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Determination of Open-green Space's Effect on Around House Prices by Means of Hedonic Price Model; in Example of Ankara/Botanik Park

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ABSTRACT

Urban open green spaces which are an important component of urban area's uses provide physical and social development for a city and they also collect communal and cultural activities within their. Open green spaces, in addition to be associated with natural life are those spaces that create social and economic values. The aim of this study as an empirical study is to query the economic values created by Ankara/Botanik park. In this study, taking into account the house selling prices nearby the Botanik Park, the impact of distance to the Botanik Park has been evaluated on house prices. Hedonic price model has been employed to examine the relationship between the rate of proximity to the park and the house prices and as a result, increase the price of houses that are close to the Ankara/Botanik Park has been determined.

Key Words: Open-Green Space, Hedonic Price Model, Economic Value, Park, Turkey.

1. INTRODUCTION

Urban open-green spaces are those places that create environmental, social and economic values. To determine the economic values created by urban open-green spaces, the sophisticated methods of measuring exist. These methods are developed with aim of measuring the economic values of non-market public products via other products bought and sold in market.

To determine the economic values created by urban open-green spaces, the hedonic price model is widely used. In category of a product, hedonic price model is a method used to estimation the apparent prices of attributes that differentiate products. Rather than the pricing of a heterogeneous product, the pricing of that product's attributes constitutes the basis of hedonic price model. Hedonic price model are used to measure the value of the compound structure which is a combination of different attributes, or consisting of different combinations of the same attributes such as house. One possibility for measuring urban open green spaces amenities in monetary terms is to examine how much people are paying for such benefits in their housing.

As everyone knows, that the open green spaces raise the prices of surrounding residences, but proving the theoretical facts with rational methods is too difficult process such this sample study. The aim of this study is to explain the theoretical concept with rational method.

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The purpose of this study is to estimate the monetary value of urban park benefits reflected in dwelling prices. This paper therefore presents the results of an empirical study conducted in the district of Botanik Park in Ankara city.

In this study also the effect of urban green spaces is questioned and calculated on country tax via sample of Botanik park financially.

2. OPEN-GREEN SPACES AND THEIR EFFECT ON SUBJECTIVE PARAMETERS (ENVIRONMENTAL, SOCIAL, ECONOMIC PARAMETERS)

Open space is valued in urban areas for many reasons. It enhances aesthetics, improves community health, and provides various nature's services benefits. These benefits include absorbing storm-water runoff, reducing air pollutants, providing wildlife habitat, moderating wind, and even reducing urban heat island effects and energy demands [1-6]. Urban open-green spaces, which are open to all members of society, depend on the spatial structure and functional properties in city are those public places that create social, environmental and public economic values. City parks and open space improve our physical and psychological health, strengthen our communities, and make our cities and neighborhoods more attractive places to live and work [7]. Moreover, these areas increase the quality of environment, both ecologically and economically.

Crowe (1959) has divided open-green spaces into two groups: The first group is those areas that architecture is dominant on them. Small recreational parks and small squares located in moving and most congested parts of the city enter into this group. These areas serve more passive recreation areas such as seating and viewing areas. The second group of those is away from the crowd and bustle places of city places so people can find peace of mind and more recreation opportunities offered to them [8]. Tandy (1975) has divided open-green spaces into four categories according to the purpose of uses and positions in city's macro form, these categories are;

- Linear Recreation Areas
- Central Open Spaces
- Sports Fields
- Recreational Parks [9].

Urban open-green spaces produce environmental, social and economic values. ***The environmental values*** created by open-green spaces can be grouped under four headings: these groups can be summarized as;

- Sustainability
- Adaptation and mitigation to climate change
- Enhancement air quality
- Contribution to open space network [10].

Urban open-green spaces provide allow to air's movement in and around the city, filter dirty air, regulate the air's relative humidity of city and absorb sun's energy so prevent to remaining heat in open [7]. In addition, parks indirectly improved individuals quality of life through the numerous environmental benefits provided to an area including reduced noise pollution, regulated microclimate, and improved air quality [11]. Trees and the soil under them also act as natural filters for water pollution. Their leaves, trunks, roots, and associated soil remove polluted particulate matter from the water before it reaches storm sewers. Trees also absorb nutrients created by human activity, such as nitrogen, phosphorus, and potassium, which otherwise pollute streams and lakes. Green space in urban areas provides substantial environmental benefits. Trees reduce air pollution and water pollution, they help keep cities cooler [7].

The social values of open-green spaces can be grouped under two headings as individual and communal values [10]. Urban open-green spaces provide the opportunities for people to integrate with nature [9]. Open green spaces are the major resources for physical activity, especially walking, running and cycling. Regular physical activity is highly efficacious as a preventer of illness and as a therapeutic intervention for existing illness, also these areas increase the level of people's health by decreasing in the level of [12]. Open-green spaces provide benefits to residents both physical and psycho-hygienic in city and also play an important role in public education [13].

The economic values created by open green areas are considered as six main headings mentioned below:

- Market Value
- Enhancement Value
- Production Value
- Natural Systems Value
- Use and Nonuse Value and
- Intangible Value.

*Market Value****:*** The most direct measure of the economic value of open space is its real estate.
Enhancement Value: The existence of open space may affect the value of adjacent lands. This increased value is called enhancement or improvement value.
Production Value: Lands valued for open space are seldom idle, but rather are part of a working landscape vital to the production of goods and services valued and exchanged in markets. The economic value resulting from these lands is called Production value.
Natural Systems Value: Open space lands support natural ecosystem functions, this value is called Natural System Value.
Use and Nonuse Value: The use value is which value consist of direct or indirect various activities in open-green spaces. In contrast to use value, nonuse values consider an individual's possibility for future use and future generations, or their altruism.
Intangible Value: The intangible value of open space will likely increase with continued advances in ethical thought and ecological knowledge [14].

