THE IMPACT OF PEDESTRIANIZATION ON RESIDENTIAL PROPERTY RENTAL VALUES

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ABSTRACT

THE IMPACT OF PEDESTRIANIZATION ON RESIDENTIAL PROPERTY RENTAL VALUES

Within the context of the economic valuation of open space, the aim of this study was to understand the impact of pedestrian ways as a public open space on rental price of residential properties. With this aim, the study also searched suitable variables to determine the factors affecting this impact.

The study involved a two stage procedure as theoretical analysis and empirical analysis. In the first stage, fundamental concepts and approaches were evaluated by reviewing related literatures of urban design and environmental economics disciplines. In the second stage, to analyze the impact of pedestrian way attributes on rental price of residential properties, an empirical analysis was carried out by employing Hedonic Price Method (HPM) which is basically a regression analysis estimating the effect of each relevant variable on the price of the asset in question. The analysis was realized with a sample of 140 observations in the case of Forbes Pedestrian Way, which is called as "Sevgi Yolu" (Way of Romance), in İzmir.

The study has put forward that pedestrian way as a public open space has a relative measurable economic value like other public open spaces; it impacts the rental price of residential properties. Regression analysis results have shown that, proximity to the pedestrian way and level of perceived quality of pedestrian way are significant determinants of rental prices of the residential properties. Consequently, the approach developed in this study has advanced the knowledge about open space valuation and provided the first evidence -in Turkey as well as in the world wide- of the impacts of pedestrian way on residential property's rental prices. The case of Forbes Pedestrian Way has shown that pedestrian way is desirable and valuable from a housing-market perspective. This evidence has also supported previous researches reporting open space provides a premium for property prices. Besides, Hedonic Price Method is promising in measuring the impact of pedestrian ways on residential property rental prices.

Key words: Economic valuation of open spaces, environmental economics, urban design, Hedonic Price Method, Forbes Pedestrian Way

ÖZET

YAYALAŞTIRMANIN KONUT KİRA FİYATLARINA ETKİSİ

Açık alanların ekonomik değerlemesi bağlamında, çalışmanın amacı kamusal kentsel açık alan olarak yaya yollarının konut kira değerlerine etkisini ve bu etkiyi belirleyen faktörleri anlamaktır.

Çalışma kuramsal analiz ve ampirik analiz olmak üzere iki aşamalı bir prosedür içermektedir. İlk aşamada, temel kavramlar ve yaklaşımlar kentsel tasarım ve çevre ekonomisi disiplinlerinin ilgili literatürleri taranarak ele alınmıştır. İkinci aşamada, yayayolu niteliklerinin konut kira değerlerine yaptığı etkiyi anlamak üzere ampirik bir analiz yürütülmüştür. Analizde temel olarak bir regresyon analizi olan ve her bir ilişkili değişkenin sorgulanan değişken üzerindeki etkisini ölçen Hedonik Fiyat Yöntemi (HFY) kullanılmıştır. Ampirik analiz "Sevgi Yolu" (Way of Romance) olarak da adlandırılan Forbes Yayayolu (Izmir) örneğinde 140 gözleme uygulanmıştır.

Çalışma, yapılan analizlerin sonucunda, kamusal bir açık alan olarak yayayollarının da diğer kamusal açık alanlar gibi göreceli ölçülebilir bir ekonomik değerinin olduğunu Forbes Yayayolu örneğinde konut kira fiyatlarına etkisini anlamak yoluyla ortaya koymuştur. Regresyon analizi sonuçları yayayoluna mesafe ve yayayolunun algılanan kalite düzeyinin konut kira fiyatlarının belirleyicilerinden olduğunu göstermiştir. Sonuç olarak, bu çalışmada geliştirilen yaklaşım, açık alanların değerlemesi konusundaki bilgi birikimine farklı bir analiz ile katkıda bulunurken, özelde, dünyada ve Türkiye'de ilk olarak, yayayollarının konut kira fiyatlarına etkisinin kanıtını Hedonik Fiyat Yöntemini kullanarak ortaya koymuştur. Forbes Yayayolu örneği yayayollarının konut pazarı perspektifinden arzu edilir ve değerli olduğunu göstermiştir. Bu kanıt, açık alanların konut fiyatları üzerine etkisi olduğunu gösteren daha önceki çalışmaları da desteklemektedir. Ayrıca, Hedonik Fiyat Yöntemi yayayollarının konut kira fiyatlarına etkisinin ölçümünde de kullanılabilir bir yöntemdir.

Anahtar kelimeler: Açık alanların ekonomik değerlemesi, kentsel tasarım, çevre ekonomisi, Hedonik Fiyat Metodu, Forbes Yayayolu

to MY FAMILY

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CHAPTER 1

INTRODUCTION

1.1. Aim and Context of the Study

Open spaces may contribute to quality of life in urban areas through their various benefits -social, environmental and physical, and economic. To ensure their contribution, they must be sufficiently generated and well planned, designed and maintained. In this point, quantitative valuation of open spaces is crucial in their generation and continuity. To value open spaces, limited amount of researches have been carried out by employing different methods. These studies primarily focused on the amount of the value in the case of certain open space types such as parks and greenways. Nevertheless, there are some open space types which have been not yet analyzed neither in Turkey nor in other countries. Pedestrian way is one of them. Thus, there is a need for further quantitative researches on economic valuation in the case of different open space types such as pedestrian way, considering not only the amount of the value but also factors affecting this value.

Within this consideration, the aim of this study was to understand the impact of pedestrian ways as an urban open space on rental price of residential properties. Via an urban design perspective, it also aimed to search for suitable variables describing pedestrian way attributes to determine the factors affecting the impact of pedestrian values on rental price of residential properties.

The study covered analysis and evaluation of all kinds of open spaces at a theoretical level. Nevertheless, at the empirical level, the study focused only on one type of open spaces that was pedestrian ways since each type of open space may show some specific attributes in addition to some common characteristics. Based on this distinction, the study carried out two levels of analyses: theoretical analysis and empirical analysis. Theoretical analysis, in the context of urban design and environmental economics disciplines, involved review of basic concepts, methods, and previous studies. Within the frame of a case study, empirical analysis aimed to investigate the impact of a pedestrian way on rental price of residential properties.

Empirical analysis was carried out in the case of Forbes Pedestrian Way in İzmir (Turkey). Empirical analysis employed Hedonic Price Method, which estimates the effect of each relevant variable on the price.

In the wider perspective, the study took place within the context of economic valuation of environment which is study field of mostly environmental economics, economics, and real estate economics disciplines. In the narrower perspective, it took place within the context of economic valuation of urban open spaces which is study field of mostly environmental economics, economics, and real estate economics, but also very rarely that of city planning and landscape architecture disciplines.

The context of the study - economic valuation of open spaces- is basically based on the appreciation of open space benefits because well designed and managed open spaces are the key for more livable and sustainable cities within the competitive processes of globalization through their various sets of benefits such as social, environmental and physical, and economic. To protect all these benefits of open spaces, and so to ensure the contribution to the quality of urban life, they must be sufficiently generated and well planned, designed and maintained. Otherwise, an open space that is poorly designed and maintained, and dangerous likely may hurt the quality of life.

1.2. Need for and Contribution of the Study

By reviewing the previous literature on open space valuation, it was considered necessary to indicate three important needs:

1) There is a need for researches on economic valuation of open spaces.

2) There is a need to develop suitable variables for better understanding of the relationship between open space (e.g. pedestrian ways) attributes and their impact on property values.

3) Further researches should be on other kinds of open spaces which have not been yet studied. Pedestrian way is one of them.

In the direction of these needs, this study was formulated.

1.2.1. Need for Economic Valuation of Open Spaces

While there is an increasing need for open spaces on the other hand major trends are cutting the budgets for creation and maintenance of these areas. Local governments have some financial problems and decisions concerning with open spaces are quite politic. In many cities, parks and other open spaces have traditionally been publicly provided facilities for which no price has been established in the market place (Nicholls 2002). But, as Luttik (2000) indicated it is conceivable that future residents and/or urban developers will finance the creation of new open spaces. Due to the increasing demand for green areas, which is not met by an increase in public finance, this is exactly what the governments are looking for: financing possibilities from private sources. In the case of private finance of them, a careful analysis of their economic value particularly property value-increasing effect has of course great importance.

A planning approach, which value open spaces also as an economic entity can solve these problems by helping governments in managing financial obstacles to generate open spaces. In this context, their economic value should be systematically measured in monetary terms in urban affairs (Tyrvainen and Vaananen 1998).

Nevertheless, although having value, urban open spaces are public goods without a market price. Therefore, as noted by Tyrvainen and Miettinen (2000), the benefits are more difficult to estimate although the cost of supplying open spaces can be calculated in a relatively straightforward way. Because most of the values attached to open spaces are non-priced environmental and social benefits such as pleasant landscape and recreation opportunities. As a result, they are valued generally qualitatively but not quantitatively. However, qualitative valuations of them are difficult to integrate into the assessment procedure. Their lack of value, expressed in monetary terms, prevents open spaces from being properly considered in the cost-benefit analyses of urban planning and design policies (Morancho 2003). Consequently, these values are underestimated or not reflected in urban planning and design processes (Kwak, et al. 2003). Therefore, quantitative information concerning urban open space benefits is needed as a component in urban affairs (Tyrvainen and Miettinen 2000, Tyrvainen and Vaananen 1998).

Nicholls (2002) suggested that particularly in the times of budgetary cutbacks and other financial constraints, positive economic valuation of open spaces is crucial, to

both their continued existence and further development or designation. Because as Luttik (2000) mentioned, decision-makers compare economic factors like contribution to the tax base and employment or value added to local economy against the value of environmental factors. By expressing value of open spaces in monetary terms they become comparable to the former. This will put more weight on environmental factors in the decision making process.

In the direction of these considerations explained above, limited amount of researches to measure the economic value of open spaces have been carried out mostly in the form of measuring their property value increasing effect. For instance, Luttik (2000) in Netherlands, Tyrvainen (1997) in Finland, Irwin (2002) and Nicholls (2002) in USA, Morancho (2003) in Spain, and more recently, West and Anderson (2006) in USA investigated the value of open spaces. But, there is still a need for further researches on economic valuation of open spaces.

1.2.2. Need for a Consideration of Factors Affecting Economic Value

Previous studies on open space valuation principally focused on the question of "what kind of impact" or "how much impact" the open space provides, since most of these studies have been carried out within the limits of economics or environmental economics disciplines. As a response to these questions, previous analysis of economic valuation of open spaces have shown that open spaces have a relative measurable economic value, and this value is positive in general. Nevertheless, some of these studies pointed out it is not always the case that an open space has a positive value, its amount is not same, and the relation between open space attributes and its impact on property values may not be linear (it may be convex or concove as well) in all markets and circumstances. Degree of the impact varies depending on the amount, size, and quality of open spaces (generally considered as open space type but not as design quality). For example, an increase in size, or decrease in the distance from an open space may not always be resulted with an increase in value. Therefore, the impacts of open spaces on property values should be further investigated. Here, the crucial question is with which factors this value differs?

Within the limits of environmental economics discipline it is possible to find the amount and sign of the property impact value of open spaces. However, to reveal

merely the amount of value is not fully enough for properly assessment in decision-making process of urban affairs. Understanding not only their impacts on real estates but also the factors determining this impact might set important conclusions in terms of policy implications and urban design works. Nevertheless, only less and rough evidence exists regarding the question of "how" open spaces produce that value. For instance, while there may be concern that design quality of open spaces will change their impacts on property values, there has been no direct quantitative systematic study to confirm or dispel this conclusion.

Thus, there is a need for developing suitable variables for better understanding the relationship between open space (e.g. pedestrian ways) attributes and their impact on property values. Nevertheless, it requires urban designer outlook since open space attributes can be properly evaluated only by a designer.

1.2.3. Need for Economic Valuation of Pedestrian Ways

There are some open space types, whose impact on property values have not yet been analyzed in the previous studies. Therefore, further researches should be on other kinds of open spaces which have not been yet studied. Pedestrian way is one of them.

Today there is much interest in creating pedestrian ways. While many projects are in the planning stages, others have been built. Presently, also in Turkey there are many applications; e.g., Sakarya Street in Ankara, Kıbrıs Şehitleri Street, Alsancak Sevgi Way, and Şirinyer Forbes Sevgi Way in İzmir.

People have enjoyed and benefited from them. Particularly, in the densely built urban environments where open spaces are so limited, they have met the open space needs of the citizens and served many benefits. Within this context, it should be re-thought increasing and crucial role of pedestrian ways -particularly in densely built areas- on quality of urban life. As an urban open space, pedestrian ways have provided varied and many benefits. For instance, as environmental benefits, they provide cleaner environment, lessen pollution and noise. They also provide more pleasant and attractive landscape and improve aesthetic quality of city. They serve some transportation benefits as well such as safer and more comfortable access to house and other places. Their social benefits are provision of opportunities for recreation and social inclusion, and better health through walking exercise. All these benefits are well known, but there are

also many economic benefits such as contribution to the local economy through both on-site and off-site benefits such as increased property values, economic revitalization by attracting and retaining business and residents, and energy consumption, which have not been yet analyzed directly and systematically since most of the values attached to pedestrian ways are non-priced benefits which are difficult to measure.

As they contribute to the quality of urban life, to improve their efficiency and contribution, first of all, pedestrian ways should be carefully designed and maintained. In addition, a host of benefits as well as economic benefits of pedestrian ways should be systematically assessed and measured in urban affairs. Nevertheless, while economic valuation of some open spaces (e.g. parks, greenways, urban forests etc.) has already been the object of several studies, and for instance, while there may be concern that locating a pedestrian way project in a neighborhood will do higher residential property values, there has been no systematic quantitative study directly focusing on pedestrian ways to confirm or dispel their impacts on property values. Only, little attention has been devoted to the value of pedestrian access within the context of valuation of new urbanism features (Lund 2003, Song and Knaap 2003, Song 2002, Tu and Eppli 1999).

Actually, the impact of pedestrian ways on nearby properties is intuitively felt and observed unsystematically. But, does this impact really occur? And, is it really positive? In other words, what is the sign and amount of real estate impact of pedestrian ways? Further, to what extent and with which factors they affect property values? What is the relationship between different attributes of pedestrian ways and their impact on property values? To response the questions above, there is a need for quantitative research investigating the impact of pedestrian ways on property values, and searching suitable variables describing pedestrian way attributes which affect the impact on property value. Nevertheless, such study requires an urban designer outlook since definition of pedestrian way attributes can be properly realized only by a designer.

This thesis provided this perspective to HPM studies by searching suitable variables describing pedestrian way attributes. Application of these variables including apart from certain quantitative characteristics, a host of qualitative characteristics of pedestrian ways ensured better understanding of the factors affecting their impact on property values. Consequently, the contribution of this thesis was, in general, realization of a synthesis between urban design and environmental economics discipline, and specifically, via an urban designer's outlook, searching the impact of pedestrian ways on property values and development of suitable variables to be used in HPM.

1.3. Research Questions and Hypotheses

In the direction of the needs for this study, three major research questions were determined to be answered.

Research Question 1: Do pedestrian ways as public open spaces have a relative measurable economic value like other public open spaces have?

Research Question 2: Do pedestrian ways have an impact on the rental price of residential properties. If yes,

Research Question 3: Which attributes of pedestrian ways affect its impact on the rental price of residential properties?

As a response to these questions, the study developed three main hypotheses.

Hypothesis 1: Pedestrian ways as a public open space have a relative measurable economic value like other public open spaces.

Hypothesis 2: Pedestrian ways have an impact on the rental price of residential properties.

Hypothesis 3: The impact of pedestrian ways on the rental price of residential properties differs depending on their different quantitative and qualitative characteristics.

1.4. Methodology of the Study

As a research approach the study carried out theoretical and empirical analysis to answer the questions above, and it employed the HPM as the research method.

To answer the first research question (Do pedestrian ways as public open spaces have a relative measurable economic value like other public open spaces have?), first of all, the study asked how the economic value of pedestrian ways can be measured quantitatively? Conducting a theoretical analysis through an extensive review of the literature, the answer for this question was found within the environmental economics discipline. Economic value of an environmental externality or resource is calculated, sometimes directly such as in contingent valuation method, which directly asks people how much they would be willing to pay for its use or conservation (Carson, et al. 2001, Venkatachalam 2004). This method is the most frequently applied method to value environmental assets and to value urban planning projects (Carson, et al. 2001).

However, it was indicated that there are severe skepticism about this method by policy-makers (Navrud 1992, Tyrvainen and Vaananen 1998, Whittington 2002, Morancho 2003, Freeman 1993, Haab and McConnell 2002, Dorfman and Dorfman 1972, Hardarson and Hardarson 2000). Other methods calculate this value indirectly.

One indirect approach for estimating the economic value is the HPM. By using HPM it is possible to measure economic value of open space attributes by analyzing their impact on real estate values since various benefits of open spaces are expected to be translated economically into property values. Presently, it is an accepted and reliable method in measuring the value of urban amenities and environmental externalities because of basing on actual data (rent/purchase price) unlike the stated preference methods. It is usually termed a revealed preference method in order to distinguish it from the stated preference methods such as contingent valuation. It obtains the value through the influence exercised by the environment on the market price of another good (Freeman 1993, Palmquist 1991, Tyrvainen and Miettinen 2000).

Consequently, this study employed HPM as a research method to value pedestrian ways since it considered HPM as the most suitable method for valuation of pedestrian ways among other methods because of the advantage of using data obtained from real behavior; although it has several strict requirements.

To answer the second and third research questions (Are the pedestrian ways one of the attributes which impact the rental price of residential properties, in other words, do they have an impact on the rental price of residential properties, if yes, which attributes of pedestrian ways affect its impact?), with an urban design outlook, the study described a wide range of pedestrian way attributes including both quantitative and qualitative ones (for detail explanation about these attributes, see Chapter 4), and carried out an empirical analysis with 140 observations in the case of Forbes Pedestrian Way in İzmir by using the HPM. Empirical analysis was realized in three steps. First, research design was described in the direction of the theoretical analysis, then, the data set was analyzed through various descriptive and inferential statistical techniques, finally, the hedonic price functions were established by running regression analysis in which the least square method was used (for detail, see 1.4.2. and Chapter 4).

1.4.1. Theoretical Analysis

Theoretical analysis was realized through a careful review of the related literatures of urban design and environmental economics disciplines to clarify and evaluate the fundamental concepts and issues.

- The concepts of urban open space and pedestrian way were reviewed within the context of urban design discipline.
- Basic concepts, methods and previous studies on economic valuation were reviewed within the context of environmental economics discipline.

The vast literature on economic valuation was reviewed in two groups:

- The first group involved valuation concepts and methods. In this group, Freeman's study (Measurement of Environmental and Resources Values: Theory and Methods, 1993) and Rosen's study (Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition, 1974) are the basic references.
- The second group of literature included empirical studies mostly carried out in Northern America and Europe in a very wide range. To review empirical studies, more than 40 journals (some are directly related, some not) were surveyed volume by volume beginning from eighties to the present. Most of the sources were obtained from these journals: Land Economics, Landscape and Urban Planning, Journal of Environmental Economics and Management, Journal of Environmental Planning and Management, Environmental and Resource Economics, Ecological Economics, Journal of Urban Economics, Urban Studies, Journal of Housing Economics, Real Estate Economics, The Journal of Real Estate Research, Journal of Property Valuation and Investment, Journal of the American Planning Association, and The American Economic Review.

The detailed review of the literature provided

- the comprehension of the context, in other words the big picture in which the study area takes place in general, and then definition of the research problem more specifically within this frame since it enabled to learn "what were done, what were not", and "how the problems were treated", in other words finding the gaps in the literature.
- the comprehension of theories and concepts of economic valuation as well as the comprehension of the advantages and disadvantages of different methods applied before, by doing this, selection of the most suitable method for the empirical analysis. Further, theoretical analysis provided a background for the coming parts of the study.

1.4.2. Empirical Analysis

In the case of Forbes Pedestrian Way (İzmir) and by employing HPM, empirical analysis was realized to test the hypotheses of the study. Empirical analysis involved

1) research design,

2) data analysis, and

3) hedonic price functions.

Table 1.1. Procedure of empirical analysis

1) RESEARCH DESIGN

A. Definition of the variables
▪ Dependent variable (rental price of housing unit)
▪ Independent variables
  ▪ structural attributes of housing unit
  ▪ locality-environmental attributes of housing unit
  ▪ pedestrian way attributes of housing unit
B. Definition of the statistics hypotheses within sets below
▪ Correlation between the price of housing unit and pedestrian way characteristics
▪ Correlation between the price of housing unit and its location-environmental cha.
▪ Correlation between the price of housing unit and its structural characteristics
▪ Price differences depending on structural characteristics (dichotomous)
▪ Price differences depending on structural characteristics (nominal)
▪ Relation between the zones and pedestrian way characteristics
▪ Difference of the zones in terms of the price, structural, location and environmental characteristics of the housing unit, and users' socio-economic characteristics
▪ Relation between the zones and structural, location and environmental characteristics of the housing unit, and users' socio-economic characteristics
C. Definition of the sample area
▪ Sample area selection
▪ Definition of the characteristics of the sample area
D. Definition of the sampling design and data collection techniques
▪ Sources of information (households and municipalities)
▪ Techniques to gather required information (questionnaire survey)
Sampling techniques / size: stratification and simple random sampling / 140 observations
E. Definition of the data analysis techniques
▪ Descriptive statistics (mean, min., max., standard deviation, frequencies)
▪ Inferential statistics (analysis of variance, *t* test, χ^2 test, correlation analysis)

2) DATA ANALYSIS
A. Descriptive statistics ▪ Mean, min., max., standard deviation, frequencies for entire area ▪ Mean, min., max., standard deviation, cross tabulation for zones **B. Inferential statistics** ▪ Analysis of variance (F test), *t* test, χ^2 test, Correlation analysis
3) HEDONIC PRICE MODELS
A. Regression analysis through least squares method **B. Evaluation of the results of the estimated hedonic price functions**

1) Research Design: It included five steps.

A. Definition of the variables: To be tested in price models, a variable set was composed of a dependent variable and three sets of independent variables.

- Dependent variable was determined as the rental price of housing unit.
- Independent variables were composed of three sets of attributes:
  - Housing unit's structural attributes,
  - location and socio-economic-physical environmental attributes, and
  - pedestrian way attributes.

