



The Relation Between the Attractiveness and Value of Districts in Warsaw

Radosław Trojanek¹,

¹. Assoc. Professor, Department of Microeconomics, Faculty of Management, Poznań University of Economics, e-mail: r.trojanek@ue.poznan.pl

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ABSTRACT

The aim of the paper is to answer the question to what degree the attractiveness of living in a particular district is reflected in the value of a given area. In this paper, it was undertaken to compare the attractiveness of the districts of Warsaw (information obtained from the study of MSO) to their value (assessed on the basis of the econometric model of apartment prices). By including location attributes (e.g. the location of apartments within districts) in the model, it will indirectly become possible to estimate their value.

1. INTRODUCTION

An apartment is a product that distinguishes itself from other goods produced and consumed by people. It satisfies the basic need of shelter. When choosing an apartment to buy, consumers consider two criteria: their preferences (regarding the size, type of building, and, first of all, location) and financial resources available to them (budget limitation). The primary need, i.e. location, may be satisfied practically everywhere (as regards location). It does not matter whether the apartment is located in the city centre or in its outskirts. The choice of a specific location depends on the preferences of a given consumer (budget limitations also play an important part here, but it may be assumed that if a consumer does not want to live in a given area, they would not buy an apartment there; the situation is different if they would like to settle in a given location, but they cannot afford it) and may depend on factors such as: the distance from work, schools, and hospitals, the accessibility of public transport, positive or negative neighborhood (both with regard to neighboring properties and environmental elements). Location is believed to be the main determinant of the value of a property. The choice of an apart-

ment in a particular district is determined by, among other things, the degree to which a specific location can satisfy consumers' needs. The more attractive a given area is (from the perspective of living there), the more valuable it may be.

In 2013, the Main Statistical Office (GUS – *Główny Urząd Statystyczny*) published a ranking of districts in Warsaw according to the attractiveness of living conditions. In the study, living conditions were defined as the level of infrastructure and factors affecting the degree to which needs are satisfied. The ranking and the characteristics of particular districts were compiled with the application of variables of a measurable character, which were available and complete: the number of people entitled to social security benefits per one thousand of the population, the proportion of the size of parks, greens, and urban greenery to the total area (%), the percentage of transportation areas to the total area (%), the number of people per one cultural institution, including cinemas, theatres and museums (combined), the number of children in kindergartens per one thousand children in the age of three to six, the number of pupils per one computer with Internet access in primary schools, the number of people per one pharmacy, the number of people per one library, the number of people per one store, and the length of cycling paths (in km). The ranking of districts was created on the basis of a synthetic indicator.

The value of a given location should be related to its attractiveness. How valuable a given area is may be established on the basis of undeveloped areas. What is a common problem with reference to cities is the inability to apply this method. Another solution is the application of the hedonic method to identify the features affecting the value of apartments. By including location attributes (e.g. the location of apartments within districts) in the model, it will indirectly become possible to estimate their value [Cheshire and Sheppard 1995; Rosenthal 1999; Rossi-Hansberg et al. 2010; Trojanek, 2010, 2015]. In this paper, it was undertaken to compare the attractiveness of the districts of Warsaw (information obtained from the study of GUS) to their value (assessed on the basis of the econometric model of apartment prices). The aim of the paper is to answer the question to what degree the attractiveness of living in a particular district is reflected in the value of a given area.

2. RESEARCH METHODOLOGY AND THE SOURCES OF DATA

Warsaw is the capital of Poland. It is the biggest and best developed Polish city, as well as an important scientific, cultural, political and business center. In statistics concerning social and economic development, it compares favorably to other largest Polish cities. In some areas, its potential is so high that it could be compared to the potential of the whole provinces of the country.

In order to estimate the value of districts in Warsaw the hedonic equation of apartments prices was constructed. By including location attributes (e.g. the location of apartments within districts) in the model, it will indirectly become possible to estimate their value. The essence of the hedonic method lies in the assumption that the price of heterogeneous goods may be described with its attributes. In other words, this method may be used for estimating the value of particular attributes of a given product. In order to identify the influence of individual features on the value of a specific good, econometric equations are constructed. The price of a given good is the response variable, whereas its quantitative and qualitative attributes are the explanatory variables. The equation may be recorded in the following way :

$$P = \beta_0 + \sum_{i=1}^K \beta_i X_i + u \quad ; (1)$$

where:

P – price of a good

β – regression coefficient
 X – attribute of a good (value driver)
 u – random error.

The key issue in hedonic methods is to choose the form of the regression function. The log-linear form of the regression function is most frequently used for studying changes in the prices in the real estate market in empirical research:

$$\log P = \beta_0 + \sum_{i=1}^K \beta_i X_i + u \quad ;(2)$$

In order to estimate the value of a district location the information on asking prices of dwellings in Warsaw in 2014 (4th quarter) year was collected. The use of asking prices is determined by the fact that in Polish conditions, the access to information on features of sold dwellings is limited. The data included in notarial deeds are the most valuable source of information on real estate prices, but they have one drawback – they do not provide a full description of a property.