Open-green spaces create income for individuals and local government directly by increasing the price of surrounding houses. Homeowners are willing to pay a premium to live in close proximity to protected open space. As a result, open spaces add to the overall value of their housing stock. This increased wealth is captured by citizens through higher sales values of homes near protected open space, and also generates increased government revenues via larger property tax collections and transfer taxes at time of sale [15]. Open-green spaces reduce air conditioning costs in summer and heating costs in winter. In the right circumstances, when trees are strategically planted to provide either shade or to act as wind breaks, they can generate 10-50% savings in cooling expenses and 4-22% savings of heating costs [16]. In opinion of Mansfield'e (2002) increasing the forest cover in a city can reduce summertime's heat and wintertime's cold. Planting trees located around residences can reduce both cooling and heating costs by decreasing summer heat and winter cold. Saving of 1.9% to 2.5% on cooling costs for each per tree have been estimated for each residence so this fact provides a strong financial incentive to choose house's location around areas with dense trees covering [17]. Open-green spaces have an important role to play in attracting inward investment and stimulating economic growth. The value of green infrastructure is also reflected in higher property prices and improved labor productivity. In addition, the image benefits of green infrastructure can be linked to increased tourism and visitor activity [18]. Trees more effectively and less expensively manage the flow of storm water runoff than do concrete sewers and drainage ditches. Trees intercept rainfall, and unpaved areas absorb water, slowing the rate at which it reaches storm water facilities, so by incorporating trees into a city's infrastructure, managers can build a smaller, less expensive storm water management system [19]. open space can provide a variety of public benefits such as drainage and water management; it is less expensive for a community to maintain open space that naturally maintains water quality, reduces runoff, or controls flooding than to use tax dollars for costly engineered infrastructure projects such as water filtration plants and storm sewers [20].

3. HEDONIC PRICE MODEL

Economists look at the natural environment as a service-producing capital; in this context they characterize open-green spaces as economic values. Economic values of open-green spaces can be measured by means of mathematical model [21]. More than 30 studies have shown that parks have a positive impact on nearby residential property values. Other things being equal, most people are willing to pay more for a home close to a nice park. Economists call this phenomenon "hedonic value." (Hedonic value also comes into play with other amenities such as schools, libraries, police stations, and transit stops.). In this study the economic values that created by a city park system have been calculated with Hedonic Price Model.[23] Open space often increases the value of surrounding properties. Recently, we have seen many studies that use property valuation methods to quantify the value of open space. A typical choice is the hedonic pricing model , which defines property prices as a function of various characteristics of properties. But few researchers have recognized an important methodological issue with their hedonic models: how to incorporate locational/spatial characteristics of open space into the model. Overlooking this issue could lead to inaccurate estimation of open space values. [1]

Hedonic methodology is mainly used for market valuation of goods for their utility-bearing characteristics. The goods under consideration embody varying amounts of attributes and are differentiated by the particular attribute composition that they possess. In most cases, the attributes themselves are not explicitly traded, so that one can not observe the prices of these attributes directly. In such a case, hedonic pricing models are very essential in order to determine how the price of a unit of commodity varies with the set of attributes it possesses. If the prices of these attributes are known, or can be estimated, and the attribute composition of a particular differentiated good is also known, hedonic methodology will provide a framework for value estimation.

Hedonic price model is the most common method used in the measuring economic values of open-green spaces. The hedonic pricing method, for which Lancaster (1966) and Rosen (1974) provide the theoretical foundation, is widely used in housing research and appraisals, and applications of new estimation techniques continually push research frontiers [22].

Measuring the economic value of a green-open system provides an explanatory overview of the process the center for open-green excellence uses in determining dollar value by way of seven attributes:

- Property value (In this study, as observable variable property value have been used to determine the open-green space's value.)
- Tourism
- Direct use
- Health
- Community cohesion
- Clean water
- Clean air [23].

The term "hedonic" is derived from Latin "hedonikos", meaning satisfaction. To this end, this concept is used in economics to imply for enjoyment, satisfaction, pleasure or utility achieved with consumption of goods or services [24]. Rosen (1974) defines hedonic prices as "the implicit prices of attributes and are revealed to economic agents from observed prices of differentiated products and the specific amounts of characteristics associated with them" [25]. Hedonic pricing models assume that differentiated products can be viewed as bundles of characteristics, and that consumers who buy a particular product are really buying the particular bundle of characteristics that meets their needs. These studies rely on extensive data on the characteristics of homes sold, such as specific distance from a defined "open space." Through cross comparisons of the prices that people are willing to buy for different bundles, we can infer the prices they are willing to pay for particular characteristics, such as "open space" [26]. However, unlike other consumption goods, the housing market is unique because it manifests the characteristics of durability, heterogeneity, and spatial fixity. Thus, to model this differentiation effectively, the second approach of the hedonic price model has been introduced. The hedonic price model posits that goods are typically sold as a package of inherent attributes [27]. The theory of hedonic price functions provides a framework for the analysis of differentiated goods like housing units, whose individual attributes do not have observable market prices. The traditional use of hedonic estimation in housing studies has been for the purpose of making inferences about non-observable values of different attributes like air quality, airport noise, commuter access (railway, subway or highway) and neighborhood amenities [28].

The equation of hedonic price model is given below.

$p = f(x; \beta) + \varepsilon$
p = vector of observed purchase / sale price,
x = qualification matrix,
β = coefficients,
ε = error term.