As the first set, variables' vector of housing unit's structural attributes was organized in three groups:

- variable set of housing's structural attributes not affected from pedestrian way;
- variable set of housing's structural comfort attributes not affected from pedestrian way; and
- variable set of housing's structural attributes affected from pedestrian way.

Secondly, variables' vector of housing unit's location and socio-economic-physical environmental attributes included

- variable set of housing's location attributes,
- variables set of housing's perceived environmental quality attributes, and
- variables set of housing's socio-economic environmental attributes.

Finally, variables' vector of housing unit's pedestrian way attributes consisted of

- variables set of housing's pedestrian way attributes (quantitative), and
- variables set of housing's pedestrian way attributes (qualitative).

In the variable set of pedestrian way attributes, apart from certain quantitative characteristics, also a host of qualitative characteristics were included. All sets were prepared as tables including variable names, codes, expected signs, and measuring scales. Variables in the first two sets were defined both with respect to the literature of open space valuation and oral interview carried with local real estate broker. When defining the variables in the last set, the study benefited from urban design and landscape design literatures (for detail, see 4.1.1).

B. Definition of the statistics hypotheses: The study organized statistics hypotheses within eight sets. In the direction of the HPM's assumptions, second and third research questions and hypotheses, five sets of statistics hypotheses were designed to understand the relation between the rental price of housing and its structural, location and environmental characteristics, and pedestrian way characteristics:

- correlation between the price of housing and pedestrian way characteristics,
- correlation between the price of housing and its location-environmental characteristics,
- correlation between the price of housing and its structural characteristics,
- price differences depending on structural characteristics (dichotomous), and
- price differences depending on structural characteristics (nominal).

In the direction of the HPM's assumptions, and third research question and hypothesis, the last three sets of statistics hypotheses were developed to test whether the zones represents or not the different segments of housing market, which offer houses in different prices with different structural, location and environmental, and pedestrian way characteristics:

- relation between the zones and pedestrian way characteristics,
- difference of the zones in terms of the price, structural, location and environmental characteristics of the housing, and users' socio-economic characteristics, and
- relation between the zones and structural, location and environmental characteristics of the housing, and users' socio-economic characteristics (for detail, see 4.1.2).

C. Definition of the sample area: The sample area was selected and its characteristics were described and also demonstrated with visual material. The selection of the research area assured including different segments of the housing market, which offer houses in different prices with different structural, location-environmental, and pedestrian way characteristics. In selection of the research area, one another important consideration was the familiarity with the area (pre-pedestrianization and existing situation). In the direction of these considerations, Forbes Pedestrian Way, which is called also as Sevgi Yolu (Way of Romance), was selected as the sample area (for detail, see 4.1.3).

D. Definition of the sampling design and data collection techniques: The study determined principally two sources and techniques to gather required information. Households and municipalities were the main sources of information. Questionnaire survey was used as the main method to get the data set featuring the price and structural characteristics of housing, and some locality, environmental and pedestrian way attributes. Further, some information about the pedestrian way and locality factors is drawn from maps provided by the municipalities. As a sampling technique for the

questionnaire survey, the stratification and within the strata (four zones) the simple random sampling techniques were used. When determining the sample size, significance and confidence interval levels were aimed as %5 and %95. On the base of the aimed sample sizes, the questionnaire survey was conducted on April, May, and June in 2007. Nevertheless, on site, a great reaction against participation to the survey was seen. Therefore, it was needed to talk much more people (approximately 500) - to persuade for participation to the survey. Although 217 people were persuaded at the beginning, later some of them said that they changed their decision. On the other hand, some of them could not be reached. Consequently, the questionnaire survey was applied to the 140 households within the entire sample area. This was bigger than the aimed sample size. Most of the surveys were carried out face to face. Nevertheless, some respondents said that they did not have enough time at that moment, therefore asked for time. In such cases, questionnaire form was left, few days later, it was received by hand.

E. Definition of the data analysis techniques: Statistical data analysis techniques used in the study were defined and explained very briefly. Statistical techniques for data analysis ranged from basic descriptive statistics, such as averages and frequencies, to advanced inferential statistics, such as analysis of variance, *t* test, χ^2 test, and correlation analysis. Selection of the inferential statistical technique was determined depending on the measuring scale of variables and the structure of statistics hypotheses (for detail, see 4.1.5).

2) Data Analysis: It included two steps. For data analysis, SPSS software package was used.

A. Descriptive statistics: The first step in the data analysis was to describe and summarize information about variables in the dataset in a clear and understandable way through descriptives, frequencies, and cross tabs. Descriptive statistics for variables (mean, minimum, maximum values for ratio scale variables and maximum frequency values for nominal and ordinal scale variables) were summarized within each set.

B. Inferential statistics: Inferential statistical tests in the direction of the statistics hypotheses were carried out to inspect the picture that would appear after operating the hedonic price models. The inferential statistics tests were handled within the frame of the eight sets of statistics hypotheses:

- Within the context of the first set of the statistics hypotheses, one statistics hypothesis was tested by using correlation analysis technique to understand the relation between the price of housing and pedestrian way characteristics.

- Within the context of the second set of the statistics hypotheses, twenty-three statistics hypotheses were tested by using correlation analysis technique to understand the relation between the price of housing and its location-environmental characteristics.
- Within the context of the third set of the statistics hypotheses, five statistics hypotheses were tested by using correlation analysis technique to understand the relation between the price of housing and its structural characteristics.
- Within the context of the fourth set of the statistics hypotheses, seventeen statistics hypotheses were tested by using *t*-test technique to understand the price differences depending on structural characteristics.
- Within the context of the fifth set of the statistics hypotheses, fifteen statistics hypotheses were tested by using F test technique (one way ANOVA) to understand the price differences depending on structural characteristics.
- Within the context of the sixth set of the statistics hypotheses, one statistics hypotheses was tested by using χ^2 test technique to understand the relation between the zones and pedestrian way characteristics.
- Within the context of the seventh set of the statistics hypotheses, eleven statistics hypotheses were tested by using F test technique (one way ANOVA) to understand differences of the zones in terms of the price, structural, location and environmental characteristics of the housing, and users' socio-economic characteristics. And finally,
- within the context of the eighth set of the statistics hypotheses, forty statistics hypotheses were tested by using χ^2 test technique to understand the relation between zones and structural, location and environmental characteristics of housing units, and users' socio-economic characteristics (for detail, see 4.2).

3) Hedonic Price Models: Finally, the hedonic price models were developed by using E-views software package.

A. First, step by step regression analysis was carried out through least squares method with 140 observations.

B. Later, the hypotheses of the study were tested in the direction of the parameters of the estimated hedonic price functions (for detail, see 4.3).

1.5. Content and Organization of the Study

The content of the study involved

1) the clarification of the concept of pedestrian way as an open space, which is the subject of valuation, demonstration of the benefits of open spaces, which are sources of the value, review of the related concepts, methods, and previous studies on economic valuation of open spaces, and review of the HPM in terms of its assumptions, historical development, advantages and disadvantages, variables and functional forms used in the hedonic price models, and previous applications within the frame of the theoretical analysis for understanding the context and method of the study; as well as,

2) the description and application of the convenient variables into the hedonic price models within the frame of the empirical analysis for revealing the impact of pedestrian way on rental price of residential properties; and

3) evaluation of the results on the base of the empirical and theoretical analysis.

Within this frame, the study was organized in five chapters (Logical flow of the study's organization was presented in Table 1.2).

Chapter 1 (Introduction) began with the explanation of the aim, scope, and context of, and need for the study. It defined, first, the big picture, in which the research took place in general, and then introduced the point, in which the research problem took place specifically. Later, it listed the research questions and hypotheses of the study. Once, the research problem had been defined, and hypothesis had been clarified, then the chapter continued with explanation of the research procedure and method (HPM). It ended with presentation of the content and organization of the thesis.

Chapter 2 (Economic Valuation of Open Spaces), as the first part of the literature review from both urban design and environmental economics disciplines' perspective, was designed to acquainted readers with the theoretical base of the study. It had two main sections. In the first section from urban design perspective, the concept of open space was explained; open space benefits were demonstrated dividing into three groups: social, environmental and physical, and economic benefits; and pedestrian way concept was described in the context of urban open space. On the other hand, the second section, from environmental economics discipline perspective, was organized to understand the basic concepts, methods, and previous studies on economic valuation through a review of vast literature. Here, the basic concepts of valuation were

determined as value, total economic value, willingness to pay, and willingness to accept. Later, the methods developed to value environment were examined dividing them into two groups: revealed preference methods and stated preference methods. This part was concluded with a review of the previous studies on economic valuation of environment in general, and specifically, on open spaces.

Chapter 3 (Hedonic Price Method) as the second part of the literature review, which was also from an environmental economics discipline perspective, was designed to comprehend the method used in the study -HPM- by reviewing it in terms of definition, emergence and historical development, assumptions, advantages-disadvantages, variables used in price models, and functional forms. Finally, the HPM was evaluated after reviewing its previous applications.

Once the theoretical background of the study had been established, then, the empirical analysis, which was carried out to understand the impacts of pedestrian way attributes on rental price of residential properties, was presented in Chapter 4 (Case Study: Economic Valuation of Forbes Pedestrian Way via HPM). This chapter was composed of three parts: definition of the research design, presentation of the data analysis, and establishing the hedonic price functions. The research design was defined in five steps: In the first step, the variables' set was defined. Dependent variable was determined as the rental price of housing unit; and independent variables were defined as three sets of attributes: housing's structural, location and socio-economic-physical environment, and pedestrian way attributes. In the second step, statistics hypotheses to be tested through inferential statistics techniques were defined. In the third step, selection of the sample area -Forbes Pedestrian Way- was explained, and the sample area was described and demonstrated with visual material. In the fourth step, data collection techniques and sampling design was explained. In the fifth step, statistical data analysis techniques used in the study were defined and explained very briefly. Once the research design was defined, then, the chapter presented the results of data analysis in two parts: descriptive and inferential statistics results. Finally, Chapter 4 presented the hedonic price functions.

In Chapter 5 (Conclusion), results of the study were summarized, and contribution of the variables describing pedestrian way attributes to the HPM was evaluated. Further, suggestions for further researches were given.

Table 1.2. Organization of the study

Steps / Parts	**Chapter**	**Content**	**Purpose / Method**	**Material**
Introduction	Chapter 1	*Study Formulation* Aim, context, need, contribution, research questions, hypothesis, methodology, content, organization	To provide logical frame	Whole chapters
Step1 / Part1: Theoretical Analysis via Literature Review	Chapter 2	*Review of the context* open space, open space benefits, pedestrian way attributes; concepts, methods, and previous studies of valuation	To introduce the context of the study providing theoretical background from urban design - environmental economics perspectives	Previous studies on open space, pedestrian ways, and valuation
Step1 / Part2: Theoretical Analysis via Literature Review	Chapter 3	*Review of the method* definition, assumption, advantages and disadvantages, previous studies on HPM	To introduce the method - HPM-providing theoretical background for empirical analysis	Previous studies on HPM
Step2/Part1-3 Empirical An. via HPM	Chapter 4	*Research* research design, data analysis, Hedonic Price Functions	To analyze the impact of pedestrian way on rental price of residential properties	Households and maps
Step 3: Evaluation / Conclusion	Chapter 5	*Evaluation* and suggestions for future researches	To evaluate research	Whole chapters

CHAPTER 2

ECONOMIC VALUATION OF OPEN SPACES

2.1. The Concept of Open Space: Definitions and Types

Open space is used to refer to the whole external environment outside buildings in urban areas. Nevertheless, as Dunnett et al. (2002) indicated, the term "open space" seems to be used loosely and interchangeably with the term "green space" which is a more recent term and particularly used to emphasize the green environment of urban areas which is more than just parks, gardens and playing fields.

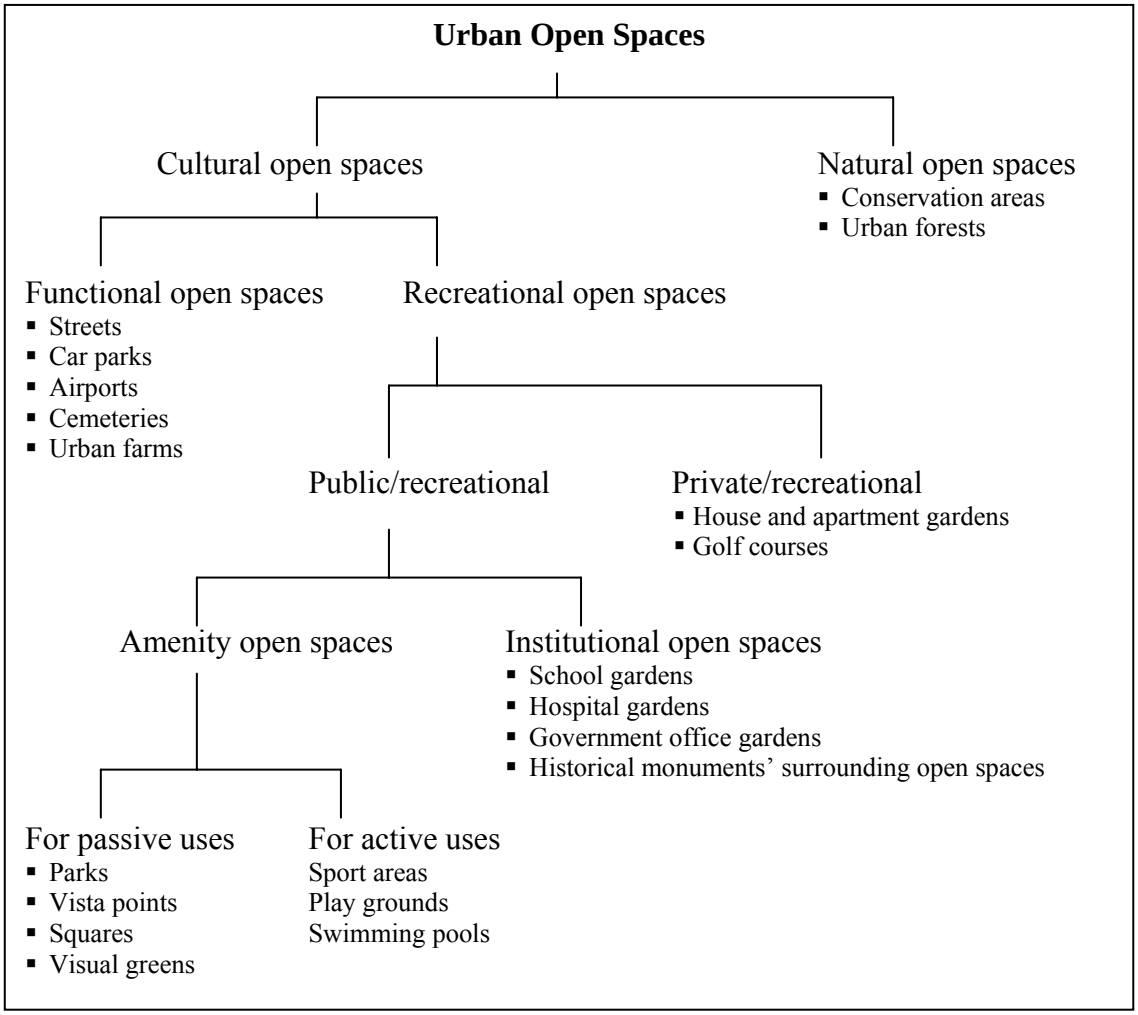

Figure 2.1 Types of open spaces (Source: Kırzıoğlu 1995, 16)

Open space consists of green space and grey space. Green space is land that consists predominantly of unsealed, permeable, soft surfaces such as soil, grass, shrubs and trees. Grey space is land that consists predominantly of sealed, impermeable, hard surfaces such as concrete, paving. The emphasis is on 'predominant' character because of course green spaces may include buildings and hard surfaced areas and grey spaces may contain trees. The distinction between the two is nevertheless important. Grey space can be further subdivided into functional spaces and civic spaces. Functional spaces serve a particular practical purpose, such as roads, pavements, car parks and other hard surfaced areas associated with different types of built development. Civic spaces are publicly accessible areas designed primarily for public enjoyment including town squares, plazas, pedestrian ways and esplanades (Dunnett 2002, see also Madanipour 1996, Kırzıoğlu 1995, Carr, et al. 1992, Altman and Zube 1989, Banerjee 2001). Indeed, there are many other classifications for open space. A more comprehensive one is schematized above.

2.2. Benefits of Open Spaces

Open spaces provide important social, environmental and physical, and economic benefits that affect quality of life in cities.

2.2.1. Social Benefits

There is an abundant literature indicating the social benefits of open spaces. Open spaces are places for people to meet and mingle. As indicated in Thompson's study (2002), open spaces particularly parks and streets are social places to see and to be seen.

Dunnett et al. (2002) stated that open spaces such as parks contribute significantly to social inclusion because they are free and access is available to all. According to them, open space provides neutral ground available to all sectors of society and can become the focus of community spirit through the many and varied opportunities provided for social interaction. In other words, they may contribute the creation of stable neighborhoods with strong community. Some open spaces have historical value, providing living reminders of past eras. Therefore, regardless of age,

they may also represent a considerable source of community pride, adding to a town's sense of identity and cultural well-being (see also Nicholls 2002).

As a social space and a vital part of urban landscape with its own specific set of functions, open spaces provide an outdoor room within a neighborhood, somewhere to relax, and enjoy the urban experience, a venue for a range of different activities, from outdoor eating to street entertainment; from sport and play areas to a venue for civic or political functions; and most importantly of all a place for walking or sitting-out (Thompson 2002, Montgomery 1997). Open spaces also functions as places for "the meeting of strangers". As pointed out by Thompson (2002) indeed, there are few other places in modern society where there is a possibility for strangers to interact, regardless of background, financial status, ethnicity, etc., but in a busy urban context, it is the park where people can actually be "private", lost in the anonymity of the crowd. Another social benefit of open spaces is that it may reduce crime (Nicholls 2002).

Perhaps, their most significant social benefit is provision of recreational opportunities such as children's play areas, walking paths, and so on (Sherer 2003). Many open spaces are popular recreational sites which contribute to child development through energetic and imaginative play, and may positively influence the behavior of both individuals and wider society as well (Dunnett et al. 2002).

Contact with some form of nature is a fundamental human need and thus, it is vitally important to access to open space. Open spaces such as parks and greenways in cities serves to human's this basic need. They are places to relax and they reduce stress levels through exercise of the body and calming of the mind. Therefore, they have also numerous public psychological and physiological health benefits. Facilitation of improvements in mental and physical fitness may also contribute to reduced health care cost (Tyrvainen 1997, Nicholls 2002).

In addition to the physical, emotional and spiritual improvements associated with spending time in open spaces, the existence of such areas also offers outdoor educational opportunities for children and field laboratories for scientists researching environmental issues (Dunnett, et al. 2002, Nicholls 2002). Experts interested in child development have insisted on the importance of allowing children to experience growing plants. Thompson (2002) claimed that in an urbanized society with an industrialized agriculture, this becomes harder than ever to achieve unless some open spaces such as allotments or school gardens are designed as a key place for this.

2.2.2. Environmental and Physical Benefits

One group of benefits is environmental in nature. Open spaces (particularly green areas) perform important environmental functions. In the cities, the main environmental function performed by open spaces through their living elements is to absorb CO_2 emissions, which come mainly from the use of private vehicles in urban transport but also are produced by heating installations and have increased considerably during recent decades. Nevertheless, the oxygen-replenishing characteristics of vegetation in open spaces to dispose of CO_2 is significant only in terms of vast urban parks (Laurie 1986). So, to what extent should open green areas be considered the "lungs of the city"? Morancho (2003) mentioned that it is needed almost a hectare of forest per inhabitant to absorb the contamination caused by these emissions. Laurie (1986) stated by grounding previous researches that to improve the air of Berlin to any marked degree, a green area of 300.000 hectares would be needed (Golden Gate Park in San Francisco is 100 hectares). Conservation of urban open areas therefore becomes indispensable to curb the growing contamination of cities

Open spaces also maintain a certain degree of humidity in the atmosphere, regulate rainfall, and tend to stabilize temperatures and reduce the extremes sheltering wind and sun, and providing ventilation channells. Laurie (1986) indicated that plants act as an absorbent material in open spaces, blotting up heat and light, and therefore open-green areas with organic surfaces reradiate less heat than do places having inorganic surfaces such as concrete. In the summer the city may be as much as 10 degrees warmer than the countryside. To the environmental functions of urban parks and other open-green areas, further factors should be added such as those of acoustic isolation since some gardens work as an acoustic screen between traffic roads and residential areas (Morancho 2003, Dunnett, et al. 2002).

Other environmental and physical benefits of open spaces are filtering pollutants and cleaning the air, controlling storm water runoff and protecting against natural hazards such as flood in natural and man-made urban environment, contribution to cost-effective sustainable urban drainage systems, reducing erosion, protecting ground water, screening obtrusive views, contributing to landscape and cultural heritage, and improving the aesthetic quality of a city offering cases of green in predominantly gray environs. They also form the basis for the conservation of fauna and flora because they

contribute to maintaining biodiversity through the conservation and enhance the distinctive range of urban habitats (Dunnett, et al. 2002, Kwak, et al. 2003, Laurie 1986, Morancho 2003, Rogers 1999, Sherer 2003, Thompson 2002).

Moreover, as Nicholls (2002) pointed out greenbelts at the edges of urban communities can serve as barriers to urban sprawl, providing clearer delineations between countryside and city. Finally, greenways and other linear open spaces such as pedestrian ways offer transportation advantages related to the safe pedestrian and bicycle connections between homes, shops, schools, and recreation areas.

2.2.3. Economic Benefits

Finally, open spaces serve certain economic benefits. Dunnett et al. (2002) divided these benefits into two groups: on-site benefits such as direct employment and revenue generation, and less tangible off-site benefits including increased nearby property prices (residential, commercial, agricultural), economic revitalization through attracting and retaining businesses and residents in an area, and increasing tourism.

Among all these economic benefits, as Kwak et al. (2003) indicated, amenity values of open spaces has gained a special attention in the recent years. That is, the benefits of proximity to an open space are capitalized into property prices since many people are willing to pay a larger amount for a property located close to parks and open spaces than for a home that is not close to these amenities (Sherer 2003).