Figure 1. Districts of Warsaw



Source: Author's creation

Table 1. The statistical characteristics of asking prices

District	Number of offers	Average area of apartment (m ²)	Average price (in €)	Average price per 1m ² (in €)
Bemowo	1196	65,17	116 467,61	1 797,57
Białołęka	832	58,05	87 888,33	1 534,62
Bielany	941	56,85	102 596,38	1 822,22
Mokotów	2128	65,19	145 673,63	2 192,23
Ochota	839	66,35	134 411,13	2 030,45
Praga-Południe	1468	61,31	113 422,32	1 847,34

Praga-Północ	360	53,62	90 010,05	1 687,01
Rembertów	36	56,32	88 703,70	1 600,66
Śródmieście	1569	65,09	168 561,01	2 590,06
Targówek	717	54,65	85 317,06	1 571,51
Ursus	458	59,60	97 626,98	1 652,53
Ursynów	1250	70,50	139 749,70	1 998,20
Wawer	88	73,95	121 872,56	1 666,34
Wesoła	46	70,63	103 797,77	1 496,00
Wilanów	433	81,60	177 308,03	2 141,49
Włochy	246	65,27	113 077,33	1 738,99
Wola	1053	54,43	110 738,99	2 015,12
Żoliborz	504	62,24	142 311,49	2 228,23
Total	14164	62,98	126 185,81	1 987,26

Source: Own calculations

3. THE ATTRACTIVENESS OF DISTRICTS IN WARSAW IN LIGHT OF MAIN STATISTICAL OFFICE RESEARCH

According to the results of the research made by Main Statistical Office the following four districts from group 1 had the highest level of the attractiveness of living conditions in Warsaw: Śródmieście, Mokotów, Ochota and Wola. The district of Śródmieście took the leading position in this group.

Śródmieście, as the oldest and relatively small district in terms of size, has dense urban housing as well as highly developed infrastructure and transportation network. Owing to its convenient transport connection with other districts, Śródmieście is an attractive location for company offices, public administration, cultural and entertainment centers, museums, galleries, cinemas and theatres.

Thanks to well-developed service, health and educational infrastructure, and to the access to cultural facilities, Śródmieście offers the most attractive living conditions.

Three districts adjacent to Śródmieście – Mokotów, Ochota, and Wola - also had a high level of the level of the attractiveness of living conditions. What contributed to the high level of this indicator in the district of Mokotów was the length of cycling paths – it accounted for more than 13% of the value of the indicator (equal to 100). In the district of Ochota, good access to cultural facilities – cinemas, theaters, museums (combined, measured as the number of people per one facility) was the main determinant: the value of this variable constituted almost 14% of the value of the indicator. In the district of Wola, in turn, it was the proportion of transportation areas to the total area of the district (over 15% of the value of the indicator) that had the most significant influence.

The group with the lowest level of the attractiveness of living conditions included three districts: Bemowo, Ursus and Białołęka, the last of which occupied the lowest position.

Białołęka, as a relatively young district, is currently experiencing investment boom, but its infrastructure is still out of proportion to the number of people settling there. Therefore, the low value of the attractiveness indicator was largely determined by poor access to health infrastructure (healthcare centers) and to cultural facilities (cinemas, theaters, museums). The values of these variables in the structure of values of the synthetic indicator were 0%.

The districts of Ursus and Bemowo also had a low level of the attractiveness of living conditions. What had a negative impact on the value of the synthetic indicator in Ursus was poor access to libraries and the big number of people per one computer with Internet access in

primary schools – the values of these variables accounted for 0% of the value of the synthetic indicator. In the district of Bemowo, it was low availability of pharmacies that represented 0% of the value of the indicator.

4. THE ESTIMATION OF DISTRICTS VALUE IN WARSAW

In order to estimate the value of district in Warsaw the hedonic model was built. By including location attributes (e.g. the location of apartments within districts) in the model, it was indirectly possible to estimate their value. In the analysis, asking prices of residential units in Warsaw in 2014 (4th quarter) were used. Empty and recurring records were removed as well as those in which a specific offer was not fully described. The recurrence of data was the result of announcing one offer by a few estate agents, thus they were repeatedly placed in a database. The next stage of the analysis involved checking the reliability of obtained data. The aim was to eliminate those offers which were, for no clearly specified reasons, far from the average. Moreover, it was assumed that the analysis will cover dwellings with the floor space of up to 200 m² and having no more than five rooms. Both fully owned dwellings and the ones with a limited right of ownership were examined. As a result of such selection the size of the database was reduced to 14 000 dwellings for sale. The number of offers gathered meets the requirements of the representativeness of a sample.