Value of β in the equation is the price of each attribute, namely this value shows hedonic price. A heterogeneous product defined as "x", consists of (x_1, x_2,…., x_n) attributes. For example, a heterogeneous product such as house consists of attributes such as number of rooms, heating system, and ect. hedonic regresyon of this type of product is defined as;

$P(x) = P(x_1, x_2, \ldots, x_n)$; $i=1,2,\ldots,n$

In hedonic equation, depending on i.attribute which defines product, apparent price of each attribute (Px_i) is found by differential,

$Px_i = \partial P_i(x)/\partial x_i$

The value obtained from this equation shows how much value will change in product's price if x_i attribute is changed and other variables / attribute are assumed to as fixed attributes . Four types of functional structure used in hedonic price model are named as;

- Linear function
- Logarithmic-Linear function
- Linear-Logarithmic function
- Full logarithmic function (Logarithmic-Logarithmic function)

Finding an appropriate function of hedonic price model is very important. For choosing the suitable model, that functional form is chosen which statistical significance and value of R^2 of this function would be high [29].

The hedonic price method is based on multiple regression model that the sale price is the dependent variable of that product and determinative factors of that product are independent variables. the market price of a housing unit can be determined by the buyers' evaluations of the housing unit's bundle of inherent attributes, such as structural, locational, or neighbourhood attributes [30]. Residential properties are multidimensional commodities characterized by durability, structural inflexibility, and spatial fixity [31,32]. Typically, the housing attributes are classified into locational attributes (L), structural attributes (S), and neighbourhood attributes (N). These attributes encompass both quantitative and qualitative attributes [33,34].

The market prices (P) of the property can, therefore, be expressed as:

$P = f(L, S, N) + \varepsilon$

In house studies, house selling price is the dependent variable. Independent variables determine the price of house and these variables can be gathered under three headings. These are; structural, locational, or neighbourhood factors. In market prices (P) function, L, S, and N are three typical groups of independent variables.

- Structural Factors: Prices of properties are frequently related to their structural attributes. Such as age of structure, the number of rooms and floor area, interior factors of structure (size, materials, heating, cooling, etc.) and exterior factors of structure. As Ball (1973) pointed out, if a house had more desirable attributes than others, the valuation of these attributes would be reflected in higher market prices for this house [35].
- Locational Factors: The location of a property has been conceived in most studies in terms of fixed and relative locational attributes. The fixed locational attributes [36,37] are quantified with respect to the whole urban area, and pertain to some form of accessibility measure. Relative locational attributes are quantified through surrogate measures such as socio-economic class, racial composition, aesthetic attributes, pollution levels, and proximity to local amenities [38].
- Neighbourhood Factors: are factors such as accessibility, airport proximity, transportation, External benefits, including pleasant landscape, unpolluted air, serenity, quiet atmosphere, air quality, etc. Goodman (1989) argued that while neighbourhood attributes cannot be explicitly valued in the market place, they could be implicitly valued through hedonic pricing by comparing houses with differing neighbourhood qualities.

The hedonic price model only works under the assumption of market equilibrium, and that there are no interrelationships between the implicit prices of attributes [39].

Theoretically, hedonic price of house's attributes can be estimated by hedonic model. In most studies which examine the relationship between house prices and the open green space, effects of physical and environmental factors (size, age, distance to parks, distance to the center, garage, field size, room number, etc.) on house prices are measured. For this reason, first we collected data of known factors that had effects on house prices and then appropriate model was chosen according to these data. In hedonic price model as a result of the regression equation, coefficients (β) show the marginal contribution of each attribute on price of sale. In regression equation, the coefficient that expect to have a positive effect on the price must appear with plus sign, also the coefficient that expect to have a negative effect on the price must appear with minus sign. The effects of open-green spaces on prices of surrounding houses have been studied by many researchers. Bolitzer ve Netusil (2000) found that all forms of recreational open spaces such as urban parks, natural areas and golf courses had a positive influence on property values [40]. Luttik (2000) reported that a "pleasant view" of open space can increase house prices. According to this study, dwellings with a different and attractive view of open space were more expensive than dwellings with normal view with otherwise similar characteristics [41]. Geoghegan 2002 discussed the fact that, particularly in a suburban setting, open space is valued as much as a buffer between homeowners and their neighbors as it is valued for its aesthetic qualities. Accordingly, Geoghegan found that permanent open space was valued more highly than developable space. Also the contributions of these areas in the city-the country's economy is quite high that was stated in this study [1]. In study done by Gao ve Asami in, increasing the surrounding land values by open-green spaces was identified [42].

4. ASSESSMENT OF ECONOMIC VALUES CREATED BY BOTANİK PARK THROUGH HEDONIC PRICE MODEL

In this study, the environmental, social and economic values created by open-green spaces have been examined for Botanik park as a sample. Design of Botanik park located in Cankaya valley in the south of Ankara was carried out in 1970. The size of the park which is about 60 acres, is surrounded with Dr. Resit Galip street in west side, Ahmet Agaoglu Street in east and residential gardens of the British Embassy and the India Embassy in north. Botanik Park is at beginning part of Cankaya valley located southern ridge of Ankara.

Land uses of Botanik park (m²) are given below:

- Green Areas: 29 476 m²
- Hard Floor: 15 532 m²
- Woodland Areas: 16 747 m²
- Pool Areas: 1330 m²

Hypothesis of this study is that the housing prices went down with distance from botanik park and the study used hedonic model.