For instance, Crompton (2000) reviewed 25 studies investigating whether parks and open space contributed to property values of nearby properties or not; and found that 20 of the results indicated such an increase (see also Correll, et al. 1978, Des Rosiers, et al. 2002, Irwin 2002, Kwak et al. 2003, Lindsey and Knaap 1999, Luttik 2000, McPherson 1992, Morancho 2003, More 1988, Nicholls 2002, Phillips 2003, Rogers 2003, Tyrvainen and Miettinen 2000). Increases in property values around parks may also lead to increases in the amount of property tax revenue. Indeed, many parks were initially constructed with a considerable expectation of their direct and indirect economic contributions to cities' revenues; Central Park in New York is an early example (Nicholls 2002).

Another emphasized economic benefit is their influence on economic revitalization through attracting and retaining businesses and residents, and increasing

tourism. According to Nicholls (2002), a well-designed and managed open space network may not only improve residents' quality of life, but also enhance outsider' perceptions. Firms that recognize the importance of lifestyle factors to their employees' well-being and, ultimately, productivity, may choose to (re)locate in cities with good open space systems. The more positive a city's image, the more likely it will attract tourists. Finally, as Dunnett et al. (2002) stated they may play role in urban renewal.

To protect all these positive benefits of open spaces, they must be well maintained and designed. However, open spaces are significant problem areas in many cities. The problem results from mainly financial constraints (Harnik 2003, DTLR 2002, Chiesura 2004, Carmona, et al. 2002, CABE 2003, Chapman 1999, ODPM 2002, ODPM 2004). Within this context, it is necessary to assess and measure their benefits in planning studies (Morancho 2003, Kwak, et al. 2003, Tyrvainen and Miettinen 2000). Through the methods developed by economics science, it is possible to make quantitative valuations for open spaces (Freeman 1993, Haab and McConnell 2002). Nevertheless, unlike the vast literature on valuation of environmental assets in general, researches measuring the economic value of open space benefits are limited. Thus, this is an area where additional research is still needed.

2.3. Pedestrian Way as an Urban Open Space

The American sociologist Jane Jacobs claimed that streets and their sidewalks, the main public place of a city, are its most vital organs. Thinking a city, first its streets come to mind. If the city's streets look interesting, lively, and secure, then the city looks interesting, lively, and secure. People will enjoy going there to see and to be seen since the street is not only a means of access but also an arena for social expression (Jacobs 1961, Lillebye 1996, Moughtin 1992).

The city streets have been a place where the pedestrian could move freely and safely for ages. In the past, many cities transport system based on the walking. In Roman and Greek times, forum and agora were places for pedestrians. Pompeii City had a success in this sense 1900 years ago. In the middle ages, plazas and squares were generated in close proximity to the cathedral. In that time, pedestrians were protected with arcades, galleries, fringes and shady spots. In 15th century, Leonardo da Vinci plotted the transportation system on a plan separating vehicle and pedestrian traffic. In

coming to the Renaissance times, pedestrians walked within the formal beauty of cities. In the period of Baroque, such glamorous and ornamented decors were joined to the pedestrian zones that pedestrian became an extra. But, at the beginning of 18th century, they found an opportunity, so they could walk safely within the decorative and geometrical plans (Hass-Klau 1993).

But, with motorization, vehicles gained precedence and importance in the city streets. The result in almost every city in the world has been a mixture of benefits and disaster. Benefits in the sense that more is done, more is made, and life goes faster; disaster because so many people are killed and injured, noise and pollution and other side effects are rife (Buchanan 1963). Presently, streets do not serve to pedestrians as much as to vehicles, and not as much as it was in the past. People learn the city from cars and buses. In consequence, the influence of the motor vehicles called into question principles of city design and organization of transport (Moughtin 1992, Buchanan 1963, Broadbent 1990).

Isaacs (2000) stated that a major goal in contemporary urban design is to encourage pedestrian activity. Today there is much interest in creating pedestrian-oriented urban places as part of a strategy to revitalize existing urban centers and to counter suburban sprawl. While many projects are in the planning stages, others have been built (Zafer 1996). Presently, also in Turkey there are many applications. Pioneering examples are Sakarya Street and Inkilap Street generated at the end of seventies and at the beginning of eighties in Ankara (Koçbeker 1982). Others followed them. Some applications were constructed also in İzmir; e.g. Kıbrıs Şehitleri Pedestrian Way, Alsancak Sevgi Pedestrian Way, and Şirinyer Forbes Sevgi Pedestrian Way in eighties and nineties.

Consequently, pedestrian ways have been so popular. People have enjoyed and benefited from them. Particularly, in the densely built urban environments where open spaces are so limited, they have met the open space needs of the citizens and served many benefits to the users (even to the nonusers). As an urban open space, pedestrian ways have provided varied and many benefits; not only some environmental (e.g., provision of cleaner environment, pollution abatement, lessening noise), physical (e.g., provision of pleasant and more attractive landscape and improving aesthetic quality of city), transportation (e.g., provision of opportunities for safer and more comfortable access to house and other places in which socio-cultural-economic activities take place such as bazaar, market, school, library, sport area, play ground, park and open spaces),

and social benefits (e.g., provision of opportunities for recreation, social inclusion, and better health through walking exercise), which are well known, but also many economic benefits (e.g., contribution to the local economy through both on-site and off-site benefits such as increased property values, economic revitalization by attracting and retaining business and residents, and energy consumption) which have not been yet analyzed directly and systematically since most of the values attached to pedestrian ways are non-priced benefits which are difficult to measure.

To conclude, pedestrian ways contribute to the quality of urban life. However, to improve their efficiency and contribution to the quality of urban life;

1) pedestrian ways should be carefully designed and maintained because physical design is an important factor involved in the transactional relationship between pedestrians and their environment. Of course, as Isaacs (2000) indicated, also social and economic issues, urban infrastructure and individual life-style choices draw people to a particular location. Nevertheless, physical design has influence on how they spend their time there and on their attitude toward the place. Therefore, well design of pedestrian ways of importance for pedestrian cognition and satisfaction;

2) in addition, a host of benefits including economic one should be systematically assessed and measured in monetary terms in urban design works.

2.4. Basic Concepts of Economic Valuation

Basic concepts of economic valuation of environment are value, total economic value (TEV), willingness to pay (WTP), and willingness to accept (WTA).

The economic concept of value has been broadly defined as any net change in the welfare of society. This concept does not restrict environmental values to benefits from the direct use of a resource. TEV is the sum of both use values and non-use values.

People may value environment for various reasons. They may derive benefits from a direct use of it, for example, from outdoor recreation or scenic driving, or from an indirect use, which might include reading or watching television programs about the resource. Part or all of the value people attach to a natural resource may, however, be unrelated to their use of it. They may want to conserve it because of ethical or moral obligations to nature itself (intrinsic value or existence value) or for the benefit of future generations (bequest value) (Hardarson and Hardarson 2000).

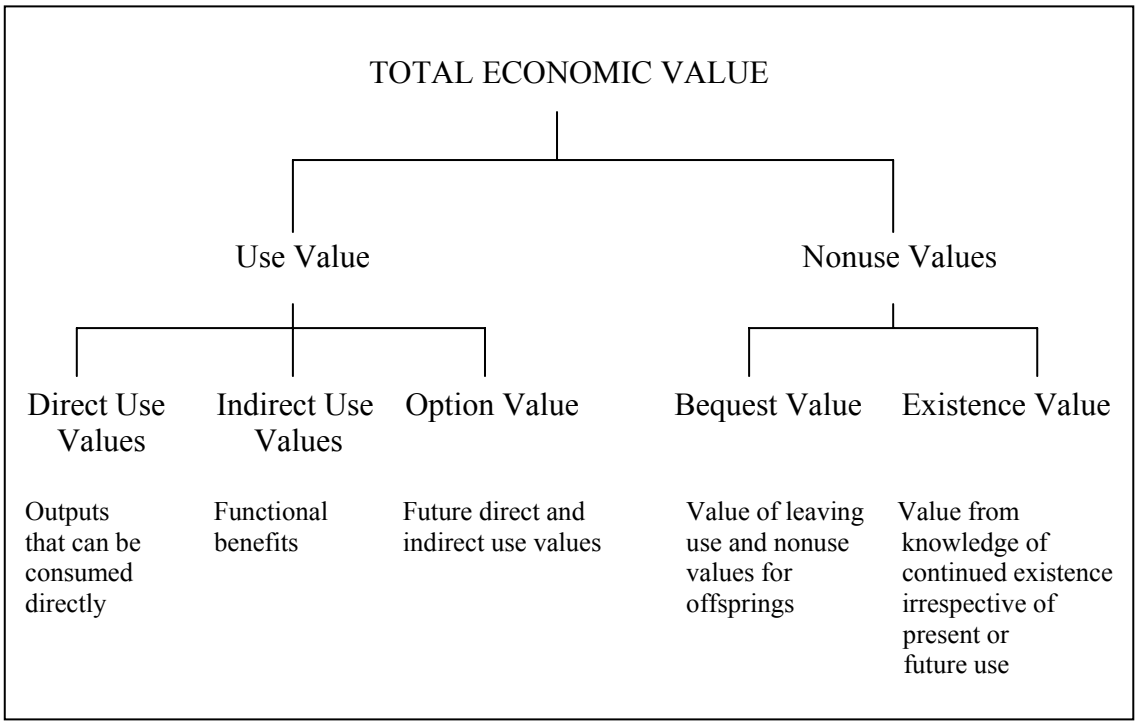

Figure 2.2. Total Economic Value (Source: Munasinghe 1993, 21)

Uncertainty regarding future preferences and regarding the impact of alternative uses of a natural resource can cause divergence between a person's willingness to pay for conservation and the discounted future stream of one-year benefits that the person expects to derive from that resource. The difference is termed option value. Option value resulting from uncertainty about future preferences may be either negative or positive; whereas option value resulting from uncertainty regarding the impact of development is invariable positive as long as the individual in question dislikes uncertainty (is risk averse). Thus, the sign of the option value is, in general, indeterminate. Uncertainty about the future benefits of an environmental good and the irreversibility of development give rise to yet another type of value, so-called quasi-option value (Arrow and Fisher 1974). If all actions were reversible then society could base its decisions about development on comparisons of its current expectations about future benefits and costs. Irreversibility, however, makes conservation more attractive. Conservation becomes more attractive the greater the uncertainty about its future benefits and the sooner one can expect some information that leads to the resolution of (or significant reduction in) this uncertainty. The concept of quasi-option value recognizes the limitations of traditional cost-benefit analysis which only compares two

streams of benefits; one resulting from development and one from conservation forever. There are, however, other options available, namely not developing at this moment in time while not ruling out development later. This choice, which is eliminated by development, is always at least as attractive in terms of expected future benefits as the "conservation forever" alternative as we still have the option to stick to conservation but also keep the possibility open to develop the area later should that turn out to be attractive (Hardarson and Hardarson 2000).

Willingness to pay (WTP) reflects the maximum monetary amount that an individual would pay to obtain a good. Willingness to accept compensation (WTA) reflects the minimum monetary amount required to relinquish the good. WTP thus provides a purchase price, relevant for valuing the proposed gain of a good, whereas WTA provides a selling price, relevant for valuing a proposed relinquishment (Brown and Gregory 1999).

Referring considerable empirical and experimental evidence, Horowitz and McConnell (2002), Shogren et al. (1994), Shogren and Hayes (1997), Hanemann (1991), Kolstad and Guzman (1999), Brown and Gregory (1999), Adamowicz et al. (1993) and many others indicated that there is a divergence between willingness to accept compensation to give up a good and willingness to pay to obtain a good. Brown and Gregory (1999) stated that the disparity between willingness to pay and willingness to accept compensation has been demonstrated repeatedly. Because using WTP estimates of value where a WTA estimate is appropriate tends to undervalue environmental assets, this issue is important to environmental managers. They summarized the reasons for the disparity and discussed some of the implications for management of environmental assets, as well as suggested some approaches for dealing with lack of credible methods to estimate WTA values of environmental goods.

According to Brown (1994), explanations of the disparity between WTA and WTP include the income effect; loss aversion or the endowment affect, which are formalized in prospect theory; the suggestion that, for some goods, moral responsibility is felt more keenly in selling than in buying; and the substitution effect.

Willingness to pay and willingness to accept measures of welfare change have been found to differ substantially when elicited from surveys or experimental market transactions. Conventional economic theory suggests that the difference between willingness to pay and willingness to accept should be smaller than those observed in empirical tests. Adamowicz et al. (1993) focused on the hypothesis that the availability

of substitutes for the good being evaluated affects the difference between the two measures. Their results suggested that the existence of a substitute does reduce the difference between willingness to pay and willingness to accept, however, the difference between these two measures is significant with or without substitutes.

Horowitz and McConnell (2002) reviewed willingness to pay and willingness to accept studies. They stated that willingness to accept is usually substantially higher than willingness to pay. These constructs have been studied for roughly 30 years and with a wide variety of goods. Horowitz and McConnell found that the less the good is like an "ordinary market good", the higher is the ratio. The ratio is highest for non-market goods, next highest for ordinary private goods, and lowest for experiments involving forms of money. A generalization of this pattern holds even when they account for differences in survey design: ordinary goods have lower ratios than non-ordinary ones. They also found that ratios in real experiments are not significantly different from hypothetical experiments and that incentive-compatible elicitation yields higher ratios.

2.5. Methods of Economic Valuation

In the literature, although there are different taxonomies for valuation methods, mostly, the economic valuation methods have been divided into two groups:

1) Revealed preference methods (indirect), and

2) Stated preference methods (direct).

Revealed preference methods rely on data regarding individuals' preferences for or against a marketed good, which has an environmental attribute related to it in some way. These techniques rely on either actual market, for example, the property market where property prices reflect the various attributes of the property, including environmental attributes. Revealed preferences techniques include:

1) hedonic price method,

2) travel cost method,

3) random utility modeling, and

4) averting behavior.

The type of data and the absence of direct enquiry into individual preferences for environmental goods restrict revealed preference methods to estimates of use value only (DTLR 2003).

On the other hand, stated preference methods can be applied to any context. These techniques are the only methods that can estimate values for non-use values of environmental resources. Non-use values have been shown to be a significant portion of total economic value in the context of many natural resources, especially where the resource concerned is unique or the impact is irreversible. There are two major variants of stated preference methods:

1) contingent valuation, and

2) choice modeling.

Both variants use similarly structured questionnaires but differ in the way they define the environmental resource of concern. Contingent valuation is concerned with the resource as a bundle of different attributes or characteristics, while choice modeling is mainly concerned with the individual attributes of the resource (DTLR 2003, Brookshire and Coursey 1987, Loureiro, et al. 2003, Moons 2003, Smith 1993).

2.5.1. Revealed Preference Methods

There are various revealed preference methods. However, the study focused on two major revealed preference methods which are travel cost and hedonic price methods

Travel Cost Method (TCM) has been used to estimate mostly the value of recreational sites. The method was first proposed by Hotelling in 1947. To visit a site people have to bear various costs. These include travel costs (petrol, train tickets, etc.), the opportunity cost of time and, possibly, an entry fee. People's travel costs differ and so does their opportunity cost of time. Thus, effectively, different individuals pay different prices for access to any given recreational site. Hardarson and Hardarson (2000) indicated that by observing how visit rates change in response to different prices one can estimate a demand schedule for the recreational services of a given site from which one can estimate the total surplus recreationers derive from these services.

The application of the TCM has some difficulties. Hardarson and Hardarson (2000) reviewed the restrictions of TCM. One problem is related to the allocation of travel costs. Some studies only estimate purchases of petrol. Other studies also include costs relating to the maintenance of vehicles, such as insurance and depreciation. Second, the appropriate measure for the opportunity cost of time is also a bid issue. Most people cannot pick their working hours flexibly and recreational activity is mostly

at the expense of other similar activity. This casts doubts over using wage rates as measures of the opportunity cost of time. Many studies use some fraction of wage rates. The fraction varies somewhat but is typically lower than 50% and often around 1/3. Another issue is if and then how one should make allowances for the fact that travelers differ (e.g., some visit only for a day, other stays for weeks). No clear consensus has emerged on how this issue or the other issues discussed above can be resolved. Researchers' choices relating to these issues can have a huge impact on welfare estimates. Third, likewise, the choice of functional form has been shown to have a significant impact on consumer surplus estimates. As in the case of the hedonic price function, economic theory does not, a priori, help much with the choice of functional form although it may be of some help in choosing between different models once they have been estimated. Statistical measures of fit and prediction are among the tools available to discriminate between functional forms. Comparisons of TCM estimates from different studies or comparisons with estimates obtained by other valuation methods, such as contingent valuation, can be of value in this regard.

Another revealed preference method is **Hedonic Price Method**. Since Chapter 3 reviewed it specifically, it was not repeated in this part.

2.5.2. Stated Preference Methods

The best known and most commonly used stated preference method is the contingent valuation method (CVM). In order to estimate the existence or non-use value of an environmental resource one has to depart from the revealed preference methods. Instead one must employ so-called stated preference methods (Hardarson and Hardarson 2000, Smith 1996). The ability of CVM to measure economic value is, however, by no means unquestioned. CVM is highly controversial and some critics go as far as to suggest that it is completely useless (see Venkatachalam 2004, Carson et al. 2001, Diamond and Hausman 1994). On the other hand, Hardarson and Hardarson (2000) stated that a more prevalent opinion is that CVM can be of some use although great care needs to be applied in the study design and in the interpretation of results.

The CV method was originally proposed by Ciriacy-Wantrup (1947) who was of the opinion that the prevention of soil erosion generates some extra market benefits" that are public goods in nature, and therefore, one possible way of estimating these

benefits is to elicit the individuals' willingness to pay for these benefits through a survey method (see Portney 1994, Hanemann 1994). However, Davis (1963) was the first to use the CV method empirically when he estimated the benefits of goose hunting through a survey among the goose-hunters. Venkatachalam (2004) indicated that this method gained popularity after the two major non-use values, namely, option and existence values, have been recognized as important components of the total economic values in environmental economics literature, especially during the 1960s. While the conventional revealed preference methods such as travel cost method are not capable of capturing these non-use values, the only method that is identified for estimating these values is the contingent valuation method. Hence, a considerable amount of studies on CVM -both theoretical and empirical- have emerged including a large number of studies criticizing the CV method.

Early studies of CVM used predominantly open-ended (OE) questions which ask respondents to state a WTP for an environmental benefit or a minimum compensation for an environmental resource loss. Recently, the OE format has been largely replaced with dichotomous choice (DC). Dichotomous choice studies present respondents with an amount and ask them to state if they are willing to pay this amount for the environmental gain under study (Hardarson and Hardarson 2000).

Venkatachalam (2004) reviewed CVM extensively in terms of the developments and issues on the theoretical, methodological and empirical aspects. In his review, the contingent valuation method (CVM) is defined as a simple, flexible non-market valuation method that is widely used in cost-benefit analysis and environmental impact assessment (see also Mitchell and Carson 1989, Cummings, et al. 1986). The other areas in economics where the CV method is increasingly being applied are health economics, transportation safety, and cultural economics. Its application in environmental economics includes estimation of non-use values, non-market use values or both of environmental resources. Venkatachalam (2004) pointed out that, in recent years, this method is commonly used in developing countries to elicit the individual's preferences for the basic infrastructural projects such as water supply and sanitation (see also Whittington, 1998).

However, this method is subject to severe criticism. The criticism revolves mainly around two aspects, namely, the validity and the reliability of the results, and the effects of various biases and errors (Venkatachalam 2004, see also Hausman 1993, Bateman and Langford 1997). Carson et al. (2001) reviewed this method in terms of

controversies, and discussed key areas of the debate over CV and the validity of passive use value. They concluded that many of the alleged problems with CV can be resolved by careful study design and implementation. They also indicated that claims that empirical CV findings are theoretically inconsistent are not generally supported by the literature. The debate over CV, however, has clarified several key issues related to non-market valuation and can provide useful guidance both to CV practitioners and the users of CV results.

2.6. Studies on Economic Valuation

Previous valuation studies were reviewed first in a wider context: environmental, then, specifically, in the context of open spaces.

2.6.1. Studies in Wider Context (Environment)

Regardless of the method employed, in general, there are many researches on the valuation of environmental assets in the world wide, particularly in USA and Europe. The vast literature on the valuation of environment may be divided broadly into two general categories.

The first category involves valuation concepts, methods, and econometric issues (e.g. Abdalla, et al. 1992, Adamowicz, et al 1997, Blamey, et al. 1999, Blamey 1998, Boxall, et al. 1996, Boyle, et al. 1996, Cameron 1992, Carson, et al. 2001, Carson, et al. 1996, Champ, et al. 2002, Cropper, et al. 1988, Cummings and Taylor 1998, Earnhart 2001, Freeman 1993, Folmer, et al. 2001, Haab and McConnell 2002, McConnell, et al. 1988, Hanley, et al. 1998, Huang, et al. 1997, Kristöm and Laitila 2002, Sterner, et al. 1998, Venkatachalam 2004).

The second literature category presents empirical studies on the economic value of environmental externalities, resources, and land uses in a very wide range (e.g. Bennett, et al. 2003, Breffle, et al. 1998, Boyle and Kiel 1999, Hadker, et al. 1997, Hanley, et al. 2003, Rosiers, et al. 1996, Thibodeau 1990, Tyrvainen and Vaananen 1998, Whitehead, et al. 1999, Arguea, et al. 2000, Asabere and Harvey 1985, Bond and Coulson 1990).

2.6.1.1. Studies Used HPM

Analyzing the literature, Nelson (1992) indicated that environmental features can increase land and house value if they are viewed as attractive or desirable, or they can reduce values if they are viewed as nuisances or undesirable (Bonnetain 2003, Rosen 1974). Therefore, these empirical studies can be categorized primarily as valuation of negative and positive environmental externalities and land uses depending upon the sign of their expected impact. Nevertheless, it is also necessary to indicate that the result obtained from the analysis may sometimes not match the expected sign. For instance, the value of climate may be positive or negative depending on the characteristics. Berrens et al. (2004) proved the positive influence of the desirable climatic features on property values. Furthermore, the value of water may be positive or negative depending on the quality, the constraints on property rights, and on the environmental conscious level of people (Bockstael and Leggett 2000, Des Rosiers, et al. 1999, Faux and Perry 1999). Literature presents such studies having unexpected results sufficiently. However, it is useful to divide this huge literature on empirical studies on valuation into two basic groups since it ensures the easy comprehension of the big frame of that complex area.