The research was done with the application of the hedonic method based on the housing price regression equation. The choice of qualitative and quantitative variables was limited by the availability of information in the database. Table 2 presents the variables used in the research.

Table 2. Qualitative and quantitative variables applied in the model

<i>Variable</i>	<i>Symbol</i>	<i>Description</i>
District	district1-Śródmieście, district2-Białołęka, district3-Bielany, district4-Mokotów, district5-Ochota, district6-Praga Południe, district7-Praga Północ, district8-Rembertów, district9-Bemowo, district10-Targówek, district11-Ursus, district12-Ursynów, district13-Wawer, district14-Wesoła, district15-Wilanów, district16-Włochy, district17-Wola, district18-Żoliborz	18 time dummy variables. If the dwelling is located in a given district, it takes the value 1; otherwise it takes 0.
Time of construction	Time of construction1 – before 1939 Time of construction2 – from 1945 to 1959 Time of construction3 – between 1960-1975 Time of construction4 – between 1976-1989 Time of construction5 – between 1990-2000 Time of construction6 – between 2001-2010 Time of construction7 – after 2010	7 time dummy variables. If the dwelling is placed in a building built in a given period, it takes the value 1; otherwise it takes 0).

Construction technology	technology1-traditional brick technology2 - mixed technology3 - prefabricated	3 time dummy variables. If the dwelling is located in a building made of a given material, it takes value 1; otherwise it takes 0.
Form of ownership	ownership	1- limited right of ownership, 2- full ownership
Standard	standard	It takes value 1 for dwellings with the lowest standard, and 5 for those with the highest.
Quality of building	building	It takes value 1 for buildings with the lowest quality, and 3 for those with the highest.
Height of building	Height	1- buildings up to 5 floors 2- buildings above 5 floors
Floor	floor	1 - ground and last floor 2 - intermediate floors 3 - first and second floor
Additional area	area	1 - if there is no basement 2 - if there is a basement

Source: Own compilation

Then, using GRET software, we estimated the parameters of functions in which the price of a dwelling was the response variable, while the explanatory variables included the location, construction material, standard, type of ownership, time of construction, floor space, number of rooms and other variables. Table 4 presents the results of the regression function for the equation.

Table 3. The estimates of price function parameters, used observations 1-14164, dependent variable: price log.

	<i>regression coefficient</i>	<i>standard error</i>	<i>t-student</i>	<i>p value</i>	
const	11,3522	0,0143588	790,6071	<0,0001	***
Ddistrict_2	-0,477067	0,00750582	-63,5596	<0,0001	***
Ddistrict_3	-0,260461	0,00665413	-39,1427	<0,0001	***
Ddistrict_4	-0,147571	0,00520647	-28,3438	<0,0001	***
Ddistrict_5	-0,198027	0,00661931	-29,9166	<0,0001	***
Ddistrict_6	-0,266504	0,00587118	-45,3920	<0,0001	***
Ddistrict_7	-0,361504	0,00889893	-40,6234	<0,0001	***
Ddistrict_8	-0,443971	0,0256188	-17,3299	<0,0001	***
Ddistrict_9	-0,271853	0,00653269	-41,6142	<0,0001	***
Ddistrict_10	-0,379562	0,00737574	-51,4609	<0,0001	***
Ddistrict_11	-0,386917	0,00852985	-45,3603	<0,0001	***
Ddistrict_12	-0,174074	0,00656624	-26,5104	<0,0001	***
Ddistrict_13	-0,421542	0,0168894	-24,9589	<0,0001	***

Ddistrict_14	-0,45963	0,0228305	-20,1322	<0,0001	***
Ddistrict_15	-0,187333	0,00902164	-20,7648	<0,0001	***
Ddistrict_16	-0,344587	0,0107282	-32,1199	<0,0001	***
Ddistrict_17	-0,23107	0,00623018	-37,0888	<0,0001	***
Ddistrict_18	-0,131848	0,00780331	-16,8965	<0,0001	***
Dtimeofconstruction_1	-0,0374379	0,0096962	-3,8611	0,0001	***
Dtimeofconstruction_2	-0,100612	0,00796085	-12,6383	<0,0001	***
Dtimeofconstruction_3	-0,153283	0,00674127	-22,7380	<0,0001	***
Dtimeofconstruction_4	-0,143609	0,00717501	-20,0152	<0,0001	***
Dtimeofconstruction_5	-0,108023	0,0067104	-16,0979	<0,0001	***
Dtimeofconstruction_6	-0,0145006	0,00511614	-2,8343	0,0046	***
Dfloor_1	-0,0341829	0,00322587	-10,5965	<0,0001	***
Dfloor_2	-0,0114898	0,00331378	-3,4673	0,0005	***
Dbuilding_1	-0,283078	0,00899395	-31,4743	<0,0001	***
Dbuilding_2	-0,339411	0,00593144	-57,2224	<0,0001	***
Dtechnology_1	0,0460111	0,00549811	8,3685	<0,0001	***
Dtechnology_2	0,0328019	0,00480477	6,8269	<0,0001	***
Dstandard_1	-0,131717	0,00575447	-22,8895	<0,0001	***
Dstandard_2	-0,0926496	0,00560709	-16,5237	<0,0001	***
Dstandard_3	-0,0599494	0,00473797	-12,6530	<0,0001	***
Dstandard_4	-0,0332245	0,0045453	-7,3096	<0,0001	***
area	0,0134715	5,98356e-05	225,1423	<0,0001	***
height	0,0100353	0,0032143	3,1221	0,0018	***
ownership	0,0232209	0,00333514	6,9625	<0,0001	***
area	0,0158152	0,002798	5,6523	<0,0001	***