4.1. Methodology and Data

For evaluating the values created by Botanik park by means of Hedonic price model, house selling prices around the park have been used and have been examined in period of 6 month (2011 July-2011 December). In a particular time section, the data were obtained from questionnaires applied to real estate agents in region of Botanik park. Totally 235 (n=235) selling prices of houses which were residential buildings with forms of apartment block have been evaluated. Such amount of houses that their information have been registered for the sale in real estate agents and have not been sold yet, have been used as data. In all 24 questions related to the variables considered to be effective on house prices were asked to real estate agents. As factors that had effect on house sales price; size, age, type of house, the number of rooms, bathrooms and garages, the floor of apartment that house was located in and the floor level of the house, facilities around the house, proximity distance to around parks, proximity distance to public transport, schools and shopping centers have been considered. These factors entered into the model as dummy and independent variables. To determine distance of houses that were in questionnaire to Botanik park, Google earth map was used. Distances were measured via Show Ruler Tool. A circular area with a radius of one kilometer was chosen as the study area around the Botanik Park. Distribution of houses in study area is shown in figure 1. (Houses that were in the same building were marked once).

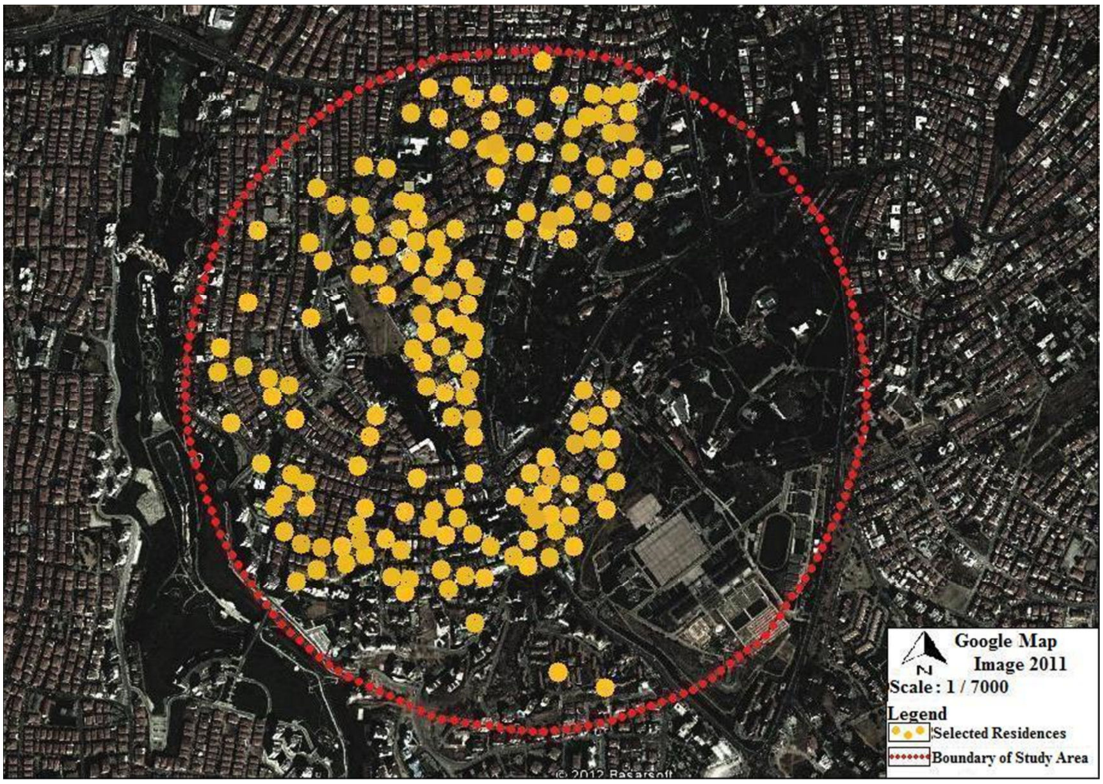

Figure 1. Distribution of Houses in Study Area

For this study in this time, do not exist the major construction activities and changing of functions around selected park allowed to correlate the houses price's increasing with the Botanik park's existence. First, Data were prepared in SPSS 15.0 data editor and Excel program and the variables were evaluated via SPSS static package program and their frequencies were eliminated. To ensure the reliable and correct of the models, relationships between independent variables were tested and examined and all independent variables that they were credible were included in model. This study utilized Eviews software program for establishing and choosing the appropriate Hedonic Model after several analysis and Excel data base also were used for Eviews program.

4.2. Data Analysis

This study estimates the hedonic price model through the E-Views program. To find out the most suitable model, the study utilizes the four types of functional structure of hedonic price model (Linear function, Logarithmic-Linear function, Linear- Logarithmic function, Full logarithmic function). The initial model covered all of the variables, and then the most insignificant ones were removed from the model in order until a significance level of α = 0,01 was achieved, The variables that were found to be significant and the related models are presented in Table 1.

Table 1. The Variables Definitions and Their Expected Effects on House Sales Price

Variable name	Definition	Expected Sign*
PRICE	Sale price of house	
FRONT	House's north, south, west and east sides that are open	+
VIEW	Landscape of house	+
BOTANIKDIST	Distance to Botanik park, in kilometers	_
PORTAKALDIST	Distance to Portakal Çiçeği park, in kilometers	_
DIKMENDIST	Distance to Dikmen park, in kilometers	_
BUILDFLOOR	The building's storey on which the house is located	_
HOUSFLOOR	The house's storey	+
AREA	The house's total construction area, in square meters	+
ROOM	Number of bedrooms in the house	+
BATHROOM	Number of bedrooms in the house	+
BUILDAGE	Age of house	+

The mean and number of observation of variables that are considered to have an effect on the Housing Prices are given in Table 2.