2.6.1.1.1. Studies on Negative Externalities and Land Uses

There is an abundant valuation literature on a great number of subjects of negative environmental externalities caused by noise, traffic, air pollution, landfills, and so on. Some applications focused on the value of air pollution (e.g., Graves, et al. 1988, Phipps, et al. 2003, Ridker and Henning 1967). Literature presented many researches indicating the value of underground water contamination. Some others focused on the acoustic contamination (e.g., Becker and Lavee 2003, Kupke, et al. 2002, McMillen 2004, Theebe 2004, Tomkins, et al. 1998, Wilhelmsson 2000).

Most of the studies focused on the economic impact of **landfill areas** and waste transport (Gawande and Smith 2001, Hite, et al. 2001, Kiel 1995, Nelson, et al. 1992, Reichert, et al. 1992, Smolen, et al. 1992, Thayer, et al. 1992). Landfills and hazardous manufacturing facilities are expected to impose health or amenity risks on surrounding communities (Farber 1998). These risks are thus expected to be translated economically

into negative effects on adjacent property values (Farber 1998, Haney 1992, Jackson 2001, McCluskey and Rausser 2001, Richards 1996).

For instance, Nelson (1992) conducted a research to estimate the price effects of a landfill in Minnesota on the value of 708 nearby homes during the 1980s. Empirical results indicated that the landfill adversely affected home values in the range of 12% at the landfill boundary and 6% at about one mile. Beyond about 2-2.5 miles adverse effects are negligible. Nelson indicated that the findings have important implications for the locating new landfills near residential areas and in areas within the path of future development.

Reichert et al. (1992) investigated the impact of five municipal landfills on residential property values in a major metropolitan area (Cleveland, Ohio). Their results showed that landfills will likely have an adverse impact upon housing values when the landfill is located within several blocks of an expensive housing area. The negative impact is between 5.5%-7.3% of market value depending upon the actual distance from the landfill. For less expensive, older areas the landfill effect is considerably less pronounced, ranging from 3%-4% of market value, and essentially nonexistent for predominantly rural areas.

Smolen et al. (1992) examined the economic effects of hazardous chemical and proposed radioactive waste landfills on surrounding real estate values in Ohio. The results of the study strongly suggested a distinct negative impact on sale prices for homes located within 2.6 miles of the existing site, and a diminishing impact before a distance of 5.75 miles is reached. Within 0-2.6 mile range to the Envirosafe Landfill, a $14,200 premium was found for each mile a house was located away from the Landfill. The premium is greater than found in other studies. A second proposed site in 1989, for low-level radioactive wastes, showed a clear, initial negative impact on housing sales prices on announcement, but negative effect on prices dissipated soon after extensive public resistance became evident and caused the proposal to be cancelled.

Thayer et al. (1992) examined the benefits of reducing exposure to waste disposal sites by using hedonic price method. They used a large detailed data set to examine the relationship between housing prices and several environmental quality indicators representing air, water, and land influences. Their primary concern was the influence of waste site proximity on housing prices. The results indicated that individuals consider waste site proximity in their housing purchases, yielding a measurable price gradient with two important characteristics. First, the price gradient

levels off with distance from the waste site. Second, distance from hazardous waste sites is more valuable than distance from non-hazardous waste sites.

Kiel (1995) investigated the impact of the discovery and cleaning of identified hazardous waste sites on house values in Boston. According to Kiel, the current ranking system for superfund sites considers only the costs of physically cleaning the site, ignoring the social benefits obtained by cleaning. This study estimated the effect of the existence of toxic sites on house values from before information on their toxicity was released by the federal government until several years after cleaning strategies were announced. The results indicated that community knowledge of the site, as well as government agency announcements, causes house prices to decline.

Hite et al. (2001) quantified the property-value impacts of a change in environmental quality by using the hedonic pricing model. In particular, they focused on the impact of the presence of landfills on nearby residential real estate prices. They combined elements of an urban location choice and hedonic pricing model to estimate the effects of the presence of multiple environmental disamenities on residential real estate prices. They accounted for temporal effects by including housing transactions in areas with both open and closed landfills and control for information effects. The results suggested that closing landfills will not necessarily mitigate property-value impacts.

Gawande and Jenkins-Smith (2001) examined the effects of perceived risks of nuclear waste transport on residential property values. They employed data on 9432 real estate transactions in South Carolina to model the effects of a series of highly publicized shipments of spent nuclear fuel to a storage facility at the Department of Energy's Savannah River Site. Using a model that corrects for spatial autocorrelation, they obtained results with important implications for the kinds of effects that nuclear waste shipments may have on property values. In areas with lower risk perception and more experience with nuclear materials management, they found that the shipments did not affect property values. In more populous urban areas, property values appear to have been lowered in a substantive manner. Limitations in the data leave uncertainties, however, which must be addressed in future research.

A more recent study was conducted by Taylor and Ihlanfeldt (2004). They measured the possible externality effects arising from small-scale hazardous waste sites by using hedonic price method. According to them, to fully assess the economic impacts of hazardous waste sites located within urban areas, evidence was needed on the extent to which these sites reduced nearby property values. In urban areas, of particular interest

was the potential effects of hazardous waste sites on commercial and industrial property values because they were far more likely to be located near hazardous waste sites as compared to residential properties. Consequently, they first presented evidence on the effects that properties appearing on various government lists of hazardous waste sites had on the values of nearby commercial and industrial properties in Fulton County, Georgia. Second, they used the estimated price gradients to examine tax-increment financing as an option for funding the clean-up of the contaminated sites. For this, they measured aggregate loss in property surrounding each site and comparing this loss to estimated clean-up costs. According to the results, in all cases, the post-announcement gradient was steeper than the pre-announcement gradient and for two land-uses (apartments and offices) these differences were significantly different from zero. They found that total estimated losses across all five land-uses equals $1 billion, which is approximately 10% of the total fair market value of all properties within a 1.5-mile radius of the 44 sites in Fulton County. Basing these results, they suggested that tax-increment financing was a viable option for funding the clean-up of many contaminated sites (Taylor and Ihlanfeldt 2004).

Some applications focused on the value of **air pollution** (Graves, et al. 1988, Phipps, et al. 2003, Ridker and Henning 1967). Phipps et al. (2003) measured the benefits of air quality improvement improving the methodology for estimating hedonic price functions when the data are inherently spatial. They developed a spatial-econometric hedonic housing price model and estimated for the Seoul metropolitan area to measure the marginal value of improvements in sulfur dioxide (SO_2) and nitrogen dioxide (NO_x) concentrations. Diagnostic testing favored the spatial-lag model over the spatial error model. Results showed that SO_2 pollution levels had a significant impact on housing prices while NO_x pollution did not. They indicated that this differential impact to the relatively higher levels of SO_2 pollution when compared with pollution standards and the relative decency of the NO_x pollution. Marginal WTP for a 4% improvement in mean SO_2 concentrations is about $2333 or 1.4% of mean house price.

Some others have focused on the **acoustic contamination** (Becker and Lavee 2003, Kupke, et al. 2002, McMillen 2004, Theebe 2004, Tomkins, et al. 1998).

For instance, McMillen (2004) added to the empirical literature by estimating the effect of airport noise on property values around one of the world's busiest airports, Chiacago O'Hare. His research results indicated that home values were about 9,2 % lower in the area that is subject to severe noise. Opponents of airport expansions argue

that increased noise will reduce property values and lower tax bases. Nevertheless, his paper indicated that aircraft are becoming so much quieter that the airport can be expanded without causing a drop in local property values or tax bases in the future. Estimates suggested that house prices may rise by as much as $284,6 million in the densely populated area around O'Hare after a new runway is added to the airport.

Theebe (2004) estimated the non-linear impact of traffic noise on property prices applying hedonic price method. Thebe used very extensive data set; over 100,000 sales transactions, with many individual property characteristics, combined with noise levels. The results showed that the impact of traffic noise ranges to 12%, with an average of about 5 %. The discount varies across sub-markets, and is a non-linear function of the noise level.

Wilhelmsson (2000) provided an empirical analysis of the impact of traffic noise on the values of single-family houses. Under the assumption that negative externalities are capitalized into house values, he used the hedonic price method and found that noise pollution has a substantial negative effect on housing values. Results showed that a single-family house of SEK975 000 would sell for SEK650 000 if located near a road where noise is loud, equivalent to total discount of 30%.

Hedonic studies presented the negative values obtained also from natural hazards such as earthquake and flood (e.g., Beron, et al. 1997, Murdoch, et al. 1993, Önder, et al. 2004, Harrison, et al. 2001).

For instance, Önder at al. (2004) examined the impact of public perception of earthquake risk on Istanbul's housing market by investigating the spatial distribution of the average house values and the changes in average house prices in Istanbul between 1995 and 2000. They used the soil type and distance to the fault lines in the Sea of Marmara as proxies for public perception of earthquake risk. According to the results of their analysis, distance from fault lines is an important factor in explaining house values and its impact on house values increased after the 1999 Kocaeli earthquake. Furthermore, there is a quadratic relationship between soil type and house values. However, none of the measures of earthquake risk significantly affect the change in house values. They indicated that these findings suggest that public perception of earthquake risk enhanced and the public information about earthquake hazard had significant impact on house values.

Murdoch et al. (1993) examined the effect of the Loma Prieta (World Series) earthquake on housing prices in the San Francisco Bay area by using a large, detailed

data set. This relationship was examined while controlling for potential confounding variables, such as location-specific risk and the timing of the earthquake. The results indicated that the Loma Prieta earthquake caused an area wide reduction in property values. In addition, they pointed out that it seems that individuals considered other measures of earthquake risks in their housing purchases, yielding a measurable price gradient. These results are relatively robust, remaining stable across estimated functional forms and independent variable sets.

Another subject of negative environmental externalities is the existence of **high voltage power lines**. For instance, Delaney and Timmons (1992) administered a survey in 1990 to estimate the impact of power lines on property values. The results suggested that proximity to high voltage power lines was capitalized into lower values for residential properties. Respondents who had appraised such property report that power lines could affect residential property value to varying degrees under certain circumstances and that the market value of these properties was, on average, 10.01% lower than the market value for comparable properties not subject to the influence of high voltage power lines. Further, the results indicated that even appraisers who had not appraised such property believe that power lines contribute negatively to property value.

Farber (1998) summarized the empirical studies completed to date that test whether undesirable land uses such as waste sites, hazardous manufacturing facilities, or electric utility plants have observable negative effects on adjacent property values. This information may be useful in assessing min. valuations of terminating undesirable land uses, such as clean-up of hazardous sites, or compensation necessary to ameliorate the economic impacts of new undesirable uses.

2.6.1.1.2. Studies on Positive Externalities and Land Uses

Positive environmental externalities are produced through various amenities such as roads, schools, parks, greenways, and golf courses. Positive environmental externalities and land uses are in general expected to improve the quality of life in the surrounding communities. Des Rosiers (2002) indicated that these benefits are thus expected to be translated economically into positive effects on adjacent property values. Like studies on valuation of negative externalities and land uses, there is a huge literature also on valuation of various subjects of positive externalities and land uses.

Most of the studies focused on the valuation of positive externality effects of **transportation improvements and elements** such as rail lines, stations, roads and highways (Benjamin and Sirmans 1996, Bowes and Ihlanfeldt 2001, Coffman and Gregson 1998, Craig, et al. 1998, Henneberry 1998, McDonald and Osuji 1995, So, et al. 1997).

For instance, McDonald and Osuji (1995) empirically studied the residential land values in the vicinity of the new elevated transit line that runs the 11 miles from downtown Chicago to Midway Airport. The results showed that in 1990 an increase of 17% in residential land values within one-half mile of the station sites can be attributed to improved access provided by the transit line. Alternatively, the increase was 1.9% (or $126.75 per lot) per mile of distance to downtown Chicago for those sites within one-half mile of the stations. The line opened on 31 October 1993, so the land market had begun to adjust well before the transit facilities were available for use.

Benjamin and Sirmans (1996) examined the effect of mass transportation on apartment rent. After reviewing the empirical research which has focused on the effect of mass transportation availability on property values, they investigated the benefits on apartment rent of Washington, D.C. apartment buildings from location near Metrorail stations. Their empirical results show that distance from a metro station has an adverse effect on apartment rent, i.e., each one-tenth mile increase in distance from the station results in a decrease in rent per apartment unit of about 2.5%. They indicated that their analysis should be of interest to a host of domestic and international market participants including academics who study real estate markets, tax assessors who determine market value, appraisers who make market-derived rent adjustments and property managers who set apartment rents.

Coffman and Gregson (1998) used a straightforward model of land price determination to estimate the impact on land values of distance from the railroad. Based on estimation they inferred a lower bound for capital gains attributable to the construction of railroads in Knox County, Illinois, during the 1850s. Knox County landowners reaped capital gains of more than $270,000-9% of the value of land.

Craig et al. (1998) investigated the relationship between transportation improvements and land values in the Antebellum United States by using hedonic approach. They found that in 1850 average farm values in counties with access to a canal or navigable river were $2.68 per acre greater than counties without such access and $1.80 greater with rail access. In 1860 the figures were $3.75 for a canal or river

access and $1.35 for rail. With average farm size around 200 acres and per capita national income roughly $150 during the decade, they concluded that on average transportation access yielded substantial economic gains.

Tomkins et al. (1998) investigated the impact of an airport in an urban property market. They stated that the effects of a major airport are unlikely to exhibit a uniform spatial distribution. The benefits to industries and individual households may extend well beyond the local economy, whereas many of the costs are spatially concentrated in the immediate environment. In particular, the problems of noise and traffic generation can be expected to fall principally upon adjacent populations. Therefore, they addressed the general question of whether the costs to local economies of airport proximity, which are in the nature of externalities, outweigh the benefits of access, employment and improved infrastructure. Based on data relating to Manchester airport and its surrounding areas, their specific approach involved an investigation of extend to which such proximity effects are capitalized into residential property prices. Their results provided some evidence to suggest that circumstances may exist where positive attributes, such as improved access and employment opportunities, may be more highly valued by local residents than negative externality effects of airport proximity.

Bowes and Ihlanfeldt (2001) investigated the impacts of rail transit stations on residential property values by using hedonic price method. According to them, while a number of studies empirically investigated the effect of rail station proximity on property values, none fully investigated the underlying factors accounting for this effect. Therefore, from a policy perspective, they emphasized the significance of understanding the factors and their roles in defining the relationship between property values and rail stations. Consequently, they identified four factors –two (access advantage, and commercial services provided in rail stations), which may cause higher property values and two (negative externality effects emitted by the station, such as noise, pollution and the unsightliness of the station, and higher crime) which may cause lower property values in station areas. Depending on these roles, they suggested that, strategies can be developed to maximize the attractiveness of rail stations and thereby alleviate automobile congestion, vehicle emissions, and low density suburban sprawl.

Yankaya (2004) analyzed the effects of subway investment on the value of house values in İzmir by using hedonic price method. He produced different models in four functional forms (linear, log-linear, linear-log, and log-log). The results showed that proximity to the subway stations is a statistically significant determinant of the

market price of housing. Further, the results indicated that the influence of transport investment on house values depends on transport costs, total vehicle time and distance to the nearest station. Finally, Yankaya pointed out that log-linear and linear-log forms were statistically superior to other functional forms.

One application is on the valuation of **wetlands.** For instance, Mahan et al. (2000) measured the value of wetland amenities in the Portland, Oregon, metropolitan area using the hedonic property price model. They used residential housing and wetland data to relate the sales price of a property to structural characteristics neighborhood attributes, and amenities of wetlands and other environmental characteristics. Measures of interest were distance to and size of wetlands, including distance to four different wetland types; open water, emergent vegetation, scrub-shrub, and forested. Other environmental variables included proximity to parks, lakes, streams, and rivers. Their results indicated that wetlands influence the value of residential property and that wetlands influence property values differently than other amenities. Increasing the size of the nearest wetland to a residence by one acre increased the residence's value by $24. Similarly, reducing the distance to the nearest wetland by 1,000 feet increased the value by $436. Home values were not influenced by wetland type.

Some applications were on valuation of **new urbanism features** (Eppli and Tu 1999, Song and Knaap 2003).

Asking whether new urbanism offers a desirable place to live, and consumers willing to pay a premium for it; Eppli and Tu (1999) investigated the impact of new urbanism on single-family home prices in Kentlands which is one of the best and most complete examples of new urbanist development. Specifically, they used Duany and Plater-Zyberk's traditional neighborhood development of Kentlands and surrounding conventional subdivisions to estimate the premium, if any, that single-family homeowners are willing to pay to reside in a community with new urbanist features. As a methodological approach they used HPM. To explain the variation of single-family home prices, they employed 28 independent variables and categorized them into six groups: site, interior, exterior, quality, location and market characteristics. To reveal the robustness of the new urbanism coefficient, they first computed a regression equation with all available housing variables, and then re-estimated after deleting variables that were not significant to the model. Using the data set containing 2,061 transaction records, they estimated a series of models.

The empirical evidence suggested that residents in Kentlands pay a premium for housing over comparable homes in surrounding conventional subdivisions. Eppli and Tu indicated that, of primary importance to their research, the "Kentlands" parameter estimates are positive and significant across all models after controlling for site, interior, exterior, quality, location and market characteristics. The analysis indicated that consumers are willing to pay a 12%, or approximately $25,000 premium for properties in Kentlands. They indicated that these findings were the first empirical evidence that new urbanism is desirable and valuable from a housing-market perspective.

The work by Eppli and Tu presumed that there are only two kinds of neighborhoods: new urbanist and traditional suburban. In fact, as indicated by Song and Knaap (2003), there are many different types of neighborhoods with many different design features, and consumers might have multifaceted housing preferences. With this consideration, Song and Knaap (2003) analyzed the relationship between new urbanism and housing values attempting a formal analysis of the virtues of new urbanism. Essentially, their research strategy involved disaggregating new urbanism into its component parts and an examination of the implicit prices those parts yield in the market place. They used two sets of variables: first, urban form variables: street design and circulation systems, density, land use mix, accessibility, transportation mode choice, pedestrian walkability; second, control variables: physical housing attributes, public service levels, location, amenities and disamenities, socio-economic characteristics. They obtained the data from the tax assessment files from Washington County, Regional Land Information System from Portland- Metro, and census data from the US Census Bureau. Prior to estimation, they omitted invalid transactions and multiple sales to ensure that sales reflect market clearing prices, and to ensure independent observations. The cleaned dataset contained 48,070 real estate sales transactions. The average sale price is $177,461, ranging from $50,000 to $916,300.

They found that residents are willing to pay premiums for houses in neighborhoods with more connective street networks; more streets, shorter dead-end streets; more and smaller blocks; better pedestrian accessibility to commercial uses; more evenly distributed mixed land uses in the neighborhood; and proximity to operating light rail stations. They also found residents are willing to pay less for houses in neighborhoods that are dense, contain more commercial, multi-family, and public uses (relative to single-family uses), and contain major transportation arterials. When combining these features in composite sketches of new urbanist and traditional

neighborhoods, they found that homes in a new urbanist neighborhood command an aggregate price premium. Further, the results showed that this premium more than compensates for the severe price discount for the small size of new urbanists lots. Much of the premium comes from improvements in internal connectivity that stem from smaller blocks, and shorter streets. Some of the premium also stems from lesser external connectivity, or greater transport isolation. Some of the premium also comes from pedestrian accessibility to commercial uses - even though those uses are not valued in the neighborhood. Song and Knaap also indicated that it is dangerous, to generalize from the attributes of a single new urbanist development as other developments that could be described as new urbanist could well differ in character a great deal from Orenco. But the Orenco example supported previous research that new urbanist neighborhoods do provide a price premium.

Some applications were on value of **school quality.** For instance, Brasington (1999), Downes and Zabel (2002), and Haurin and Brasington (1996) proved that the school quality and characteristics have an important influence on property in particularly housing values.

Haurin and Brasington (1996) investigated the relationship between school quality and house prices focusing on explaining variations in real constant-quality house prices in jurisdictions located in multiple MSAs. Using a hedonic house price framework, they tested competing theories of house price determination. Using two variants of the random coefficients model, they found that public school quality has a very large impact on real constant-quality house prices. Their results suggested that capitalization of school quality differences occurs on a per lot basis rather than per square foot of land. Also important to the explanation of variations in house prices are variables derived from urban theory, such as distance to the CBD, and from the amenity literature, such as a community's crime rate, arts, and recreational opportunities.

Brasington (1999) explored which measures of public school quality the housing market values by using hedonic price method. Results showed that proficiency tests, expenditure per pupil and the pupil/teacher ratio are consistently capitalized into housing prices. Teacher salary and student attendance rates are also valued, but these results are sensitive to the estimation technique employed. Results also indicated that value-added measures, the graduation rate, teacher experience levels and teacher education levels are not consistently positively related to housing prices, so researchers should probably avoid using them as public education quality measures.

Also Downes and Zabel (2002) estimated the impact of school characteristics on house prices using data from Chicago for 1987-1991. They obtained information from the American Housing Survey and the Illinois School-Report Cards and assigned to each house the school-level data for the closest school. The evidence suggested that the school-level variables are significantly better in describing house values than the district-level data. They found that controlling for unobserved, temporally-stable determinants of house values is necessary to obtain unbiased estimates of the impact of school characteristics on house prices. Results also indicated that homeowners pay attention to school outputs, i.e., test scores, and not to inputs, i.e., per-pupil expenditures.

One specific subject of applications was to understand the value of view. Nevertheless, a relatively small number of studies examined the value of the view amenity, as pointed out by Benson et al. (1998) either as a primary or secondary focus of analysis (e.g., Brown and Pollakowski 1977, Correl, et al. 1978, Benson, et al. 1997, Benson, et al. 1998, Wolverton 1997). These studies found that view adds significantly to the value of residential real estate.

