined:

$$V(w^{oI}) = (1 + K)^2 \cdot V(w^I) + (w^I)^2 \cdot V(K) \tag{4}$$

where:

$$V(K) = \left(\frac{1}{\hat{c}_n}\right)^2 \cdot V(\hat{c}_{dr}) + \left(-\frac{\hat{c}_{dr}}{\hat{c}_n^2}\right)^2 \cdot V(\hat{c}_n) \tag{5}$$

$$V(w^I) = \frac{\sum_{i=1}^n (c_{n_i} - w^I)^2}{n \cdot (n-1)} \qquad V(\hat{c}_{dr}) = \frac{\sum_{i=1}^m (c_{dr_i} - \hat{c}_{dr})^2}{m \cdot (m-1)} \qquad V(\hat{c}_n) = \frac{\sum_{i=1}^n (c_{n_i} - \hat{c}_n)^2}{n \cdot (n-1)} \tag{6}$$

which jointly leads to the following formula:

$$V(w^{oI}) = (1+K)^2 \cdot \frac{\sum_{i=1}^n (c_{n_i} - w^I)^2}{n \cdot (n-1)} + (w^I)^2 \cdot \left(\frac{1}{\hat{c}_n}\right)^2 \cdot \frac{\sum_{i=1}^m (c_{dr_i} - \hat{c}_{dr})^2}{m \cdot (m-1)} + (w^I)^2 \cdot \left(-\frac{\hat{c}_{dr}}{\hat{c}_n^2}\right)^2 \cdot \frac{\sum_{i=1}^n (c_{n_i} - \hat{c}_n)^2}{n \cdot (n-1)} \tag{7}$$

where:
$\hat{c}_{dr}$, $\hat{c}_n$ – as in the formula (1),
c_{dr_i}, c_{n_i} – transaction prices in the road and building real estate databases, respectively,
m, n – the number of road and building real properties, respectively
w^I – the market value of real estate, estimated in Variant I.

The last three columns of Table 1 contain the appropriate deviations for calculating the variances $V(w_1^I)$, $V(w_2^I)$, $V(\hat{c}_n)$. Basing on them, variance is calculated and followed by the standard deviation of the estimated amount of compensation for the owners of expropriated parcels:

$$V(w_1^{oI}) = (1 + 0,43)^2 \cdot 158.80 + 226.26^2 \cdot \left(\frac{1}{190.42}\right)^2 \cdot 875.81 + 226.26^2 \cdot \left(-\frac{272.43}{190.42^2}\right)^2 \cdot 73.20 \tag{8a}$$

$$V(w_2^{oI}) = (1 + 0,43)^2 \cdot 73.52 + 188.22^2 \cdot \left(\frac{1}{190.42}\right)^2 \cdot 875.81 + 188.22^2 \cdot \left(-\frac{272.43}{190.42^2}\right)^2 \cdot 73.20 \tag{8b}$$

and thus: $\sigma(w_1^{oI})$ = 42.10 [PLN/m²] and $\sigma(w_2^{oI})$ = 33.95 [PLN/m²]. The coefficients of variation, in both cases equal to $\lambda_1 = \lambda_2 = 0.13$, indicate a fully satisfactory accuracy of estimating the amount of compensation.

It should be clarified at this point that the modified algorithm of the paired comparison analysis, similarly to the classical algorithm, does not allow for the possibility of carrying out accuracy analysis in the strict sense of the term. The deviations $c_{n_i} - w^I$, occurring in the first formula (6), relate the result of the valuation to the market data, which it originated from. However, it is not derived directly from market prices, but from "adjusted" prices, due to differences in the attributes. Nevertheless, this is the most natural way of estimating the standard deviation of the result in this specific method.

3.3. Estimating the amount of compensation for real property expropriated under the Real Estate Management Act - Variant II

In the second variant of the land acquisition procedure, under the Real Estate Management Act, it is assumed that expropriation was carried out subject to a decision on the location of a public purpose investment, as part of the administrative expropriation procedure. In this case, the determination of the market value of the real property will be based on comparison with data regarding transactions of land intended for roads. A database of 29 transactions has been compiled in Table 3.

Table 4 presents the results of the subsequent stages of calculation, associated with the use of the algorithm described by Formula (2), for the valuation of the two selected properties. In this variant, the results obtained are equal to the amount of compensation for the expropriation of the analyzed plots of land.

Table 4

Calculations of market values of real estate basing on road parcels

Designations	*Worth*	*Location*
N_1: $\bar{a}_i$	**2**	**2**
N_2: $\bar{a}_i$	2	1
$\hat{a}_i$	1.517	1.552
k_i	0.583	0.417
$a_{j_{max}} - a_{j_{min}}$	3	3
$\Delta c_{i/j}$	93.67	67.00
N_1: $\bar{a}_i - \hat{a}_i$	0.48	0.45
N_2: $\bar{a}_i - \hat{a}_i$	0.48	-0.55
Unit market value of the real estate	$w_1^{II} = w_1^{oII}$ = **347.68 [PLN/m²]**	$w_2^{II} = w_2^{oII}$ = **280.68 [PLN/m²]**
Market value of the real property being valued	W_1^{II} = **59 801 [PLN]**	W_2^{II} = **67 925 [PLN]**

Source: own study.