* + increasing / - reducing effect on the house selling price.

Table 2. The number of observation and mean of Housing Prices and the Variables that are considered to have an effect on the Housing Prices.

Variable	Number of Observation	Mean	Variable	Number of Observation	Mean
PRICE	235	245,570	**BUILDFLOOR (4)**	90	0,38
PRICE(100,000-200,000)	59	0,25	**BUILDFLOOR (4>…)**	35	0,15
PRICE (201,000-300,000)	119	0,51	**HOUSFLOOR (-1 & 0' floor)**	41	0,18
PRICE (301,000-400,000)	46	0,19	**HOUSFLOOR (1'Floor)**	78	0,33
PRICE (400,000>…)	11	0,05	**HOUSFLOOR (2'Floor)**	45	0,19
FRONT(1 face)	59	0,25	**HOUSFLOOR (3'Floor)**	48	0,20
FRONT(2 face)	152	0,65	**HOUSFLOOR (4'Floor>=…)**	23	0,10
FRONT(3 face)	23	0,10	**AREA(…=<100 m²)**	34	0,14
FRONT(4 face)	1	0,004	**AREA (101 m²-120 m²)**	57	0,24
VIEW(Closed)	10	0,04	**AREA (121 m²-140 m²)**	49	0,21
VIEW(Semi-Closed)	41	0,18	**AREA (141 m²-160 m²)**	24	0,10
VIEW(Semi-Open)	139	0,59	**AREA (161 m²-180 m²)**	39	0,17
VIEW(Open)	45	0,19	**AREA (181 m²>…)**	32	0,14
BOTANIKDIST(0-200m)	63	0,27	**BUILDAGE (0-10Year)**	14	0,06
BOTANIKDIST (201m-500m)	101	0,43	**BUILDAGE (11year-20 Year)**	51	0,22
BOTANIKDIST (501m>)	71	0,30	**BUILDAGE (21Year >…)**	170	0,72
PORTAKALDIST (0-200m)	41	0,18	**ROOM(…=<2)**	26	0,11
PORTAKALDIST (201m-500m)	114	0,48	**ROOM (3)**	143	0,61
PORTAKALDIST (501m>)	80	0,34	**ROOM (3)**	55	0,23
DIKMENDIST (0-200m)	13	0,06	**ROOM (4>…)**	11	0,05
DIKMENDIST (201m-500m)	42	0,18	**BATHROOM (1)**	190	0,81
DIKMENDIST (501m>)	179	0,76	**BATHROOM (2)**	38	0,16
BUILDFLOOR (…=<2)	2	0,1	**BATHROOM (3)**	7	0,03
BUILDFLOOR (3)	108	0,46			

The avrage of house salling prices was calculated as 254,570 TL, scatter chart of sale prices of houses is shown in Figure 2.

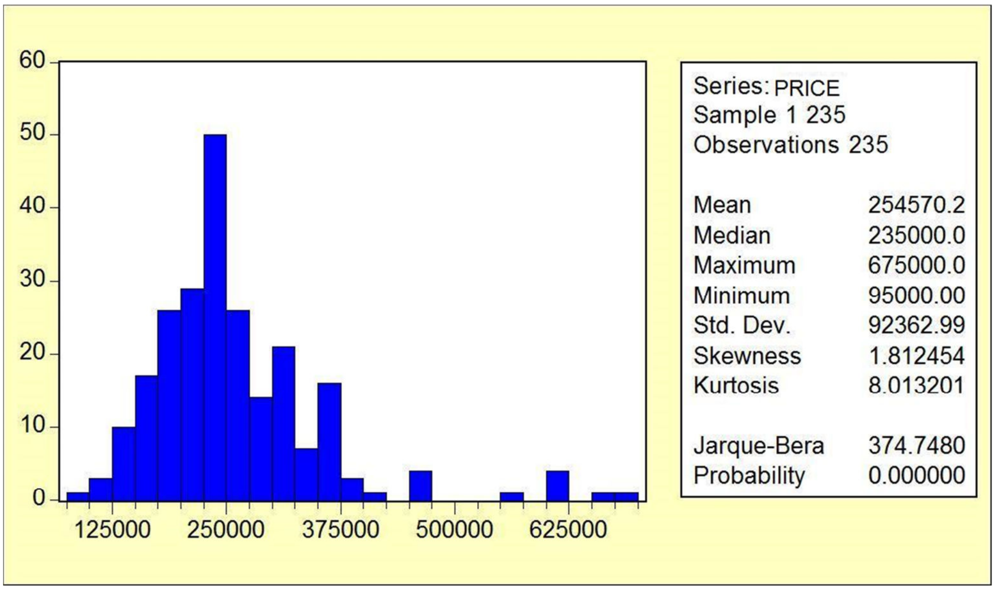

Figure 2. Scatter Chart of Sale Prices of Houses)

Maximum Price: 675 000 TL
Minimum Price: 95 000 TL
Average Price: 254 570 TL

In a hedonic model, heterogeneous spatial units often cause misspecifications or measurement errors that lead to spatial heteroscedasticity in the error term (i.e. non-constant error variance), which is also known as 'spatially induced heteroscedasticity' [3]. This study estimates the hedonic price model through the E-Views program. To use the data with reliance, the distribution of the error terms must be normal and for this reason in this study, Jarque–Bera[†] normality test has been used on distribution of the error terms. Scatter chart of error terms is given in Figure 3.