For instance, Benson et al. (1998) investigated the value of the view amenity in single-family residential real estate markets. They indicated that views are not uniform, but vary by type (water, mountains, valleys, and so on) and by quality. Such variation may exist not only between real estate markets but within markets as well. Water views, for example, may range from high-quality full views to low-quality partial views, even within the same neighborhood. Nevertheless, as they reported, only a few studies attempted to distinguish between views on the basis of quality; in some cases, the type of view (mountain, ocean, lake, valley, and so on) was not identified.

Therefore, they estimated the value of a view for a variety of view types and quality levels in a single-family residential market using data for the city of Bellingham, Washington, a city with a variety of views, including ocean, lake, and mountain, allows for differentiation of the view amenity by both type and quality. To avoid the small sample problems encountered by some previous researchers, they collected view data for a large number of single-family properties (5,095 properties). Consequently, they indicated that the value of a view varied substantially depending on type and quality.

Their result showed that a view added 25.6% to value. However, when views were classified into seven categories, the percentage increase in property value

attributable to a view ranged from 8.2% for a poor partial ocean view, to 18.1% for a lake view, 29.4% for a good partial ocean view, 30.8% for a superior partial ocean view, and 58.9% for an unobstructed ocean view. High-quality ocean-view properties were found to command the largest market premium (approximately 60%), one that was several times larger than the premium attached to a low-quality ocean view (8%). For ocean views of all quality levels, the value of a view was found to vary inversely with distance from the water. Consequently, Benson et al. suggested that if a hedonic pricing model is utilized to value view homes, even for a single market, a simple view or no view specification can be inadequate.

Other applications were on value of **islands** (Bonnetain 2003), **tropical rainforests** (Carson 1998), **watersheds** (Bennett and Acharya 2001, Farber and Griner 2000), **public housing projects** (Rabiega, et al. 1984), view (Benson, et al. 1998, Wolverton 1997), and **group homes** on property values (Colwell, et al. 2000).

Bonnetain (2003) made a hedonic price analysis for a particular kind of private goods: islands. His research addressed the following question: Why do island prices vary across locations? To answer this question, an econometric model was developed to explain differences in island prices with respect to their characteristics (distance from the coast, size, economic and political situation of the Membership State). The findings suggested that an island price is likely to increase with its size and temperature. Similarly, islands which exhibit greater geographical isolation tend to be more highly valued. Moreover, the price of islands increases in response to an increase in per capita income and population density of the States to which they belong, reflecting the importance of the public good and externality dimension embodied in real estate parcels. On the contrary, political instability and war-proneness of the membership States have no effect on an island price.

The economic value of planning decisions are not only resulted from the decisions on land use types, but also from other decisions related with such as conservation (Asabere and Huffman 1991, Leichenko, et al. 2001), plot size (Lin and Evans 2000, Wolverton 1997, Thorsnes 2000, Thorsnes and McMillen 1998), and location (Alanso 1964, Archer, et al. 1996, Gallimore, et al. 1996, Henneberry 1998, Turnbull 1997). And, each of these decisions has some economic consequences. Within this context, Asabere and Huffman (1985) measured the net effect of historic districting on the value of federally certified historic sites. The impact could be either positive or negative depending on the tension between positive externality effects and the

constraints on property rights. Since federally certified historic parcels are not severely encumbered by regulations, they expected positive externality effects to dominate any negative effects of constraining rights. Consequently, they found that the net effect of historic districting on land values is significantly positive. They also found that while residential parcels within historic districts attract a huge price premium of 131%, the premium associated with nonresidential parcels within historic districts is statistically insignificant.

Thorsnes and McMillen (1998) used a semiparametric estimator to analyze the relationship between land values and parcel size in a sample of 158 undeveloped parcels in the Portland, Oregon, metropolitan area. Their semiparametric estimator combined the benefits of parametric and nonparametric estimation. The value-size relationship was estimated nonparametrically, which permits the function to be linear, convex, and concave in different regions. A simple log-linear parametric relationship was assumed for the rest of the model, which conserves degrees of freedom and simplifies hypothesis testing. Their semiparametric estimates did not reject log-linearity for the value-size relationship.

Leichenko et al. (2001) analyzed the relationship between historic preservation and residential property values in the case of Texas Cities. Designation of historic districts is increasingly used as a tool to revive or halt the deterioration of central-city neighborhoods. While historic designation is generally thought to have a positive impact on property values, evidence on this issue is mixed. One limitation of previous research is that it typically focuses on historic neighborhoods in one city and thus bases its conclusions on a very limited sample. Their study expands upon previous work by examining the effects of designation on property values across a larger set of cities. For this purpose, they used hedonic regression models to estimate housing prices in historic districts and comparable neighborhoods in nine Texas cities. Their results suggested that, in most cases, historic designation is associated with higher property values.

Lin and Evans (2000) investigated the relationship between the price of land and size of plot when plots are small. They used a data set of land sales collected in an almost laboratory-like situation to examine the relationship. The results showed that the price of land per unit of area increases with plot size. Their current study looked at smaller sites which are otherwise identical in their characteristics. Most other studies, however, looked at sites which vary in size, in location, and, in particular, the extent to which they are serviced with infrastructure.

Colwell et al. (2000) studied the effect of group homes on neighborhood property values. The majority of studies examining the impact of group homes on neighborhood property values have found that group homes do not adversely affect property values. However, their results showed that properties which are proximate to group homes experience a decline in value following the announcement of a group home's pending establishment. Of importance their model is being the first in this literature to accommodate different price levels and appreciation rates across neighborhoods.

Ding et al. (2000) investigated the effect of residential investment on nearby property values providing evidence from Cleveland, Ohio. They analyzed the effect of both new and rehabilitation residential investment on nearby property values. They used hedonic price method with applying geographic information systems. According to the findings, first, the effect of investment on property values is geographically limited; second, new investment has a greater impact on nearby property values than rehabilitation; third, there is evidence that new construction and rehabilitation have a significantly positive impact in low-income areas, as well as predominantly non-minority neighborhoods; finally and most importantly, the research suggested that small-scale investment has no impact on nearby property values. Thus, investment policy, which promotes and encourages investments that are not sufficiently large, may not be able to improve tax bases and enhance neighborhoods. They also indicated that results could be misleading if spatial lagged variables are inappropriately measured.

Leichenko et al. (2001) investigated the relationship between historic preservation and residential property values in Texas Cities. Their study expanded upon previous work by examining the effects of designation on property values across a larger set of cities. The study employed hedonic regression models to estimate housing prices in historic districts and comparable neighborhoods in nine Texas cities. Results suggested that, in most cases, historic designation is associated with higher property values.

Thorsnes (2000) estimated the effect of subdivision size and zoning on residential lot prices. Though land-development regulations potentially control neighborhood externalities, the developer of a residential subdivision contributes to that control by developing a larger parcel of land. The results indicated that adding an acre to the median development increases lot prices by about 3%. Amenities appear to be

income normal, and the return to parcel size is greater in unincorporated areas, perhaps due to less intensive control over externalities.

Zylicz et al. (2001) investigated the impact of environmental amenities on the housing market in Warsaw by using hedonic price method. They surveyed and analyzed four housing markets in Warsaw –house sales, apartment sales, house rentals and apartment rentals. They obtained more than 100 characteristics of 982 estates from real estate agencies, site visits, and local maps. Through correlation analysis, they identified 24 variables as significant for explaining sale or rental prices. Nevertheless, they indicated that the prices in each of the four markets were best explained by different sets of variables, and this confirmed that the four markets are governed by different preference patterns.

Their results showed that structural characteristics of apartments and houses in addition to location determined much of the price variance. The urban noise, air quality, and green neighborhood proved to be significant factors in explaining estate prices. Nevertheless, authors indicated that as the Polish economy still undergoes a transition, its housing market may reveal peculiar features that require additional insights. Therefore, they suggested two possible directions for additional researches: first, to study marginal rates of substitution between elements of structural characteristics of houses or apartments; second, to build environmental quality indices for districts.

The relationship between residential property values and nonconforming land uses is of interest to real estate academicians and practitioners alike. For some time, urban economist and also urban planners and city officials have been concerned with the relationship between nonconforming land uses and the potential for visual intrusion, increased traffic congestion, and other negative externalities. The literature suggests that some nonconforming land uses impose negative externalities on residential properties while other uses produce positive externalities. On the other hand, as Li and Brown (1980) showed that the same nonconforming use may produce both positive and negative externalities.

Another study in searching the value of nonconforming use is Thibodeau's (1990) research, which estimated the effect of high-rise office buildings on residential property values. The hedonic specification employed in that study permitted the estimation of both negative and positive externalities potentially associated with this high-rise employment center. According to the results, residential property values for nearby houses were discounted by as much as 15 percent. Alternatively, values for

properties 1,000 meters away from the high rise sold for a 5 percent premium. Nevertheless, there were many more homeowners that benefit from the positive externalities than there were homeowners burdened by the negative externalities. Hence, the net effect of the high rise was positive; it increased aggregate residential property values about 1% (Thibodeau, 1990).

Des Rosiers et al. (1999) estimated the effect of drinking water quality on property values in Charlesbourg, a major municipality (70,000 inhabitants) of the Quebec City region where repeated water-related health problems were experienced in 1990 and 1991. They sampled 807 bungalow sales from the data bank of the Quebec Urban Community Appraisal Division, and environmental information pertaining to local drinking water quality levels supplements data on physical, neighborhood and access attributes. Their findings indicated that water-related health hazards exert a detrimental and measurable impact on higher property values, with the average duration of the warning period per sector clearly emerging as the dominant factor. More precisely, market segmentation suggested that the higher the price of the property, the sharper the decline in market value because of this factor. In their study, the most severely affected properties of the upper third segment of the market experienced drops in value ranging from 5.2 to 10.3 percent of mean sale price.

Faux and Perry (1999) estimated irrigation water value applying hedonic price analysis to agricultural land sales in the case of Malheur County, Oregon. This provided price information, where otherwise absent, which can facilitate reallocation of water supplies to meet growing demands. They indicated that the failure to include available information on soil quality, an important determinant of agricultural land value, resulted in erroneous conclusions. They estimated the value of irrigation water at $9 for an acre-foot on the least productive land irrigated, and up to $44 per acre-foot on the most productive land.

Michael et al. (2000) derived implicit prices for nine measures of water clarity using hedonic property value models of lakefront properties in Maine. Results showed that water clarity variables based on different perceptions may result in differences in implicit prices large enough to potentially affect policy decisions.

Harding et al. (2003) estimated bargaining effects in hedonic models providing evidence from the housing market. Bargaining is common in markets for heterogeneous goods and differences in bargaining power between buyer and seller affect the negotiated transaction price. Previous research has found systematic evidence in the

housing markets that weak buyers pay higher prices and weak sellers receive lower prices for their homes. Earlier work has modeled the bargaining effect as a parallel shift in the hedonic function, implicitly assuming that attribute shadow prices were unaffected by the bargaining process. Harding et al. used a sample of home sales where the seller's bargaining power is weakened by the fact that the home is vacant at the time of sale to test whether the effect of bargaining is best captured by a shift in the hedonic constant or whether the attribute shadow prices vary as well. The question is significant for property valuation where estimation of the marginal value of an attribute is commonly used to adjust comparable sales data. They found strong confirmation that bargaining power influences the negotiated price. Results also indicated that bargaining power alters attribute prices, although they did not find a consistent pattern across markets.

McLeod et al. (2002) investigated the relationship between environmental amenities and agricultural land values by using a hedonic model. Authors stated that remote agricultural lands, which include wildlife habitat, angling opportunities and scenic vistas, command higher prices per hectare in Wyoming than those whose landscape is dominated by agricultural production. They used geographic information systems data to measure recreational and scenic amenities associated with rural land. Results indicated that the hedonic model specification performed well across several functional forms. The sampled land prices were explained by the level of both environmental amenities as well as production attributes. Statistically significant amenity variables included scenic view, elk habitat, sport fishery productivity and distance to town. They reported that the analysis permitted a better estimation of environmental amenity values from hedonic techniques. Finally, they indicated that improved estimation of amenity values is vital for policies aimed at open space preservation, using agricultural conservation easements and land use conflict resolution.

One special hedonic price method study was conducted by Vandell and Lane (1989) as a preliminary attempt to evaluate empirically the contribution of architectural quality to the value of buildings. They tested the model using disaggregate cross-sectional and longitudinal operating performance and amenity data from a set of 102 office buildings in Boston and Cambridge. Data on design quality for the set of buildings were provided by a detailed evaluation of each structure by a panel of architects. Their results confirmed a strong influence of design on rents; structures rated in the top 20% for design quality were predicted to extract almost 22% higher rents than

those rated in the bottom 20%. In contrast, the data showed a weak relationship between vacancy behavior and design quality. Finally, good design was shown to cost more to produce on average, but not necessarily in every case. They indicated that good design may not in fact be more profitable on average, but may provide a small probability of a high return to the developer. Nevertheless, their study was discussed because of the way to define and measure the design quality.

2.6.1.2. Studies Used Other Methods

Empirical studies used other methods can also be categorized as valuation studies on negative and positive environmental externalities and land uses. Nevertheless, as this study used HPM, the applications of other methods were not reviewed as extensive as it was done for HPM studies. The following presents only some examples.

Hadker et al. (1997) conducted a study to survey the residents of Bombay and measured their willingness to pay for the maintenance and preservation of Borivli National Park using the contingent valuation method. They paid special attention to hypothetical bias, starting point bias, embedding effects and part-whole biases of contingent valuation method. Despite India being a developing country with medium to low income levels, the evidence suggested that people are willing to pay for preserving environmental amenities. Having statistically adjusted for embedding and anchoring effects, households are willing to pay exclusively for Borivli National Park, on average, Rs 7.5, per month, for the next five years. Extrapolating to the city of Bombay, this amounts to a substantial Rs 20 million each month for the next five years, or a present discounted value of in excess of Rs 1 billion, suggesting a strong interest in environmental conservation.

Breffle et al. (1998) used contingent valuation method to estimate a neighborhood's willingness to pay to preserve a 5.5 acre parcel of undeveloped land in Boulder, Colorado, that provides views, open space and wildlife habitat. Households were surveyed to determine bounds on their willingness to pay for preservation. This application demonstrated that contingent valuation is a flexible policy tool for land managers and community groups wanting to estimate willingness to pay to preserve undeveloped urban land.

Choe et al. (1996) conducted both a contingent valuation study and a travel cost model in Davao, Philippines to estimate the economic benefits of surface water quality improvements in developing countries. They reported that the contingent valuation and travel cost estimates are very close to each other and are quite low, both in absolute terms and as a percentage of household income. These findings suggested that water pollution control is simply not a high priority for Davao's residents, and support the argument that households' willingness to pay for environmental amenities such as improved water quality is low.

Chakraborty and Keith (2000) estimated the recreation demand and economic value of mountain biking in Moab, Utah applying Count Data Models. They reported the results of both standard and truncated count data travel cost demand models for estimating demand for and the economic value to participants in mountain biking in the Moab, Utah area. The total annual use value for mountain biking in the Moab area was US $1.33 million. This value suggested that this recreation has a higher value than most other activities in the area and that public land managers should be aware of the relative value of mountain biking as they make allocation decisions.

Farber and Griner (2000) measured the value of watershed quality improvements in Western Pennsylvania using Conjoint Analysis. They constituted the sample with a panel data set from which user and non-user valuations were distinguished. In addition, sample respondents were identified by the distances of their residences to the stream sites, permitting the analysis of effects of distance on quality improvement valuations. These valuations suggested that persons living within roughly 50 miles of the evaluated stream segments place some positive value on stream improvements.

Woodward and Wui (2001) measured the economic value of wetland services by conducting a meta-analysis. Using results from 39 studies, they evaluated the relative value of different wetland services, the sources of bias in wetland valuation and the returns to scale exhibited in wetland values. They indicated that while some general trends are emerging, prediction of a wetland's value based on previous studies remains highly uncertain and need for site-specific valuation efforts remains large.

2.6.2. Studies in Open Space Context

Within the context of environmental economics, also urban open spaces have a significant value (monetary or not) like other environmental externalities, and this value have been measured by several methods. However, unlike the vast literature on the valuation of environmental assets in general, researches measuring the value of public open spaces are limited. Most of these studies have been made to analyze the value of green open spaces such as parks (Crompton 2000, Irwin 2002, Luttik 2000, McPherson 1992, Morancho 2003, More 1988, Nicholls 2002, Phillips 2003, Rogers 2003), greenways and greenbelts (Lindsey and Knaap 1999, Correll, et al. 1978), urban forests (Kwak, et al. 2003, Tyrvainen and Miettinen 2000, Tyrvainen and Vaananen 1998, Tyrvainen 1997), and individual or group trees and landscaping (Anderson and Cordell 1988, Des Rosiers, et al. 2002, Theriault, et al. 2003).

Most of the previous studies are empirical; nevertheless, there are some reviews as well. Correll (1978), More et al. (1988), Anderson and Cordell (1988), McPherson (1992), Tyrvainen (1997), Tyrvainen with Vaananen (1998), Lindsey and Knaap (1999), Tyrvainen and Miettinen (2000), Luttik (2000), Bates and Santerre (2001), Nicholls (2002), Des Rosiers et al. (2002), Irwin (2002), Alkay (2002), Morancho (2003), Kwak et al. (2003), Tajima (2003), Fukahori and Kubota (2003), Loomis et al. (2004), and, more recently, Anderson and West (2006) conducted empirical researches to value open spaces. Further, Crompton (2000), Phillips (2003), and Rogers (2003) provided reviews of previous studies on economic valuation of open spaces. In the following, a detail review of the previous empirical studies on economic valuation of open spaces in a chronological order was provided.

2.6.2.1. Studies Used HPM

Correll (1978) researched the effect of greenbelts on residential property values. Correll looked at the effect of proximity to greenbelts in Boulder, Colorado, and showed that, other things being equal, there was a $4.20 decrease in the price of residential property for every foot one moved away from the greenbelt, and that the average value of homes next to the greenbelt was 32% higher than those 3,200 feet away. This study showed that the greenbelt added $5.4 million to the total property values of one

neighborhood. That generated $500,000 per year in additional potential property taxes, enough to cover the $1.5 million purchase price of the greenbelt in only three years.

More et al. (1988) investigated the value of urban parks. For this, they reviewed and applied three valuation techniques to urban parks since they consider that the reason why urban parks and open spaces are subject to development pressure is that planners and researchers have been unable to articulate their value in economic terms. Their results indicated that landscape planners need to be aware of the strengths and shortcomings of each method to properly evaluate research on valuation of urban parks.

Anderson and Cordell (1988) measured the influence of trees on residential property values by using HPM. They conducted a survey of the sales of 844 single-family residential properties in Athens, Georgia, U.S.A. Their results indicated that landscaping with trees was associated with 3.5%–4.5% increase in sales prices. During the 1978–1980 study period, the average house sold for about $38 100 (in 1978 constant dollars) and had five trees in its front yard. The average sales price increase due to trees was between $1475 and $1750 ($2869 and $3073 in 1985 dollars) and was largely due to trees in the intermediate and large size classes, regardless of species. This increase in property value resulted in an estimated increase of $100 000 (1978 dollars) in the city's property tax revenues.

Tyrvainen (1997) conducted a hedonic price study to reveal whether and how urban forest benefits are capitalized in property prices as well as to search for suitable variables for describing the green space benefits in hedonic pricing models. For these purposes, she collected apartment sales data (1006 apartments) in Joensuu a town of 48 000 inhabitants, where green spaces represent 34% of the town area, and designed the hedonic models to explain purchase prices using apartment' structural characteristics, and locality-environmental quality variables as explanatory variables.

Tyrvainen's study results indicated that urban forests are an appreciated environmental characteristic and their benefits are reflected in the property prices. Proximity of water courses and wooded recreation areas as well as increasing proportion of total forested area in the housing district has a positive influence on apartment price. In contrast, forest parks have a negative effect on prices, this was not expected. According to her, this occurred since the range of variable values remained small, that is, the criteria for capitalization (enough variation within the variable) were not fulfilled since most of the apartments (78%) were at a distance of 100m or closer from a forested area. She also claimed that the negative impact of the nearby forests can

be understood by the notion that dense, mature coniferous forests may not be appreciated close to a house in these latitudes where the length of the day is only 6 h during winter and the amount of light is an important apartment feature.

Consequently, Tyrvainen suggested that the effect of urban forest on property prices is nonlinear rather than linear, and the increasing effect depends on their distance, size, quality, and quantity. Furthermore, attitudes towards urban forests depend on people's cultural background as well as on their ability to pay. Therefore, the valuations are expected to differ in different parts of the country, and also be substantially different from people's attitudes in central Europe. It is also expected that people's willingness to pay for the environment depends on their ability to pay.

Tyrvainen and Miettinen (2000) made a hedonic study in Salo, Finland to value implicitly non-priced urban forest amenities by comparing dwelling prices and specific amounts of amenities associated with dwelling units. The empirical study was based on data from the sales of terraced houses in the district of Salo. The hedonic price model included two variables measuring urban forest amenities: distance to a forest park and view onto forest.

Their results showed that residents pay for such environmental amenities as the forest view through property prices. On the housing market of Salo, buyers have to pay 4.9 percent more to obtain a dwelling with a forest view. In addition, proximity to the nearest forested park was found to have a significant positive effect on house prices. According to the semilogarithmic model, an increase of one kilometer in the distance reduced the price of a dwelling by 5.9 percent. However, when the relationship between the dwelling price and distance to the nearest forested area was log-linear, or the distance was established using dummy variables, the effect to selling prices was strongest up to a distance of 300 meters.

The results suggested that distance to a forested park has a price effect if the area is within walking distance from home. This is in line with urban recreational studies, which also report that the most intensive use of such areas occurs near the home environment. Further, Tyrvainen and Miettinen indicated that in spite of local differences between the towns, the results of their study provided a good gauge of valuations of urban forests in Finnish towns. In central Europe, however, landscape preferences and demands for urban greens probably differ as a result of cultural differences and the local history of land use.

In the Netherlands, **Luttik (2000)** researched the value of trees, water and open space as reflected by house prices. Luttik stated that houses in attractive settings will have an added value over similar, less favorably located houses. And, this effect is intuitively felt. But, does this effect always occur? Which environmental factors make a location an attractive place to live in? To find an answer to these questions, Luttik studied nearly 3000 house transactions, in eight towns and regions in the Netherlands to estimate the effect of different environmental attributes on transaction prices.