3.4. Analysis of the accuracy of the result in the second variant

An estimate of the standard deviation of the calculated market values in this variant was obtained directly from the deviation of the predictions of values of expropriated properties in relation to the transaction prices of road properties. These deviations have been presented in the last columns of Table 3, and the deviation itself was calculated according to a formula analogous to the first formula (6):

$$V(w^{II}) = V(w^{oII}) = \frac{\sum_{i=1}^{m}(c_{dr_i} - w^{II})^2}{m \cdot (m-1)} \tag{9}$$

and thus: $\sigma(w_1^{oII})$ = 32.83 [PLN/m²] and $\sigma(w_2^{oII})$ = 29.64 [PLN/m²]. The coefficients of variation in both cases are respectively λ_1 = 0.09 i λ_2 = 0.11, which - also in this variant – indicate a fully satisfactory accuracy of estimating the amount of compensation.

3.5. Comparison of compensation results in different variants

Table 5 summarizes the earlier results of the calculated amounts of compensation relative to the unit of the surface area of the expropriated real properties. Also included are the results of parametric tests of significance comparing both variants, performed on a strict level of significance of 0.10.

As part of the test comparisons carried out with *F*-statistics with the Fisher-Snedecor distribution, in the following form:

$$F = \left(\frac{\sigma(w_i^{oI})}{\sigma(w_i^{oII})}\right)^2 \tag{10}$$

the hypotheses comparing the standard deviations of the determined compensations was verified for both properties:

$$H_0: \sigma\left(w_i^{o_I}\right) = \sigma\left(w_i^{o_{II}}\right) \tag{11}$$

against the hypothesis:

$$H_1: \sigma\left(w_i^{o_I}\right) > \sigma\left(w_i^{o_{II}}\right) \tag{12}$$

As there were no grounds to reject the hypothesis (11) – in order to verify the equality of the compensation levels determined in two variants, expressed by the hypothesis:

$$H_0: w_i^{o_I} = w_i^{o_{II}} \tag{13}$$

with respect to its alternative form:

$$H_1: w_i^{o_I} \neq w_i^{o_{II}} \tag{14}$$

the statistics of the *T*-Student distribution were used in the following form:

$$T = \frac{w_i^{o_I} - w_i^{o_{II}}}{\sqrt{\frac{n+m}{n \cdot m} \cdot \frac{k_I \cdot n \cdot \sigma^2\left(w_i^{o_I}\right) + k_{II} \cdot m \cdot \sigma^2\left(w_i^{o_{II}}\right)}{k_I + k_{II}}}} \tag{15}$$

where:

$w_i^{o_I}, w_i^{o_{II}}$ – compensations for the expropriation of real property *i* in various procedures: variants I and II,

$\sigma\left(w_i^{o_I}\right), \sigma\left(w_i^{o_{II}}\right)$ – standard deviations of compensation levels for the real property *i*,

n, m – the size of the databases which are the basis for estimating the amount of compensation,

k_I, k_{II} – the number of the degrees of freedom in different variants of determining the amount of compensation.

Table 5

Results of point estimation of compensation for the real properties expropriated using different procedures

Real property	Variant I	k_I	Variant II	k_{II}
N_1	$w_1^{o_I} = 323.55 \pm 42.10\ [\text{PLN/m}^2]$	15	$w_1^{o_{II}} = 347.68 \pm 32.83\ [\text{PLN/m}^2]$	28
N_2	$w_2^{o_I} = 269.15 \pm 33.95\ [\text{PLN/m}^2]$		$w_2^{o_{II}} = 280.68 \pm 29.64\ [\text{PLN/m}^2]$	
Comparison of standard deviations of compensation levels				
	Test function F		Critical value $F_{0.10}$	
N_1	1.64		1.74	
N_2	1.31			
Comparison of compensation levels in two variants				
	Test function T		Critical value $t_{0.10}$	
N_1	0.4455		1.6811	
N_2	0.2441			

Source: own study.

The values of the statistics (10) and (15) were summarized with the critical values of the relevant distributions read from the statistical tables. As demonstrated by the results contained in Table 5, none of the examined differences were identified as significant. Thus, both variants led to estimates of the amounts of compensation which were statistically at the same level.

4. Conclusions

The research objective, formulated at the beginning of this paper, was an attempt to demonstrate that representative market data and reliable market analyses should lead to very similar results in determining the amount of compensation for the acquisition of real properties resulting from the intended use of land for the construction of a public road in the area where homogeneity of its function (use) is maintained.

Market value, which is the basis for determining the amount of compensation, was, each time, calculated (two variants for two real properties) using the same, most popular property valuation method, i.e., paired comparison analysis.

It should be noted, however, that the study does not apply to specific situations, such as those resulting from the diversity of territories adjacent to the land subject to acquisition; nor does it apply to the situation of agricultural land, since these studies were not conducted for such land. The present study was simply a matter of comparing the results of calculating compensation levels in different manners when both methods were formally possible.

The studies performed at the end of the analyses concerned the discrepancies between both the amounts of compensation and its accuracy. They demonstrated the insignificance of the differences between the variants of the two modes of expropriation: under the Act on special rules of preparation and implementation of investment in public roads, the so-called Special Road Act, and pursuant to the Real Estate Management Act. In order to strengthen the reliability of such conclusions, similar studies should also be carried out on other local markets.

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