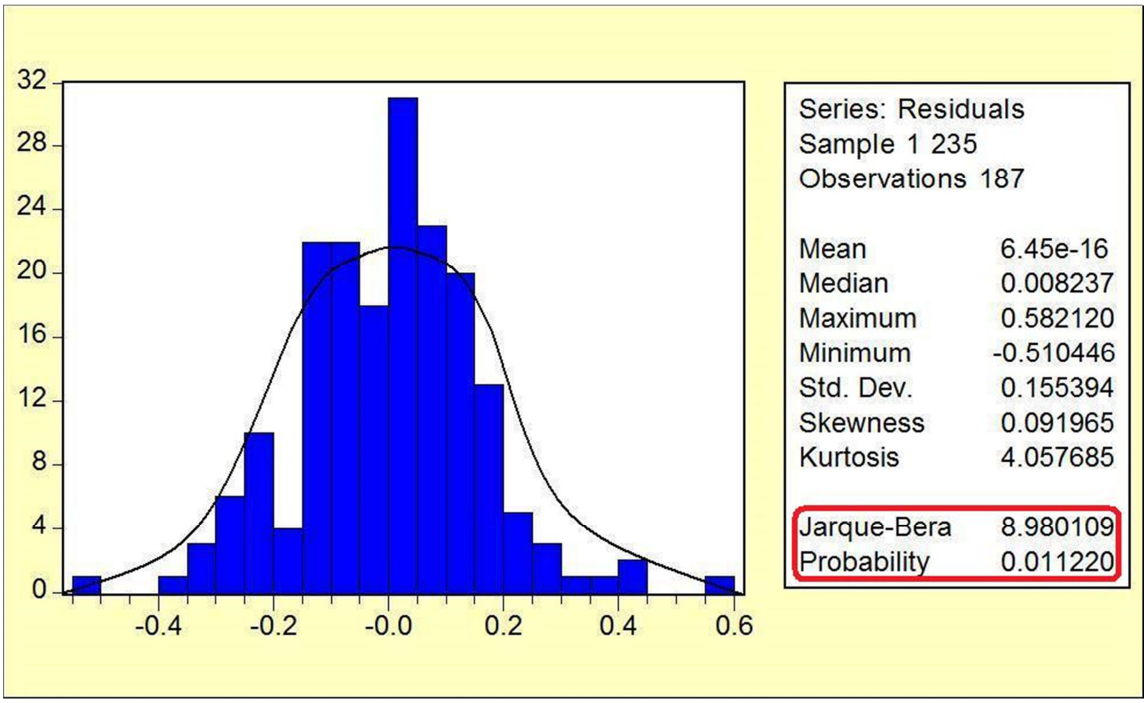

Figure 3. Scatter Chart of Error Terms (Normality Test)

[†] The Jarque–Bera test is a goodness-of-fit test of whether sample data have the skewness and kurosis matching a normal distribution.

Eviews econometrics software allows estimating White heteroscedasticity for error terms. Probability of the results of White test can be controlled at the α = 0,01, α = 0,05, α = 0,10 levels. In this study, probability of the results of White test are controlled at the α = 0,01 level. Significance level of 1 percent is commonly used for heteroscedasticity test. In fact, the number of total observation is about 235 in total. However, missing variables were abserved in the data set. Some property observation were omitted from the data set in order to ensure the robustness of the models due to the missing variables. After deleting these variables by Eviews software, 187 oservations have remained.

Jarque-Bera Normality Test;

1.Step: H0: Error terms have normal distribution;

H1: Error terms have not normal distribution;

2.Step: Value of 0,01 have been used as statistically significant (α = 0,01). the Jarque-Bera statistic has an asymptotic χ2 distribution that approached to chi-square distribution with 2 rates of freedom (df=2).

$\chi^2_{\alpha,df} = \chi^2_{0,01,2} = 9,21$

3.Step Calculated Jarque-Bera: Value of Jarque-Bera was calculated as 8,98;

4.Step If Jarque-Bera < $\chi^2_{\alpha,df}$, ➔ (8,98 < 9,21) ➔ H_0 hypothesis can not be rejected.

Also as shown in the Figure 3, the error terms distribution are not shifted to the right or left and this issue shows the distribution of error terms is normal. To be that, the distribution of error terms were normal and the changing variance problem were resolved. After this stage, based on achived data , the appropriate model was established in E-views softeare program. In this study, analysises were done for Linear, Linear-Log, Log-Linear and Log-Log models of hedonic regression and were tried to interpret the common significant variables and choose the functional form best fit to data. Taking into account the expected signs, coefficients and R^2 value the suitable model was chosen as Log-Log form. From 4 functional form of hedonic model, that model was chosen which the R^2 value of that was highest. Coefficients of independent variables of the established hedonic price model are given in Table 3.

Table 3. Coefficients of Independent Variables of The Established Hedonic Price Model

Dependent Variable: PRICE
Method: Least Squares
Sample: 1 235

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.874923	0.373450	26.44241	0.0000
LOG(BOTANIKDIST)	**-0.072105**	0.027857	-2.588393	0.0105
LOG(PORTAKALDIST)	-0.033624	0.030997	-1.084750	0.2795
LOG(DIKMENDIST)	-0.034068	0.042693	-0.046504	0.9630
LOG(VIEW)	0.216822	0.078508	2.761767	0.0064
LOG(FRONT)	0.006646	0.045633	0.145643	0.8844
LOG(BUILDFLOOR)	0.128481	0.049958	2.571807	0.0109
LOG(HOUSFLOOR)	-0.013293	0.024720	-0.537731	0.5914
LOG(BATHROOM)	0.164995	0.046066	3.581662	0.0004
LOG(ROOM)	0.060239	0.079908	0.753846	0.4520
LOG(AREA)	0.610356	0.074022	8.245640	0.0000
LOG(BUILDAGE)	-0.109553	0.034588	-3.167357	0.0018