Luttik performed the analysis in two stages. Firstly, she estimated the house price due to structural housing attributes in a linear regression analysis. Subsequently, she assumed that the difference between this value and the actual transaction price could be ascribed mainly to difference in locality. In her study, locality referred to not only to environmental amenities, but also to schools, traffic noise, view of apartment buildings, motorways, shops, public transport or other public facilities. The ratio of the estimated price and the actual transaction price was referred to as the location indicator – which was calculated as the difference between the two values expressed as a percentage of the estimated value. The location-indicator was linked to location variables in a second linear regression analysis. Further, the selection of research areas assured an analysis of the influence of a wide range of green area types, water bodies, open space and landscape types, which not only differ in age, function and type, but also occur on different scale levels: from small, decorative green and canals to large parks and lakes.

According to results, the largest increases in house prices due to environmental factors (up to 28%) for houses with a garden facing water. A pleasant view can lead to a considerable increase in house price, particularly if the house overlooks water (8-10%) or open space (6-12%). In addition, house price varies by landscape type. Attractive landscape types attract a premium of 5-12% over less attractive environmental settings.

Clearly the most influential environmental attribute in her study is the presence of water features. She informed that current town developments in the Netherlands indicate that town developers are well aware of the value of water features, given the large number of plans that include water bodies. The Dutch government is searching for alternative sources of finance for creation / or maintenance of nature and landscape features. Given the immediate effect of water features, as opposed to green areas which need time to mature, and the high premium water features seem to attract, they seem to be the major candidate for private finance or joined public-private finance.

Also green in the residential area was shown to attract a premium in a number of cases. This advocates preservation of existing green areas in residential areas, and application of existing green areas in new urban developments. Nevertheless, it proved to be much more difficult to demonstrate the effect of a park or a recreational area bordering the residential area. Luttik tested this hypothesis in four cases. Only in one case (out of four) this variable was significant. This sheds some doubt on the current policy preference in the Netherlands for development of this type of green areas. Recreational lakes bordering the residential area were shown to attract a premium, also when they were of the same size as the investigated green areas bordering the residential area (circa 100 ha). This suggests the application of sizeable water bodies in parks or recreational areas. At the same time, this leads the way to preserve openness in the landscape, another environmental factor that was reflected in a higher house price.

Further, larger green areas (1000 ha) and attractive landscape types were demonstrated to have a considerable impact on house price. Only in one case, the hypothesis that an attractive, wooded landscape attracts a premium on the house price had to be rejected. Luttik considered that in this particular case it seemed likely that poor accessibility crossed the willingness to pay for an attractive landscape. In this situation, improving accessibility is a clue for policy action.

To sum, the results showed that the impact of green areas was ambiguous; in many cases, the hypothesis that a green structure attracts a premium had to be rejected. The effect of water bodies and open space could be demonstrated in almost every instance. Attractive landscape types were shown to attract a premium over less attractive landscape types (monotonous agrarian landscapes). Finally, she suggested that a promising option would be to preserve existing green areas in residential areas improving the accessibility to them, and develop larger green areas with water features in new urban developments.

In USA, **Nicholls (2002)** measured the impacts of green spaces on property values and the property tax base applying hedonic price model to a series of open spaces (greenbelts, neighborhood parks, and a golf course). She found that the most substantial impacts on property prices were caused by adjacency to a golf course, the premium for such a location ranged from $61,000 to $73,500 (16% to 19% of value), depending upon model specification. Also, adjacency to a greenbelt had a significant, positive impact on property prices in two of three cases; premiums ranged from $13,000 to $48,000 (5% to 13% of total value). By reviewing the literature, she also appreciably

criticized the previous studies on open space valuation also by indicating the problems of comparability of previous studies particularly in terms of methods employed.

Nicholls indicated that unsurprisingly, results of prior studies not provided conclusive evidence as to the relationship between proximity to an urban park and property value. Most analyses recorded mixed findings, suggesting positive impacts around some facilities and in some areas, but negligible effects around and in others. Nevertheless, results have indicated the potential for substantial premiums to be associated with properties located adjacent or close to parks. Premiums are most likely for properties adjacent to or within a short distance of large, well maintained, and attractive facilities, and whose use is predominantly passive. Smaller premiums or negligible effects appear more likely for properties close to smaller, less attractive, active-use amenities. Properties adjacent to heavily used, unattractive, or poorly maintained parks may, however, record reductions in value due to the inconveniences associated with their location, according to previous studies.

According to Nicholls, beyond problems of comparability, many of the methods used in earlier studies suffered from numerous deficiencies and beyond the lack of consistency between them. Many of the earlier studies (those in the 1930s through the mid 1970s) simply compared or correlated proximity with property value, concluding that any relationship discovered was due entirely to the effect of the park. All other characteristics that differentiate individual houses and their values from one another were ignored. Since the mid 1970s, multiple regression techniques have increasingly been used. However, though this approach does enable numerous potential influences on property values to be analyzed simultaneously, it also raises several other methodological concerns inherent to its usage that have rarely even been acknowledged in green space analyses of property value impacts. Furthermore, use of multiple regression procedures does not solve the questions either of which types of property value to use as the dependent variable, or how to define and measure the proximity relationship between sample properties and the green space under the analysis.

According to **Des Rosiers et al. (2002)** while the impact of tree cover on residential prices has already been the object of several studies, little attention has been devoted to landscaping as such. Thus, they investigated the relations between landscaping and house values by using the hedonic price approach. Their study based on a detailed field survey of 760 single-family homes sold between 1993 and 2000 in Quebec, Canada. They captured the environmental information from the front and side

of houses and included thirty-one landscaping attributes of both houses and their immediate environment dealing with tree as well as ground cover, flower arrangements and rock plants, hedges, landscaped curbs, density of visible vegetation as well as roof, patio and balcony arrangements. They added landscaping features to an array of physical, census and access attributes.

They found that, by and large, a positive tree cover differential between the property and its immediate neighborhood translates into a higher house value (roughly 0.2%). Findings also suggested that the positive price impact of a good tree cover is more enhanced by retired persons. Nevertheless, according to them, quite interestingly, an above-average density of the vegetation visible from the property impacts negatively on prices. Finally, they indicated that a high percentage of lawn cover as well as features such as flower arrangements, rock plants, etc. all command a substantial market premium (each percentage of ground cover adds some 0.2% to the price, and, the presence of a hedge or landscaped wall raises a property's value by nearly 4%).

Irwin (2002) conducted a research to reveal the effects of open space on residential property values in USA. According to her open space is a heterogeneous good, and thus it may be distinguished by land use, land cover, ownership type, development potential, and geographic location, each of which may be valued differentially. However, less evidence exists regarding the relative values of the various attributes associated with open space since studies have tended to focus on a particular type of open space.

Therefore, using residential sales data from an ex-urban region in central Maryland, Irwin employed a hedonic pricing model to test whether different types of open space generate significantly different spillover effects. She distinguished open space first by whether the land is preserved or is developable, and second by land ownership (privately vs. publicly held preserved open space) and land use type (cropland, pasture, and forests that are developable) to explore whether preserved open space carries a premium with it and whether the various landscape amenities that are associated with different open space land uses have differing marginal values.

Results showed a premium associated with permanently preserved open space relative to developable agricultural and forested lands and support the hypothesis that open space is most valued for providing an absence of development, rather than for providing a particular bundle of open space amenities.

Morancho (2003) analyzed the link between housing prices and urban green areas endowments using the hedonic technique as methodological approach. In that study, together with a set of the conventional explanatory variables used to explain housing prices, Morancho considered three environmental variables effecting housing prices: the existence of views of a park or a public garden, the distance from the dwelling to its nearest green area and the size of that open space. The sample was made up of 810 observations gathered in Castellon, Spain. Results showed that size of the houses is the most relevant variable on price. And, there is an inverse relationship between the selling price of the dwelling and its distance from a green urban area (every 100m further away from a green area means a drop of €1800 in the housing price), however, neither the size of the nearest green area nor the views of a garden or a public park influences the price. Morancho suggested for urban planning studies, provision of numerous small green areas throughout the city is more appropriate than a few vast parks, and the creation of large park areas as complements to small landscaped areas.

Tajima (2003) focused on the benefits of parks in urban centers and provided new estimates of the demand for urban green space and implications for valuing the environmental benefits of Boston's Big Dig Project. Using Boston's land use and assessed property price data, Tajima determined that proximity to urban open space has positive impacts on property values, while proximity to highways has negative impacts on property prices. Based on this observation, Tajima expected that the spatial alteration will cause a significant increase in nearby property prices. Results showed that when distance to the nearest large park doubles, the coefficient of -.085 implies that property price is expected to decrease by 6%. For the highway, the effect is in the opposite direction. When distance to the nearest highway doubles, the coefficient of .064 means that property price will increase by 5%. Through the empirical analysis using the hedonic pricing method, Tajima indicated that people are willing to pay higher prices to live near a park. Demand for a property apparently increases with the creation of a new park nearby. Further, the data suggested that the increase in property price caused by the environmental quality improvement by the Big Dig may negatively impact low-income minority groups who live in rental housing units in the neighborhood. However, it may benefit the owners of the properties in the form of capital gains and by attracting a wealthier population. Finally, Tajima stated that further investigation is needed in order to make proper assessments of the impacts of the Big Dig on community demography.

Loomis et al. (2004) estimated a hedonic model of public market transactions for open space protection illustrating how the price per acre of open space paid by public buyers such as counties or land trusts, is influenced by local demand and supply factors. They run empirical regression model using 133 public transactions (73% are purchases and 27% are easements) of open space in the Front Range of Colorado. The model explains over half the variation in price per acre. The mean price per acre was $13,635. According to the results, if a property provides access to water bodies, this feature increases the price per acre by $937, while adjacency of the parcel to existing park or open space adds $11,039 an acre. 1% increase in county population results in a 0.27% increase in price per acre. Easements cost $ 6783 less than purchases, a sizeable cost saving. Loomis suggested that the prediction capability of the hedonic price equation may be an alternative to traditional real estate appraisal techniques when agencies must determine fair market values of prospective open space parcels that vary in attributes from existing ones.

And, more recently, **Anderson and West (2006)** applied hedonic price method to home transaction data from the Minneapolis-St. Paul metropolitan area to estimate the effects of proximity to open spaces -neighborhood park, special park, golf course, cemetery, lake- on sales price. Allowing the effects of proximity to vary with demographic and location-specific characteristics and the analysis included fixed effects to control for observed and unobserved neighborhood characteristics. The results showed that the value of proximity to open space is higher in neighborhoods that are dense, near the central business district, high-income, high-crime, or home to many children. They suggested that using the metropolitan area's average value may substantially overestimate or underestimate the value of open space in particular neighborhoods.

While there is a considerable interest, particularly in Northern America and Europe, for economic valuation of open spaces, there is little concern in Turkey (Alkay 2002, Nalbantoğlu 1997). **Alkay (2002)** measured the economic value of green areas in Istanbul by using Hedonic Price Method. She used double-logarithmic functional form for each model. The results showed that green areas in different size and types have varying impacts on nearby house values. In four districts, Alkay found that neighborhood parks (with a premium changing between %10 and %14), district parks (with a premium changing between %14 and %17), and visual greens (with a premium changing %13) have a positive impact on house values.

2.6.2.2. Studies Used Other Methods

McPherson (1992) accounted the benefits and costs of urban green space. With an indication that economic approaches used to estimate value of green space services have limited utility for policy-makers, planners, and managers, McPherson described a green space accounting approach to partially address this deficiency by using benefit-cost analysis for a proposed tree-planting project in Tucson. The approach directly connected vegetation structure with the spatial-temporal flow of functional benefits and costs. Prices were assigned to each cost (i.e. planting, pruning, removal, irrigation) and benefit (i.e. cooling energy savings, interception of particulates, storm water runoff reduction) through direct estimation and implied valuation of benefits as environmental externalities. The results suggested that the approach can be used to evaluate net economic benefits associated with capital investments in urban forests vs. other investments in the urban infrastructure or traditional environmental control technologies.

In **1998, Tyrvainen with Vaananen** conducted a contingent valuation study again in Joensuu in which green spaces represent 34% of the town area to measure the use-values of urban wooded recreation areas, and the residents' willingness to pay for small forest parks contributing to the quality of housing environment, and to evaluate the suitability of the contingent valuation method in assessing urban forest amenities in Nordic conditions, where most green spaces are formed from preserved forest vegetation and the use of forests is based on free access to all forest areas. They found that most visitors were willing to pay for the use of wooded recreation areas. Furthermore, approximately half of the respondents were willing to pay to prevent the conversion of forested parks to another land-use. They indicated that the results can be used to assess the profitability of the management of urban forests. In addition, the results are useful in assessing value of green space benefits in different land use options.

With a consideration of the substantive debate over the public value of private landscapes, the debate over contingent valuation (CV), and the processes of greenway planning and implementation, **Lindsey and Knaap (1999)** searched for the willingness to pay for urban greenway projects. Their article reported the results of an experiment to estimate the value of an urban greenway and to test the validity of contingent valuation (CV), and discussed the implications of the results for greenway planning. The

experiment concerned people's willingness to pay (WTP) for greenway projects in a publicly designated greenway in Indianapolis, Indiana, that is mostly in private ownership. In the summer of 1997, they mailed a CV survey and an actual solicitation for funds simultaneously to split samples of greenway property owners, greenway renters, and county residents. They asked in survey and the solicitation about WTP for educational, cleanup, and other projects by the White River Greenways Foundation related to management of the Crooked Creek Greenway. Response rates varied among the three populations and between treatments. The response rate for the survey of Greenway property owners was 47%, somewhat low for mail surveys with high salience. As expected, response rates were lower for County residents and were very low for Greenway renters. They found that the proportion of respondents willing to pay was much higher in response to the survey than the actual solicitation, and hypothetical mean WTP was much greater than the actual contributions. Most property owners in the corridor had located there because of its amenities, and had lived there during the greenways planning process, but still were unaware that the corridor had been designated a greenway. Despite their previous lack of knowledge, a majority of the respondents believed that designation will have positive or at least neutral effects.

Lindsey and Knaap reported their findings summarizing as follows. First, general awareness that the Crooked Creek corridor had been designated a greenway was low, but most respondents believed that such a designation will increase their quality of life and thus property values in the corridor. Second, support for greenway projects, measured as willingness to pay and as willingness to donate to the White River Greenways Foundation, was greater among property owners than renters and greater among those who lived in the corridor than among those who did not. Third, although most respondents valued the greenway designation and reported participation in outdoor recreation and other behavior consistent with environmental appreciation, most thought other public objectives were more important, and most considered a basic public health issue -reduction of sewage in the water- as the most important greenway improvement. Finally, for both property owners and renters in the Greenway, and for residents throughout the County, stated WTP was greater than stated willingness to contribute, which was greater than actual willingness to contribute. These results have important implications for greenway planning in Indianapolis, for CV research, and for greenway planning in general.

To conclude, their findings suggested that there are indeed public benefits to private landscapes, but that in any particular place, their value depends on salience and proximity to individuals as well as other site-specific characteristics, and may in fact be very local and limited. Although Lindsey and Knaap provided additional evidence that hypothetical CV surveys do not provide precise estimates of WTP, they indicated that CV surveys can inform debates over the public value of private landscapes. In particular, planners can use the results of CV surveys to design and carry out more effective strategies for greenway and open space planning.

Bates and Santerre (2001) analyzed the public demand for open space in the case of Connecticut Communities. They stated that in USA at both the state and national levels, public policies are being designed to stimulate the demand for locally owned open space. And, yet very little is known about the factors that influence the demand for open space and the sensitivity of demand to price and income. To fill the void, they used data for Connecticut cities and towns to estimate the public demand for open space. Their empirical study results suggested that the demand for open space is relatively insensitive to changes in price but highly responsive to changes in income. Their findings also showed that federal and state open space may tend to crowd out locally owned open space and that locally owned open space represents a highly congestible good. Finally, they indicated that privately owned open space is not a good substitute for locally owned public open space.

Kwak et al. (2003) estimated the value attached by the public to Kwanggyo Mountain in the Seoul Metropolitan Area of Korea using a contingent valuation survey, aimed at providing policy-makers with useful information to make an informed public decision in urban development planning. They carefully designed and implemented the survey to meet a number of recommendation rules suggested in the literature. The overall results showed that the respondents received the hypothetical scenario well and would be willing to pay a significant amount for the proposed program of conserving the mountain. The total value stated by the public amounted to approximately US$2.9 million per year. They indicated that this quantitative information can be used in policy-making process for urban development plans.

Fukahori and Kubota (2003) searched for the role of design elements on the cost-effectiveness of streetscape improvement discussing the effectiveness of contingent valuation methods in evaluating the visual quality of streets. Economic valuation methods provide effective design methods that balance cost-effectiveness with the

quality of urban design. Research on conventional contingent valuation methods concentrates on estimating the total value of landscape resources such as forests, wetlands, and parks. In contrast, they assess street design plans from both economic and psychological points of view and analyze by factor analysis the relative importance of design elements such as vegetation, lighting columns, and pavements on the economic and perception-based values. They estimated the economic value of streetscape by the contingent valuation method in order to quantify landscape quality; clarified the meaning of economic valuation by respondents by analyzing the relationship between psychological rating scales and the economic scale; analyzed the contributions of design elements to economic valuation by respondents; and discussed streetscape quality from the point of view of cost efficiency based on several cost-related indices.

Fukahori and Kubota conducted the experiments by using computer-simulated photomontage images as virtual alternatives for two street design projects in Saitama City. Many spatial elements make up a streetscape and, as it would be ineffective to evaluate every element observed on a street, only those elements that are dominant in determining the cost and visual quality of a design should be taken into account. Visual elements of a streetscape usually include the road structure (road surface, vegetation, street hardware, and furniture), elements along the street (surrounding buildings, signboards, and so on), the background, human activities, and underground structures and utilities. Consequently, they organized elements as various types of design with a varying cost of materials for street furniture. Then, they asked the respondents participating in the experiment to evaluate the alternatives by a bidding game method, which is one of the elicitation methods used in contingent valuation. They used six indices for the economic evaluation of street design that include an acceptable cost derived from a contingent valuation method as well as composite indices related to the cost and benefits (cost (C), amenity (A), acceptable cost (AC), A/C, AC/C, A – C) and clarified their characteristics indicating cost-effectiveness.

According to the results, Fukahori and Kubota pointed out that an acceptable cost had a strong correlation to the amenity score for each of the two street design projects. In addition, they suggested that AC/C is highly correlated to low cost plans and that A/C is a moderate index balancing high amenity value and low cost.

2.7. Evaluation

Via a detailed review of this open space valuation literature, it was seen that open spaces have a relative measurable economic value, and this value is positive in general. Nevertheless, it is necessary to indicate some important findings and needs:

1) The most common method employed in the previous studies is hedonic price method which aims to value open green space by measuring their impacts on property values. The other methods of valuation of open space benefits are contingent valuation and travel cost. However, applications of these methods are very rare. Therefore, there is still a need for further research to understand the value of open spaces, however, not only in the form of property value increasing impact by employing hedonic price method, but also in other forms by using other methods such as contingent valuation method and travel cost method.

2) Most of the previous hedonic price analysis of open spaces were carried out in Northern America and in Europe. These studies indicated that open spaces in general have a positive impact on property values. Nevertheless, an open space may not have a positive impact and the amount of this impact is not same in all markets and circumstances. Therefore, there is a need for further research to investigate the impact of open spaces on property values and in different property markets.

3) Previous studies on open space valuation principally focused on the amount and sign of the value of the open space, since most of these studies have been carried out within the limits of economics or environmental economics disciplines. However, to reveal merely the amount or sign of value is not fully enough for properly assessment in decision-making process. Understanding not only their value but also the factors determining this value might set important conclusions in terms of policy implications and urban design works. Nevertheless, only less and rough evidence exists regarding the question of how open spaces produce that value. Thus, there is a need for studies to search causalities for better understanding the relationship between open space attributes and their values. Nevertheless, such studies will require urban designer outlook since open space attributes can be properly evaluated only by a designer.

4) There are some open space types, e.g. pedestrian ways, whose impact on property values have not yet been analyzed in the previous studies. Therefore, further researches should be on other kinds of open spaces which have not been yet studied.

CHAPTER 3

HEDONIC PRICE METHOD (HPM)

One indirect approach for estimating the monetary value of an environmental asset is hedonic price method, which is usually termed as a revealed preference method. This method obtains the economic value through the influence exercised by the environment on the market price of another good (Freeman 1993, Morancho 2003, Tyrvainen and Miettinen 2000). The aim of the method is to reveal how much of the differences in property prices depend on the differences of environmental quality, that is, the implicit price that individuals are willing to pay to consume environmental characteristics associated with the house, and to infer what the social value of this difference is (Mantymaa 2003, DTLR 2003).

This chapter reviews the hedonic price method in terms of its emergence and historical development, assumptions, advantages and disadvantages, variables used in the hedonic models, types of functional forms, and previous studies.

3.1. Emergence and Historical Development of HPM

Griliches (1971) and Rosen (1974) provided the theoretical support for the development of the hedonic models. Nevertheless, Goodman (1998) indicated that although, popularized by Griliches in the early 1960s, the pioneering work, and using of the term ‘hedonic’, dated back to a 1939 article by Andrew Court who was an economist for the Automobile Manufacturers Association in Detroit, and received, at best, only perfunctory citations. However, according to Colwell and Dilmore (1999), the origins of the method may possibly be found in previous works.

Colwell and Dilmore (1999) claimed that they found an earlier researcher for the first application of hedonic models. According to them, the first application was more than 15 years prior to A. T. Court. In 1922, G. C. Haas conducted a hedonic study on agricultural land prices with a particular focus on distance to the city center and city size. Thus, Haas’s work had much of the flavor of contemporary urban economics. According to Colwell and Dilmore, a reestimation of Haas’s model revealed that he did

a respectable job in an age before computational machinery was available. Estimation of a new model showed that some of Haas's adjustments to price, especially his time adjustments, were amazingly accurate. According to them, Haas work was very sophisticated and stand up quite well to the standards of contemporary hedonic price studies. First, the data-gathering effort was substantial. Second, there were a number of statistical devices, other than regression analysis, that were used primarily to adjust the dependent variable. Third, the regression analysis had four explanatory variables. Nevertheless, Colwell and Dilmore also stated that they were not for sure that Haas was the exactly the first. According to them, in fact, there may be a researcher for that honor a full decade earlier than Haas. But, the real competition with Haas for high impact on the field was probably Wallace (1926), and not Court (1939). They concluded their study indicating that who was the first matters somewhat, but it was especially interesting that Haas's very early hedonic analysis could be spun into the thread of urban land economics tradition.