Source: Own calculations.

On the basis of the obtained results it may be concluded that the explanatory variables used in the equation explain the fluctuations of dwelling prices in Warsaw in 4th quarter of 2014 in 89%. Moreover, all the variables applied in the model turned out to be statistically relevant.

Taking into account the aim of the paper, the statistical relevance of districts variables are important. The application of the log-linear model helps us to identify the percentage difference in the price of the same dwelling located within the district and reference one (in case of this research it is Śródmieście district). In our case, the value of the coefficient with district2 (Białołęka) variable is -0.477, which indicates that a dwelling located in the Białołęka was about 38% ($\exp(-0,477) - 1$) cheaper than the same dwelling located in Śródmieście in 4th quarter of 2014 in Warsaw.

Then the location value of districts indicators were calculated, taking the statistical relationship given by the equation:

$$V_i = 1 - [\exp(\text{regression coefficient of } i\text{-district}) / \exp(-0,477067)]$$

where:

V_i – location value of i – district.

This procedure allowed us to order the districts taking into account their values. In the table 4 ranking of value district and ranking of districts made by MSO are presented.

Table 4. Ranking of value district and ranking of districts made by MSO

<i>Place in MSO ranking</i>	<i>District</i>	<i>Value of the indicator</i>	<i>Place in our research</i>	<i>District</i>	<i>Value of the indicator</i>
1	Śródmieście	0,842	1	Śródmieście	1,00
2	Mokotów	0,678	2	Żoliborz	0,67
3	Ochota	0,673	3	Mokotów	0,64
4	Wola	0,657	4	Ursynów	0,58
5	Żoliborz	0,602	5	Wilanów	0,55
6	Praga-Południe	0,563	6	Ochota	0,53
7	Włochy	0,532	7	Wola	0,46
8	Ursynów	0,518	8	Bielany	0,40
9	Praga-Północ	0,495	9	Praga-Południe	0,38
10	Targówek	0,495	10	Bemowo	0,37
11	Wesoła	0,459	11	Włochy	0,23
12	Wilanów	0,401	12	Praga-Północ	0,20
13	Wawer	0,38	13	Targówek	0,17
14	Bielany	0,359	14	Ursus	0,15
15	Rembertów	0,354	15	Wawer	0,09
16	Bemowo	0,326	16	Rembertów	0,06
17	Ursus	0,3	17	Wesoła	0,03
18	Białołęka	0,265	18	Białołęka	0,00

Source: Own calculations.

The indicator values cannot be compared directly, however they may be useful in looking for similarities and differences between these two researches. The most attractive district in Warsaw according to the attractiveness of living conditions was Śródmieście. It turned out that from point of view of value it took a leading position as well. The worst district in MSO research it was Białołęka. In our research this district was characterized by the smallest value. The districts located on the right side of Vistula river had lower value than these on the left side. The results of the research show some similarities but they are not identical. It may be stated that attractiveness of living condition had some reflection in the value of districts.

5. CONCLUSION

The aim of the paper is to answer the question to what degree the attractiveness of living in a particular district is reflected in the value of a given area. In this paper, we undertake to compare the attractiveness of the districts of Warsaw (information obtained from the study of MSO) to their value (assessed on the basis of the econometric model of apartment prices). The application of the log-linear model helps us to identify the percentage difference in the price of the same dwelling located within the district and reference one (in case of this research it is Śródmieście district). The most attractive district in Warsaw according to the attractiveness of living conditions was Śródmieście. It turned out that from point of view of value it took a leading position as well. The worst district in MSO research it was Białołęka. In the research this district was characterized by the smallest value. The districts located on the right side of Vistula river had lower value than these on the left side. The results of the research show some similarities but they are not identical. It may be stated that attractiveness of living condition had some reflection in the value of districts however it is not completely the same. The explanation of this situation may be fact that in MSO research not all of factors influencing the attractiveness of living condition were included.

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