R-squared	**0.718754**	Mean dependent var	12.42757
Adjusted R-squared	0.701076	S.D. dependent var	0.293016
S.E. of regression	0.160203	Akaike info criterion	-0.762726
Sum squared resid	4.491393	Schwarz criterion	-0.555383
Log likelihood	83.31492	F-statistic	40.65743
Durbin-Watson stat	2.065607	Prob(F-statistic)	0.000000

The functional form of Logarithmic-Logarithmic model of Hedonic regression and its expected signs is given blow;

$LOG(PRICE) = \beta_1 - \beta_2\, LOG(BOTANIKDIST) - \beta_3\, LOG(PORTAKALDIST) - \beta_4\, LOG(DIKMENDIST) + \beta_5\, LOG(VIEW) + \beta_6\, LOG(FACADE) + \beta_7\, LOG(BUILDFLOOR) - \beta_8\, LOG(HOUSFLOOR) + \beta_9\, LOG(BATHROOM) + \beta_{10}\, LOG(ROOM) + \beta_{11}\, LOG(AREA) - \beta_{12}\, LOG(BUILDAGE)$

As a result of the created model coefficients of Independent variables are given below;

Calculated coefficients:
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LOG(PRICE) = 9.874922659 - 0.07210465287*LOG(BOTANIKDIST) -0.03362385433* LOG(PORTAKALDIST) - 0.034068*LOG(DIKMENDIST) + 0.216821654* LOG (VIEW) + 0.006646077774*LOG(FACADE) + 0.1284814896*LOG(BUILDFLOOR) - 0.01329277749* LOG(HOUSFLOOR) + 0.1649945534*LOG(BATHROOM) + 0.06023853673* LOG(ROOM)
+ 0.6103558328*LOG(AREA) - 0.109552919* LOG(BUILDAGE)

As result of models, value of The coefficient of determination (R^2) have been calculated for logarithmic functions for selecting model, which belongs to the highest value for R^2. The logarithmic model that takes the highest value of R^2 has been accepted as "common model". Value of R^2 was calculated as 0.718 for this model.

R-squared = 0.718754

The technique of Ordinary Least Squares is used for this study, this technique allows the estimation of the relative contribution of each of the variables, on average, to the measurement of house prices. This relative contribution is the coefficient of the variables in the regression equation is to indicate the relative importance of the variables in explaining the variation of house prices.

Here, remarkable result is related to the floor of house. Higher floors would have lower price. Because according to questionnaires, lack of elevator in these houses causes it.

After forecasting the models, the reliable of the models and the results of the models such as coefficients, the sign of parameters and significance levels for individual regressiom coefficients were tested. The appropriate model for this study is Log-Log model. The table 4 is based for interpret of coefficients.

Table 4 Functional Forms and Elasticity Analysis of Hedonic Model [45].

Name	Functional Form	Marginal Effect (dY/dX)	Elasticity [(X/Y) (dY/dX)]
Linear	$Y=\beta_1+\beta_2 X$	β_2	$\beta_2(X/Y)$
Linear-Log	$Y=\beta_1+\beta_2 \ln X$	$\beta_2(1/X)$	$\beta_2(1/Y)$
Log-Linear	$\ln Y=\beta_1+\beta_2 X$	$\beta_2(Y)$	$\beta_2(X)$
Log-Log	$\ln Y=\beta_1+\beta_2 \ln X$	$\beta_2(Y/X)$	β_2

The concept of elasticity refers that " percentage change in Y with respect to a percentage chane in X for a small change in X". In Log-Log form of hedonic model, it is defined as:

$$E = \%\text{ change in } Y / \%\text{ change in } X = (dY/dX)\,(X/Y) = \beta_2$$

LOG(PRICE) = 9.874922659 **- 0.07210465287***LOG(BOTANIKDIST)

$$\beta_2 = \mathbf{0.07210465287}$$

When distance to Botanik park rises about 1%, hedonic price of house falls about 0.072%. (Coefficient of variable has a negative sign.). Model found that housing prices went down with distance from botanik park about 0.072 percent of market house prices decreases in price for each editional meter from the park. Relationship between distance to Botanik park and Hedonic price is shown in Figure 4.