On the other hand, Goodman (1998) indicated that also Court's work stand up quite well in terms of many standards of contemporary hedonic price analysis by addressing problems of nonlinearity and changes in underlying goods. Court was interested in automobile price indices. The term 'hedonic' was used to describe the relative importance of various components, such as horsepower, braking capacity, and window area, among others in constructing an index of usefulness and desirability. Thus, hedonic price comparisons recognize the potential contribution of any commodity, a motor car in this instance, to the welfare and happiness of its purchasers and the community.

Nevertheless, there was little follow-up to Court's hedonic work from 1939 to 1960. Goodman (1998) explained why it took so long. First of all, the econometrics that took hold in the 1940s and 1950s was fundamentally and data collection concentrated. Hedonic price analysis, which is fundamentally a micro-econometric analysis, might have been of less professional interest to those conducting quantitative work. Second, the rudimentary nature of data collection and coding, as well as the time-consuming nature of regression analysis on office calculators and early electronic computers, made the contemporary types of calculation impossible. Calculating one regression with many observations and a large number of explanatory variables was a major undertaking. Detailed examination of which variables were important, or what functional form would fit best was beyond the machines of the early analysts.

In 1958, Griliches recalled using his first hedonic regression on the demand for fertilizer. Similar to Court, Griliches's work on automobile price indices used automobile models as units of analysis including the regressions reported in more modern terms (standard errors of the coefficients, R^2s). Like Court's work, the Griliches analysis was not published in conventional economics journals. Unlike Court, however, Goodman (1998) stated that there was considerable response, and hedonic prices moved swiftly into the micro-econometric tool kit.

In 1974, the method was first introduced to the housing sector by Rosen (1974). Later it was summarized by Freeman (1979, 1985) and recently by Palmquist (1991). Since initial formulation of the hedonic price model, an extensive literature has been developed on application of the model to value locality and environmental amenities associated with residential property. Milon et al. (1984) stated that the early research using the hedonic technique centered on statistical estimation of the relationship between amenities and land prices. However, it was not until the statement of the implicit market model by Rosen (1974) and the subsequent extensions to the problems of land markets by Polinsky and Rubinfeld (1977) and Witte et al. (1979) that the theoretical implications of the hedonic technique were clarified.

From its early emergence onwards, hedonic price method has been applied on diverse range of the impacts of environmental externalities on residential, commercial, and agricultural property markets. For instance, some application focused on the impact of air pollution, noise, underground water contamination, and the existence of high power electric networks and hazardous waste landfills. Some applications of the method focused on the analysis of the value of urban amenities and various land uses such as schools, open spaces (e.g., Luttik 2000, Morancho 2003), urban forests (e.g., Tyrvainen and Miettinen 2000, Tyrvainen 1997), urban wetlands (e.g., Mahan, et al. 2000), public housing projects (e.g., Rabiega, et al. 1984), shopping centers, and office buildings (e.g., Thibodeau 1990), and the neighborhood effects (e.g., Tse 2002) (for detail information about the previous application of the method, see part 3.6).

3.2. Assumptions of HPM

Hedonic price method offers a means to estimate the marginal implicit prices of characteristics associated with a differentiated market good such as housing. The hedonic price function, which posits price as a function of the quantities of a good's

attributes, arises through the interactions of many buyers and sellers in the market. As a result, it describes the locus of equilibrium points between buyers and sellers in the market. The marginal implicit price of any of the good's attributes is found by differentiating the hedonic price function with respect to the attribute. Evaluated at an individual's optimal choice, this implicit price represents the individual's marginal willingness-to-pay for the attribute (Irwin 2002). The method seeks to estimate an implicit price for environmental attributes by observing actual markets (DTLR 2003).

The starting hypothesis of HPM is that goods are formed by a heterogeneous set of attributes or characteristics. Thus, when acquiring a good, it can be considered the price buyers have paid for it to be the sum of price paid for each one of its characteristics, so that an implicit price exists for each one of attributes defining the good. Assuming that the housing as a multi-attribute good, its price will be determined by a set of attributes. Principally, there are three categories of attributes:

1) One category of attributes reflects the structural characteristics of the house such as the plot and building size, type and age of the house, number of rooms, bathrooms, balconies, material quality, comfort level, and so on.

2) The second category involves locality and environmental characteristics such as proximity to city center, schools, hospitals, green areas, environmental quality, and so on.

3) Finally, the last category includes local socio-economic characteristics. For instance, if a household wishes to have easy access to a recreation area, it will buy this type of house and pay a premium for it. Therefore, the selling price of the house reflects both structural and locality-environmental characteristics. When structural characteristics are shared, it is possible to estimate the value of locality and environmental characteristics (Palmquist 1991, Freeman 1993, Luttik 2000, Morancho 2003, Tyrvainen and Miettinen 2000).

In the application of the method to the property market, five assumptions have to be considered;

1) Housing is a heterogeneous good, that is, it is formed by a heterogeneous set of attributes or characteristics. Thus, it can be considered the price buyers have paid for it to be the sum of price paid for each one of its characteristics, so that an implicit price exists for each one of attributes defining the property.

2) Housing is a segmented market. Any large area has in it a wide variety of sizes and types of housing with different location and environmental characteristics.

3) The entire urban area as a whole can be treated as a single market for housing services in which the individuals have information on all alternatives and are free to choose a house anywhere in the urban market.

4) The housing market is in or near equilibrium, that is, that all individuals have made their utility-maximizing residential choices given the prices of alternative housing locations, and that these prices just clear the market given the existing stock of housing and its characteristics.

5) Preferences are weakly separable in housing and its characteristics, that is, the demands for characteristics independent of prices of other goods. In addition, hedonic theory suggests that large cross-sectional datasets should be used (see Freeman 1985, Palmquist 1991, Freeman 1993, Tyrvainen 1997).

3.3. Advantages and Disadvantages of HPM

The hedonic price method is theoretically promising in measuring non-priced goods since it has the advantage of being based on actual transaction data, choice and purchase price unlike the contingent valuation method (Freeman 1993, Palmquist 1991, Tyrvainen 1997). Nevertheless, the hedonic property price method has also some limitations and disadvantages.

There are several strict requirements in conducting comprehensive empirical studies of the method. The method needs large datasets from restricted time periods which are time-consuming and difficult to collect. In addition, as Milon et al. (1984), Freeman (1993), Irwin (2002), Mantymaa (2003), Palmquist (1991), Tyrvainen and Miettinen (2000), Tyrvainen (1997), Abelson (1979), Butler (1982), Brown and Rosen (1982) and many others indicated, a variety of econometric issues and problems may occur in estimating hedonic models since as with most other applications of economic theory, the hedonic model does not provide a complete quantitative characterization of real land markets. These problems may include functional form and model specification, extent of the housing market, selection of appropriate variables, multicollinearity and spatial correlation

The hedonic model may take several types of functional forms such as linear, semi-logarithmic, double logarithmic or quadratic forms. Nevertheless, the functional form of the hedonic price equation cannot be specified purely on theoretical grounds

since the hedonic theory does not give a basis to know the functional form to be used (Cropper, et al. 1988, Milon, et al. 1984, Morancho 2003). Also Mantymaa (2003) stated that according to economic theory it is impossible to say what form of the hedonic price method is the right one. Therefore, the form of the equation must be defined empirically. In general, a flexible functional form is suggested, but it may reduce the ability to obtain significant results (Freeman 1993, Freeman 1985, Palmquist 1991, Tyrvainen 1997, Tyrvainen and Miettinen 2000). The question of functional form has received considerable attention in the literature (see Abelson 1979, Butler 1982, Diamond 1980, Freeman 1979, Brown and Rosen 1982, Huh and Kwak 1997, Milon, et al. 1984).

For instance, Huh and Kwak (1997) conducted a research on the choice of functional form of a hedonic price model in Seoul. Their study demonstrated that the important part of exploring the proper functional form of the hedonic price model included investigating a dissimilar and unique hedonic price structure when the hedonic price model was applied to different housing markets. Also, Milon et al. (1984) examined the problem of choosing a functional form for hedonic models and developed a flexible functional form for amenity valuation using a generalized Box-Cox transformation. According to them, the flexible form lead to amenity value estimates with no prior restrictions on the hedonic relationship and permits likelihood ratio tests of more traditional functional forms. Cropper et al. (1988) examined how errors in measuring marginal attribute prices vary with the form of the hedonic price function. They estimated various forms of hedonic function using equilibrium housing prices, and calculated errors in estimating marginal attribute prices by comparing each consumer's equilibrium marginal bid vector with the gradient of the hedonic function. They found out that, when all attributes are observed, linear and quadratic Box-Cox forms produce lowest mean percentage errors; however, when some attributes are unobserved or are replaced by proxies, linear and linear Box-Cox functions perform best.

Tyrvainen and Miettinen (2000) indicated that besides the functional form of the hedonic price equation, also other econometric problems require special attention. One of these issues is the choice of appropriate variables in the models. It was seen in the previous studies that, the number and quality of explanatory variables vary considerably between the different studies. Theoretically, the price equation should include all the housing characteristics included in the utility functions of households. Nevertheless, the choice of variables in empirical studies has restrictions such as the availability of data

and multicollinearity. In hedonic price models some explanatory variables are often multicollinear. Therefore, multicollinearity occurs when some environmental variables correlate with each other (see also Goodman 1989, Mantymaa, 2003). Consequently, estimating accurate and stable regression coefficients may be difficult. In this situation, as Tyrvainen and Miettinen (2000) suggested, one solution to the problem is to omit or separate a highly collinear variable from the model, provided this does not lead to serious specification bias. In other words, restricting the number of variables may also make the interpretation of results easier. Also, it is possible to use some other multivariate statistical method than regression analysis.

There are some problems also associated with spatial autocorrelation. Tyrvainen and Miettinen (2000) stated that the error terms may be spatially correlated if some relevant variable, typically local externality, is excluded from the regression model. The second form of spatial autocorrelation is more complicated. It may occur if positive error terms in the sale of houses at one location may noticeably influence sales prices at nearby locations, and less so at more distant locations (see also Goodman, 1989).

One limitation is related to the method's assumptions that, first, the entire urban area can be treated as a single market; and second, the housing market is in or near equilibrium (Freeman 1993, Palmquist 1991). Nevertheless, as Mantymaa (2003) and many others pointed out this is not always the case, there may be lack of houses or public policy restricts the function of a housing market. Further, the price structures of hedonic models are not stable. They may differ significantly from market to market, or from year to year. However, this may be questionable if housing market has received significant shocks over the time period. Thus, it is suggested to consider the temporal stability of estimated parameters (Tyrvainen and Miettinen 2000, Goodman 1989).

Another difficulty in hedonic studies is to select the proper areas to analyze. Luttik (2000) stated that the essence of the hedonic price method is a comparison of situations with and situations without a specific attribute. Consequently, the value of a specific attribute can only be tested if suitable situations with and without can be found. For example, if a whole district is nice and green, the value-increasing effect of green in the residential area cannot be tested in this district. Another -otherwise comparable- district, which is not nice and green, is needed. Since the house market is highly segmented, the two districts should be found within the same segment of the house market. This might cause difficulty in the selection of suitable research areas.

In addition, hedonic theory suggests that large datasets from restricted time periods should be used. Nevertheless, in many countries, data for the hedonic price studies is difficult to get (often manually) and its collection in general time consuming and labor intensive (Freeman 1985, Palmquist 1991, Tyrvainen 1997, Tyrvainen and Miettinen 2000). Nevertheless, as Tyrvainen and Miettinen (2000) stated in future data on house prices will be more readily available from price registers, and geographical information systems and numerical maps will simplify data collection (Bateman, et al. 2002, Paterson and Boyle 2002). Furthermore, Tyrvainen (1997) claimed that in the future city planning will be done numerically using GIS and therefore, the hedonic price models will become more usable for assessing the economic consequences of land-use changes in environmental impact assessment.

Another problem with hedonic price method is that the method does not reveal existence values (Mantymaa 2003). Further, hedonic price method is applicable only when people perceive the existence of the environmental issue sufficiently for it to feature in property values. Otherwise, no statistical association between the impact and the property price can be detected (DTLR 2003). Therefore, as Tyrvainen (1997) pointed out, it is necessary to choose environmental variables in the hedonic model so that they correspond to the ways people perceive the environment.

To conclude, despite its limitations and strict requirements, the hedonic price method is presently theoretically promising and accepted method in the valuation of different environmental benefits.

3.4. Variables Used in HPM

The hedonic price method reveals the implicit prices of various attributes of properties. Therefore, selection of suitable variables describing the attributes of housing is essential. Theoretically, as mentioned above, the price equation should include all housing characteristics. Nevertheless, it may not be possible to include all attributes because of the availability of data and multicollinearity. Hence, the choice of variables varies considerably between different studies. Regardless, variables used in the hedonic models consist of a dependent variable and a set of explanatory (independent) variables.

The dependent variable is rent or purchase price in most applications. The data on the price of the property may be obtained from real estate agents, tax assessment

records, government data registry, or through questionnaire surveys to be applied to households. For reliable estimations, the researcher should decide carefully about the source of data. The most reliable as well as practical data source should be used (Freeman 1993).

The independent (explanatory) variables can be divided into three categories. First category of variables comprises the structural characteristics of the house. The second category involves locality and environmental characteristics. Finally, the last category includes the variables of local socio-economic characteristics. The data on the explanatory variables may also be obtained from real estate agents, tax assessment records, government data registry. Nevertheless, some kind of data may not be gathered from these sources. In this circumstances, although being time-consuming, conducting questionnaire surveys may be preferred. For reliable estimations, the researcher should decide carefully about the source of data (Freeman 1993, Palmquist 1991).

Unlike dependent variable, it was seen in the previous studies that the number and quality of independent variables vary considerably between the different studies. Through a very careful and extensive review of previous studies presented Chp 2, the following variables which have been used in previous applications of HPM were found. Below, these variables were listed within three categories of attributes.

1) Structural variables: Structural variables used in the previous hedonic price studies are

- size of the housing unit,
- size of the garden,
- size of the plot,
- age of the building,
- building type,
- construction type,
- number of all floors,
- floor number of the housing unit,
- number of bedrooms,
- number of bathrooms,
- number of balconies,
- number of facades,
- facade orientation,
- material quality,

- overall building quality,
- type of heating,
- type of door and window material,
- type of main door material,
- availability of storage,
- avaliability of room looking light hole,
- availability of elevator,
- avaliability of shutter,
- avaliability of satellite,
- avaliability of cabled TV,
- avaliability of doorkeeper,
- avaliability of car parking, and so on.

In the previous applications, it is seen that these variables are very influential on the price of housing.

2) Locality and environmental variables: In the previous hedonic price studies, these locality variables have been used:

- distance from housing unit to district center,
- distance from housing unit to bazaar,
- distance from housing unit to supermarket,
- distance from housing unit to primary health service area,
- distance from housing unit to hospital,
- distance from housing unit to nearest primary school,
- distance from housing unit to socio-cultural service area,
- distance from housing unit to sport facilities and areas,
- distance from housing unit to parks and play grounds,
- distance from housing unit to greenways,
- distance from housing unit to golf courses,
- distance from housing unit to lakes and watersheds,
- distance from housing unit to view,
- distance from housing unit to urban forests,
- distance from housing unit to urban wetlands,
- distance from housing unit to technical and administrative service areas,
- distance from housing unit to public transportation roads and stations,
- distance from housing unit to metro stations,

- distance from housing unit to railway and railway stations,
- distance from housing unit to waste disposal lands,
- distance from housing unit to hazardous waste landfills,
- distance from housing unit to energy lines and high power electric networks.

Apart from these locality variables, also various environmental quality variables such as air pollution, noise, underground water contamination, and natural hazards risks such as earthquake and flood have been used such as quality and quantity of urban amenities.

3) Local socio-economic variables: These variables include

- demographic characteristics and
- socio-economic pattern such as age, education, profession, income, car ownership, racial discrimination.

3.5. Functional Forms of HPM

Since housing is a heterogeneous good, its price is determined by a set of attributes when identical characteristics are shared. The price function of housing is formulated as follows:

$$P = f(A_i , L_i , E_i)$$

A_i: a vector of the structural attributes such as age and type of building;

L_i: a vector of the locality and environmental attributes such as accessibility to city center, parks and play grounds;

E_i: the hedonic variable.

The essence of the method consists of finding what portion of the price is determined by hedonic variable (Freeman 1993, Tyrvainen 1997, Morancho 2003).

Application of the hedonic price method into the housing market theoretically consists of two stages. Tyrvainen and Miettinen (2000) stated that, at the first stage, implicit prices for different housing characteristics are estimated with formula given above. Here, variation in selling prices of dwellings is explained by the characteristics of housing. One can use these implicit prices directly to evaluate the benefits or losses

arising from marginal changes in the supply of environmental goods. This procedure will apply when the environmental change affects only a restricted area and a small number of people. In contrast, the use of price estimates is more problematic if the change in question covers the whole urban area or a large part of it. Here, a second stage of analysis is required, where information about implicit prices and data concerning environmental quality are combined to identify the inverse demand functions of characteristics. Owing to the strict requirements of the data and the econometric problems connected with the second stage, most empirical valuation studies have used only the first-step hedonic model.

Regardless of the number of stages, one important issue in estimation of implicit prices is determination of the functional form of the price equation. The hedonic model may take several types of functional forms such as linear, semi-logarithmic (log-linear), double logarithmic (log-log), inverse semi-logarithmic, quadratic, or Box-Cox transformation forms presented with formulas below (Palmquist 1991, Tyrvainen 1997, Tyrvainen and Miettinen 2000, Morancho 2003, Yankaya 2004).

Linear functional form:

$P = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots + \beta_n X_n + \varepsilon;$

Semi-logarithmic (log-linear) functional form:

$LnP = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots\ldots\ldots\ldots\ldots\ldots + \beta_n X_n + \varepsilon;$

Linear-log functional form:

$P = \alpha + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \ldots\ldots\ldots\ldots\ldots + \beta_n \ln X_n + \varepsilon;$

Double logarithmic (log-log) functional form:

$LnP = \alpha + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \ldots\ldots\ldots\ldots\ldots + \beta_n \ln X_n + \varepsilon;$

Inverse semi-logarithmic functional form:

$LnY = \alpha - \beta_2 1/X_1 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots + \varepsilon;$

Quadratic functional form:

$Y = \alpha + \beta_1 + \beta_2 X_1 + \beta_3 X_1^2 + \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots + \varepsilon;$

Selection of the best functional form is essential in finding correct results. Nevertheless, the hedonic theory does not give a basis to know the functional form of the price equation as stated in part 3.3 (Morancho 2003, Cropper, et al. 1988, Milon, et al. 1984, Mantymaa 2003). Thus, form of the equation must be defined empirically.

The question of functional form has received considerable attention in the literature as mentioned before. According to Rosen (1974), there are many reasons to suppose the relationship between the price and the environmental variable to be non-linear. Therefore, logarithmic specifications may fit better. Nevertheless, linear models are still in use because of ease of interpretation of the parameters (Morancho 2003). In general, a flexible functional form is suggested, but it may reduce the ability to obtain significant results. Milon et al. (1984) stated that the flexible form leads to amenity value estimates with no prior restrictions on the hedonic relationship and permits likelihood ratio tests of more traditional functional forms. According to the results of Cropper et al.'s study (1988), when all attributes are observed, linear and quadratic Box-Cox forms produce lowest mean percentage errors; however, when some attributes are unobserved or are replaced by proxies, linear and linear Box-Cox functions perform best. On the other hand, Cropper et al. (1988) suggested linear form, semi-logarithmic and double logarithmic forms instead quadratic forms when some relevant explanatory variables are omitted (Freeman 1993, 1985, Palmquist 1991, Tyrvainen 1997, Tyrvainen and Miettinen 2000, Morancho 2003, Box and Cox 1964).

3.6. Applications of HPM

From Court (1939) onwards (especially in recent decades), the hedonic price method has been applied on diverse range of goods. Among them, the most common applications have focused on the valuation of environmental externalities caused by such as air pollution (e.g., Smith and Huang 1995, Zabel and Kiel 2000), noise, underground water contamination, high power electric networks, and hazardous waste landfills (Mantymaa 2003, Palmquist 1991).

Some applications of the method have focused on the analysis of the value of urban amenities (see Bartik 1988) and various land uses such as schools, open spaces (e.g., Luttik 2000, Morancho 2003), urban forests (e.g., Tyrvainen and Miettinen 2000, Tyrvainen 1997), urban wetlands (e.g., Mahan, et al. 2000), public housing projects

(e.g., Rabiega, et al. 1984), shopping centers, office buildings (e.g., Thibodeau 1990), and the neighborhood effects (e.g., Tse 2002) on house prices.

Other applications have focused on the valuation of social-economic factors such as racial discrimination and urban revitalization (e.g., Ding, et al. 2000). Within the context of real estate sector, the method has been studied for housing, commercial (e.g., Bender, et al. 1999, Dunse and Jones 1998), and agricultural (e.g., McLeod, et al. 2002) property markets. Nevertheless, the most common application of the method is in housing market (For detail review of previous hedonic studies, see 2.6.1.1. and 2.6.2.1.).

3.7. Evaluation

The hedonic price method is presently an accepted and reliable method in valuation of different environmental benefits. In the application of property market, Hedonic price method assumes that first, housing is a heterogeneous good, thus, an implicit price exists for each one of attributes defining the property; second, housing is a segmented market; third, the urban area as a whole can be treated as a single market for housing services; fourth, the housing market is in or near equilibrium; and finally, demands for characteristics of housing independent of prices of other goods.

As a revealed preference technique, from its early emergence onwards, it has been widely applied to measure the impact of diverse range of environmental externalities caused by such as air pollution, noise, underground water contamination, the existence of high power electric networks and hazardous waste landfills, and urban amenities and various land uses such as schools, open spaces, forests, wetlands, public housing projects, neighborhood effects, shopping centers and office buildings in property values. Nevertheless, in the case of urban open spaces, researches are limited.