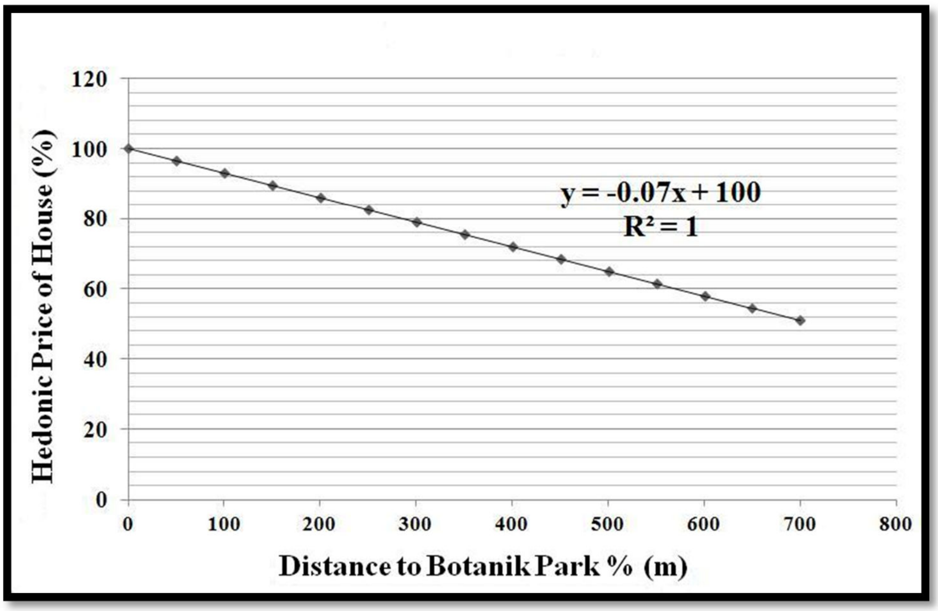

Figure 4. Relationship Between Distance to Botanik Park and Hedonic Price

For example, if the price of a house located 100 meters away from Botanik Park be as 100 000 TL and other variables that affect on this house price are kept constant and only the effect of distance to Botanik park on house price are examined, the obtained result will become as blow;

if this house is moved 200 meters away from Botanik Park, price of this house decreases to 92 800 TL. So that house loses value as 7200 TL.

Also according to the rules of the Real Property Tax Law, the additional property tax for building located within the boundaries of the metropolitan municipality and the neighboring areas and lands; as well as real estate taxes, must be calculated with the rate of 2 per thousand dwellings [Real Estate Tax general notification EK EMLAK VERGİSİ GENEL TEBLİĞİ, SERİ NO:1, Sayı:25088, 24 Nisan 2003]. When the research results and these information are coupled; residential taxes are increasing with the rate of 0,0014% for a meter as a unit closer to Botanik park. Relationship Between Distance to Botanik Park and Tax of House is shown in Figure 5.

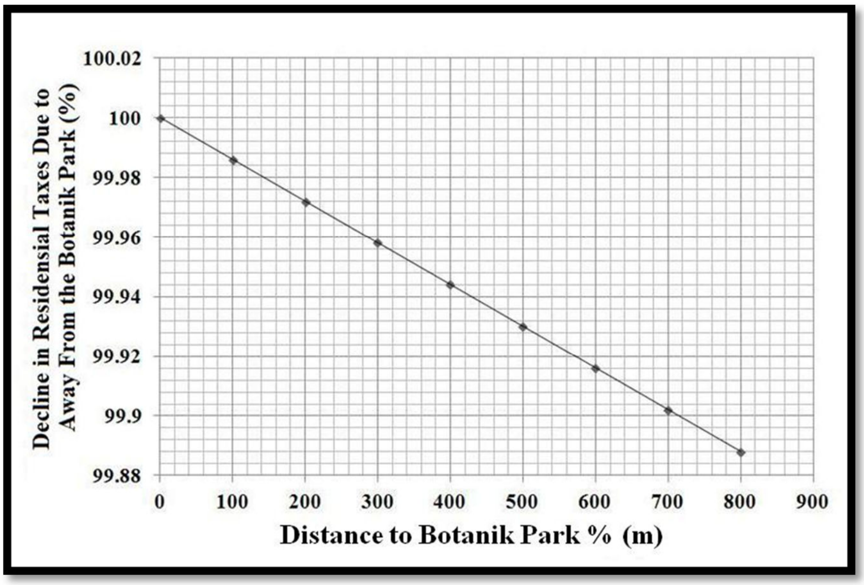

Figure 5. Relationship Between Distance to Botanik Park and Tax of House

For example, residential tax of house which is the value of 100 000 TL that are located 100 meters away from Botanik park is 200 TL. If the same house is moved to 200 meters away from Botanik park, the payable amount of residental tax will be 186 TL. So the amount of tax for this house decreases 14 TL for every 100 meters distance away from the Botanik park.

5. DISCUSSION AND CONCLUSIONS

Urban open-green spaces create environmental, social and economic values within the entire city, for this reason these areas as component of city memory, identification, cultural and visual quality must be protected and improved. Facility of open-green spaces's use for public which this facility is a ownership structure of the open-green spaces provides interpretations of the urban as public space and makes it impossible to be expressed benefits in economic terms directly. However, for measuring the value of these areas on the city's and country's economies there was no any developed model. In this study, the environmental, social and economic values created by open-green spaces have been examined for Botanik park as a sample.

To reveal the created values of open spaces, mathematical models can help to determine the types of use of these areas, planning and management approaches. The economic values of urban open-green spaces are often ignored; also in planning, land trades and transfer operations the values of open spaces are often overlooked. However, valuation of real estate and reflection of this value to tax value is important for economies of countries and cities. For this reason, in such studies should implement on all open spaces periodically to determine the real economic values created by open-green spaces and these values should be reflected in taxes.

As a result of this study, the increase in house's prices around Botanik park have been determined and the positive effect of existence Botanik park in house's prices have been understood. So that, when the house's distance to Botanik park decreases about %1, the hedonic price of house increases about % 0,072. Open-green spaces cause to increase the house prices and this increasing proportionally causes to increase in house's tax. As conclusion local government would be beneficial from this fact. When the distance to Botanik park decreases about %1, the tax of houses increases about % 0,00014. Namely, away from the park for every 100 meters, house price fall by 0.014%. Detection the open-green space values by means of mathematical models helps to determine the types of use, planning and management approaches of these areas.

Determining the economic value of a city park system is a science still in its infancy. Much research and analysis lie ahead. And cities themselves, perhaps in conjunction with universities, can help greatly by collecting more specific data about, park tourism, adjacent property transactions, water runoff and retention, and other measures. In fact, every aspect of city parks— from design to management to programming to funding to marketing—would benefit from deeper analysis. In that spirit this study is offered: for the conversation about the present and future role of parks within the life and economy of cities.

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