The method is theoretically promising in measuring the value of urban amenities and environmental externalities because of basing on actual data (rent/purchase price) unlike the stated preference methods. Therefore, this study employed hedonic price method as a research method. Nevertheless, the hedonic price method has some disadvantages as well. These are because of several strict requirements such as selection of suitable area to analyze, and large data sets. There are also a variety of econometric issues and problems in estimating hedonic models such as questions of functional form, multicollinearity and spatial correlation.

CHAPTER 4

CASE STUDY: ECONOMIC VALUATION OF FORBES PEDESTRIAN WAY VIA HEDONIC PRICE METHOD

As the case study, an empirical analysis was carried out through conducting a questionnaire survey and employing HPM to test the hypotheses of the study. The case area was choosen to be Forbes Pedestrian Way in Buca, İzmir. This part was composed of determination of research design, results of data analysis, and hedonic price models.

4.1. Research Design

The research design included a five stepped process. These steps were explained more in detail under the following sub-headings.

1) determination of the variables,
2) determination of the statistics hypotheses,
3) determination of the case area,
4) determination of the sampling design and data collection techniques, and
5) determination of data analysis and preparation techniques used in the study.

4.1.1. Determination of the Variables

In the light of theoretical analysis, variables' set was composed of dependent variable and sets of independent variables. **Dependent variable** was the rental price of housing unit. **Independent variables** consisted of three sets of attributes: housing unit's structural, location and socio-economic-physical environmental, and pedestrian way attributes. Variables in the first two sets were defined both with respect to the literature of open space valuation and interview carried with local real estate brokers. Variables in the last set were defined firstly in this study. When defining these last variables, the study benefited from urban design and landscape design literatures.

4.1.1.1. Variables Vector of Housing Unit's Structural Attributes

As the first set, variables' vector of housing's structural attributes was organized in three groups: variables set of housing unit's structural attributes not affected from pedestrian way (A1); variables set of housing unit's structural comfort attributes not affected from pedestrian way (A2); and variables set of housing unit's structural attributes affected from pedestrian way (A3). Below, these sets were presented as tables including variable names, codes, expected signs, and measuring scales.

Table 4.1. Variables set of housing unit's structural attributes not affected from pedestrian way

Sign	Code	Name/Explanation	Measure
(-)	VA1V1	age of the building	ratio
(-)	VA1V1A	age of the building	ordinal
(+/-)	VA1V2	building type	nominal
(+/-)	VA1V3	construction type	nominal
(+/-)	VA1V4	number of all floors	ratio
(+/-)	VA1V5	floor number of the housing unit	nominal
(+/-)	VA1V5A	floor number of the housing unit	ratio
(+)	VA1V6	size of the housing unit	ratio
(+)	VA1V7	size of the plot	ratio
(+)	VA1V8	number of bedrooms	ordinal
(+)	VA1V9	number of bathrooms	ordinal
(+)	VA1V10	number of balconies	ordinal
(+)	VA1V11	number of facades	ordinal
(+/-)	VA1V12A-VA1V12H	facade orientation	dichotomous
(+)	VA1V13	availability of storage	dichotomous
(-)	VA1V14	avaliability of room looking light hole	dichotomous

Table 4.2. Variables set of housing unit's structural comfort attributes not affected from pedestrian way

Sign	Code	Name/Explanation	Measure
(+)	VA2V1	material quality of wet spaces	ordinal
(+)	VA2V2	material quality of dry spaces	ordinal
(+)	VA2V3	overall building quality	ordinal
(+/-)	VA2V4	type of heating system	nominal
(+/-)	VA2V5	door-window material	nominal
(+)	VA2V6	main door material	nominal
(+)	VA2V7	availability of elevator	dichotomous
(+)	VA2V8	car parking location	nominal
(+)	VA2V9	avaliability of shutter	dichotomous
(+)	VA2V10	avaliability of satellite	dichotomous
(+)	VA2V11	avaliability of cabled TV	dichotomous
(+)	VA2V12	avaliability of doorkeeper	dichotomous

Table 4.3. Variables set of housing unit's structural attributes affected from pedestrian way

Sign	Code	Name/Explanation	Measure
(+)	VA3V1	number of rooms viewing pedestrian way	ordinal
(+)	VA3V2	number of balconies viewing pedestrian way	ordinal

4.1.1.2. Variables Vector of Housing Unit's Location and Socio-Economic-Physical Environmental Attributes

Secondly, variables' vector of housing unit's location and socio-economic-physical environmental attributes included variables set of housing unit's location attributes (B1), variables set of housing unit's perceived environmental quality attributes (B2), and variables set of housing unit's socio-economic environmental

attributes (B3). Below, these sets were presented as tables including variable names, codes, expected signs, and measures.

Table 4.4. Variables set of housing unit's location attributes

Sign	Code	Name/Explanation	Measure
(-)	VB1V1	distance from housing unit to district center	Ratio
(-)	VB1V2	distance from housing unit to bazaar	Ratio
(-)	VB1V3	dis. from housing unit to supermarket (TANSAS)	Ratio
(-)	VB1V4	dis. from housing unit to primary health service	Ratio
(-)	VB1V5	distance from housing unit to hospital (public)	Ratio
(-)	VB1V6	distance from housing unit to hospital (private)	Ratio
(-)	VB1V7	distance from housing unit to primary school	Ratio
(-)	VB1V8	dis. from housing unit to socio-cultural service	Ratio
(-)	VB1V9	distance from housing unit to district park	Ratio
(-)	VB1V10	distance from housing unit to district sport area	Ratio
(-)	VB1V11	distance from housing unit to hippodrome	Ratio
(-)	VB1V12	distance from housing unit to post office	Ratio
(-)	VB1V13	distance from housing unit to the nearest public transportation station	Ratio
(-)	VB1V14	distance from housing unit to railway station	Ratio
(+/-)	VB1V15	distance from housing unit to railway	Ratio
(-)	VB1V16	distance from housing unit to the nearest public transportation road	Ratio
(-)	VB1V17	distance from housing unit to town hall	Ratio
(+/-)	VB1V18	distance from housing unit to the nearest mosque	Ratio
(+)	VB1V19	distance from housing unit to gas station	Ratio
(-)	VB1V20	distance from housing unit to university	Ratio
(-)	VB1V21	distance from housing unit to police station	Ratio
(+/-)	VB1V22	dis. from housing unit to abandoned covered bazaar	Ratio
(+)	VB1V23	distance from housing unit to prison	Ratio

Table 4.5. Variables set of housing unit's perceived environmental quality attribute

Sign	Code	Name/Explanation	Measure
(+)	VB2V1	perceived quality of surrounding environment (1) in terms of sufficiency of parking areas - *"It is not difficult to find a place for car parking in surrounding env."*	ordinal (likert)
(+)	VB2V2	perceived quality of surrounding environment (2) in terms of sufficiency of recreation areas - *"Recreation areas in surrounding are sufficient"*	ordinal (likert)
(+)	VB2V3	perceived quality of surrounding environment (3) in terms of air pollution - *"There is not air pollution in surrounding environment"*	ordinal (likert)
(+)	VB2V4	perceived quality of surrounding environment (4) in terms of noise pollution - *"Noise level is not so high in surrounding environment"*	ordinal (likert)
(+)	VB2V5	perceived quality of surrounding environment (5) in terms of security - *"Surrounding of house is secured"*	ordinal (likert)
(+)	VB2V6	perceived quality of surrounding environment (6) in terms of vehicle traffic density - *"vehicle traffic density is not so high in surrounding environment "*	ordinal (likert)
(+)	VB2V7	perceived quality of surrounding environment (7) in terms of population density - *"Population density is not so high in surrounding environment "*	ordinal (likert)
(+)	VB2V8	perceived quality of surrounding environment (8) in terms of building density - *"Building density is not so high in surrounding environment"*	ordinal (likert)
(+)	VB2V9	perceived quality of surrounding environment (9) in terms of vehicle density - *"Vehicle density is not so high in surrounding environment"*	ordinal (likert)
(+)	VB2V10	perceived quality of surrounding environment (10) in terms of prestige - *"Prestige of surrounding environment is high"*	ordinal (likert)

Table 4.6. Variables set of housing unit's socio-economic environmental attributes

Sign	Code	Name/Explanation	Measure
(+/-)	VB3V1	marital status of the respondent	dichotomous
(+/-)	VB3V2	household population	ratio
(+/-)	VB3V3A1	age of the respondent	ratio
(+/-)	VB3VA1A	age of the respondent	ordinal
(+/-)	VB3V3A2	education of the respondent	nominal
(+/-)	VB3V3A3	education of the respondent	ratio
(+)	VB3V3A4	profession of the respondent	nominal
(+/-)	VB3V3A5	sex of the respondent	dichotomous
(+)	VB3V4	household's montly income	ratio
(+)	VB3V4A	household's montly income	ordinal
(+)	VB3V5	availability of car ownership	dichotomous
(+/-)	VB3V6	amount of apartment bill	ratio
(+/-)	VB3V6A	avaliability of apartment bill	dichotomous
(-)	VB3V7	year of rent	ratio
(-)	VB3V7A	year of rent	ordinal
(+)	VB3V8	rent price at the beginning	ratio
	VB3V9	present rent price	ratio
	VB3V9A	present rent price	ordinal
(+)	VB3V10	number of people working in house	ordinal
(+/-)	VB3V11	number of children in house	ordinal
(+/-)	VB3V12	number of children at the age of primary education	ordinal
(+/-)	VB3V13	number of children at the age of high/university education	ordinal
(+/-)	VB3V14	average education level of household	ratio
(+/-)	VB3V15	average age of household	ratio
(+/-)	VB3V15	average age of household	ordinal

4.1.1.3. Variables Vector of Housing Unit's Pedestrian Way Attributes

Finally, variables' vector of housing unit's pedestrian way attributes consisted of variables set of housing unit's pedestrian way attributes (distance - frequency of usage) (C1), and variables set of housing unit's pedestrian way attributes (perceived pedestrian way quality) (C2). Below, these sets were presented as tables including variable names, codes, expected signs, and measuring scales.

Table 4.7. Variables set of housing unit's pedestrian way attr. (distance-frequency)

Sign	Code	Name/Explanation	Measure
(-)	VC1V1	distance from house to pedestrian way	scale
(+/-)	VC1V2	frequency of usage of pedestrian way	nominal

Table 4.8. Variables set of housing unit's pedestrian way attr. (perceived quality)

Sign	Code	Name/Explanation	Measure
(+)	VC2V1	perceived quality of pedestrian way (1) in terms of character of functionality (access to home) - *"I use the pedestrian way to go my house"*	ordinal (likert)
(+)	VC2V2	perceived quality of pedestrian way (2) in terms of character of functionality (access to urban amenities) - *"I use the pedestrian way to go to the park, bazaar, market, and so on"*	ordinal (likert)
(+)	VC2V3	perceived quality of pedestrian way (3) in terms of character of functionality (recreation and social interaction) - *"I use the pedestrian way for recreation"*	ordinal (likert)
(+)	VC2V4	perceived quality of pedestrian way (4) in terms of character of functionality (shopping) - *"I use the pedestrian way for shopping"*	ordinal (likert)

to be continued

Table 4.8. Variables set of housing unit's pedestrian way attr. (perceived quality) (cont.)

Sign	Code	Name/Explanation	Measure
(+)	VC2V5	perceived quality of pedestrian way (5) in terms of functionality (access) of overall road space - *"I walk (access) throughout the pedestrian way not facing with any barrier"*	ordinal (likert)
(+)	VC2V6	perceived quality of pedestrian way (6) in terms of equity-functionality (access) of overall road space - *"Everybody (including also the handicapped people, kids, elderly, pregnant, and so on) walk (access) throughout the pedestrian way not facing with any barrier"*	ordinal (likert)
(+)	VC2V7	perceived quality of pedestrian way (7) in terms of length - *"I wish the pedestrian way was longer"*	ordinal (likert)
(+)	VC2V8	perceived quality of pedestrian way (8) in terms of memorability - *"I easily remember the entire pedestrian way when I close my eyes"*	ordinal (likert)
(+)	VC2V9	perceived quality of pedestrian way (9) in terms of comfort of resting places due to climate conditions (shade) - *"In the pedestrian way, there are resting places and benches which are protected from sun in the summer"*	ordinal (likert)
(+)	VC2V10	perceived quality of pedestrian way (10) in terms of comfort of overall pedestrian way space due to climate conditions (shade) -*"I walk on the pedestrian way without discomforted from sun in the summer"*	ordinal (likert)
(+)	VC2V11	perceived quality of pedestrian way (11) in terms of comfort of overall pedestrian way space due to climate conditions (sun) - *"I walk on the pedestrian way benefiting from sun in the winter"*	ordinal (likert)

to be continued

Table 4.8. Variables set of housing unit's pedestrian way attr. (perceived quality) (cont.)

Sign	Code	Name/Explanation	Measure
(+)	VC2V12	perceived quality of pedestrian way (12) in terms of comfort of overall pedestrian way space due to climate conditions (wind) - *"The pedestrian way is protected from disturbing air turbulence"*	ordinal (likert)
(+)	VC2V13	perceived quality of pedestrian way (13) in terms of comfort of overall pedestrian way space due to climate conditions (rain) - *"Drainage is well provided in the pedestrian way, that is, there is not rain water on ground in the rainy days"*	ordinal (likert)
(+)	VC2V14	perceived quality of pedestrian way (14) in terms of spatial identity of overall pedestrian way space - *"The pedestrian way some distinctive features which makes it different from other ways"*	ordinal (likert)
(+)	VC2V15	perceived quality of pedestrian way (15) in terms of aesthetic quality of overall pedestrian way space - *"The pedestrian way design is aesthetically satisfactory"*	ordinal (likert)
(+)	VC2V16	perceived quality of pedestrian way (16) in terms of image quality (prestige) of overall pedestrian way space - "*The pedestrian way makes a positive contribution to the nearby environment's prestige"*	ordinal (likert)
(+)	VC2V17	perceived quality of pedestrian way (17) in terms of maintenance quality of overall pedestrian way space - *"The pedestrian way is well maintained regularly"*	ordinal (likert)
(+)	VC2V18	perceived quality of pedestrian way (18) in terms of security of overall road space during day - *"The pedestrian way and its surrounding is secure for everybody during day"*	ordinal (likert)

to be continued

Table 4.8. Variables set of housing unit's pedestrian way attr. (perceived quality) (cont.)

Sign	Code	Name/Explanation	Measure
(+)	VC2V19	perceived quality of pedestrian way (19) in terms of security of overall pedestrian way space during night - *"The pedestrian way and its surrounding is secure for everybody during night"*	ordinal (likert)
(+)	VC2V20	perceived quality of pedestrian way (20) in terms of comfort depending on pedestrian congestion during day - *"The pedestrian way is not so crowded that the pedestrians have difficulties for comfortable walking and short communications with others on the way during day"*	ordinal (likert)
(+)	VC2V21	perceived quality of pedestrian way (21) in terms of comfort depending on pedestrian congestion during evening - *"The pedestrian way is not so crowded that the pedestrians have difficulties for comfortable walking and short communications with others on the way during evening"*	ordinal (likert)
(+)	VC2V22	perceived quality of pedestrian way (22) in terms of security depending on pedestrian congestion during day *"The pedestrian way is not so crowded that the pedestrians have a feeling of unsecurity because of congestion during day"*	ordinal (likert)
(+)	VC2V23	perceived quality of pedestrian way (23) in terms of security depending on pedestrian congestion during evening - *"The pedestrian way is not so crowded that the pedestrians have a feeling of unsecurity because of the congestion during evening"*	ordinal (likert)
(+)	VC2V24	perceived quality of pedestrian way (24) in terms of comfort from the aspect of noise pollution resulting from pedestrian density during day - *"The pedestrian way is not so noisy because of pedestrian congestion that the pedestrians have a discomfort during day"*	ordinal (likert)

to be continued

Table 4.8. Variables set of housing unit's pedestrian way attr. (perceived quality) (cont.)

Sign	Code	Name/Explanation	Measure
(+)	VC2V25	perceived quality of pedestrian way (25) in terms of comfort from the aspect of noise pollution resulting from pedestrian density during evening - *"The pedestrian way is not so noisy because of pedestrian congestion that the pedestrians have a discomfort during evening"*	ordinal (likert)
(+)	VC2V26	perceived quality of pedestrian way (26) in terms of the comfort from the aspect of noise pollution resulting from shops during day - *"The pedestrian way is not so noisy because of shops that the pedestrians have a discomfort during day"*	ordinal (likert)
(+)	VC2V27	perceived quality of pedestrian way (27) in terms of comfort from the aspect of noise pollution resulting from shops during evening - *"The pedestrian way is not so noisy because of shops that the pedestrians have a discomfort during evening"*	ordinal (likert)
(+)	VC2V28	perceived quality of pedestrian way (28) in terms of convenience of adjacent land uses - *"I enjoy with land uses taking place on the pedestrian way such as food and clothe stores"*	ordinal (likert)
(+)	VC2V29	perceived quality of pedestrian way (29) in terms of functionality (social interaction) - *"For me, food stores such as restaurants and cafes provide an opportunity for social contact with others"*	ordinal (likert)
(+)	VC2V30	perceived quality of pedestrian way (30) in terms of equity-functionality (social interaction) - *"Food stores such as restaurants and cafes on the pedestrian way is sufficiently diverse that the different groups such as the rich, the poor, families, and youth are able to afford"*	ordinal (likert)

to be continued

Table 4.8. Variables set of housing unit's pedestrian way attr. (perceived quality) (cont.)

Sign	Code	Name/Explanation	Measure
(+)	VC2V31	perceived quality of pedestrian way (31) in terms of quantity of places for social interaction - *"There is enough food stores and cafes on the pedestrian way"*	ordinal (likert)
(+)	VC2V32	perceived quality of pedestrian way (32) in terms of aesthetic quality of buildings enclosing the pedestrian way - *"The enclosing buildings of pedestrian way are beautiful"*	ordinal (likert)
(+)	VC2V33	perceived quality of pedestrian way (33) in terms of facade identity of enclosing buildings *"Façade of enclosing buildings makes the pedestrian way different from other ways"*	ordinal (likert)
(+)	VC2V34	perceived quality of pedestrian way (34) in terms of convenience due to distances between sitting areas and benches - *"In the pedestrian way, I don't have to walk so much to a bench when I need to rest"*	ordinal (likert)
(+)	VC2V35	perceived quality of pedestrian way (35) in terms of quantity of benches - *"There are enough benches in the pedestrian way"*	ordinal (likert)
(+)	VC2V36	perceived quality of pedestrian way (36) in terms of comfort of benches - *"The benches in the pedestrian way are comfortable"*	ordinal (likert)
(+)	VC2V37	perceived quality of pedestrian way (37) in terms of convenience due to distances between two trashes - *"In the pedestrian way, I don't have to walk so much to a trash when I need it"*	ordinal (likert)
(+)	VC2V38	perceived quality of pedestrian way (38) in terms of equity-convenience due to distance between two trashes - *"In pedestrian way, others don't have to walk so much to a trash when they need"*	ordinal (likert)

to be continued

Table 4.8. Variables set of housing unit's pedestrian way attr. (perceived quality) (cont.)

Sign	Code	Name/Explanation	Measure
(+)	VC2V39	perceived quality of pedestrian way (39) in terms of convenience due to easy usage of trashes - *"The trashes in the pedestrian way are convenient to use"*	ordinal (likert)
(+)	VC2V40	perceived quality of pedestrian way (40) in terms of quantity of trashes - *"There are enough trashes in the pedestrian way"*	ordinal (likert)
(+)	VC2V41	perceived quality of pedestrian way (41) in terms of quantity and quality lighting - *"The entire pedestrian way is sufficiently lighted in the night"*	ordinal (likert)
(+)	VC2V42	perceived quality of pedestrian way (42) in terms of quantity of phone boxes - *"There are enough telephone boxes in pedestrian way"*	ordinal (likert)
(+)	VC2V43	perceived quality of pedestrian way (43) in terms of convenience of street pavement - *"The pavement in the pedestrian way are convenient to walk"*	ordinal (likert)
(+)	VC2V44	perceived quality of pedestrian way (44) in terms of equity-convenience of street pavement - *"The pavement in the pedestrian way are convenient to walk as well as for others such as handicapped, women, pregnant"*	ordinal (likert)
(+)	VC2V45	perceived quality of pedestrian way (45) in terms of safety of street furniture - *"Street furniture such as bench, lighting, and garbage in the pedestrian way are safe to use"*	ordinal (likert)
(+)	VC2V46	perceived quality of pedestrian way (46) in terms of maintenance of street furniture - *"Street furniture such as bench, lighting, and garbage in the pedestrian way are undamaged and in good condition"*	ordinal (likert)

to be continued

Table 4.8. Variables set of housing unit's pedestrian way attr. (perceived quality) (cont.)

Sign	Code	Name/Explanation	Measure
(+)	VC2V47	perceived quality of pedestrian way (47) in terms of durability of street furniture material - *"Street furniture such as bench, lighting, and garbage in the pedestrian way are made of durable materials"*	ordinal (likert)
(+)	VC2V48	perceived quality of pedestrian way (48) in terms of aesthetic quality of street furniture - *"Street furniture such as bench, lighting, and trash in pedestrian way makes a contribution to the streetscape"*	ordinal (likert)
(+)	VC2V49	perceived quality of pedestrian way (49) in terms of identity of street furniture - *"Street furniture such as bench and lighting in the pedestrian way makes the pedestrian way different from other ways"*	ordinal (likert)
(+)	VC2V50	perceived quality of pedestrian way (50) in terms of aesthetic quality of natural landscaping elements (plant material)- *"Trees and flowers in the pedestrian way makes a contribution to the streetscape"*	ordinal (likert)
(+)	VC2V51	perceived quality of pedestrian way (51) in terms of identity of natural landscaping elements (plant material) - *"Trees and flowers in the pedestrian way makes the pedestrian way different from other ways"*	ordinal (likert)
(+)	VC2V52	perceived quality of pedestrian way (52) in terms of aesthetic quality of water elements- *"The pool in the pedestrian way makes a contribution to the streetscape"*	ordinal (likert)
(+)	VC2V53	perceived quality of pedestrian way (53) in terms of identity of water elements - *"The pool in the pedestrian way makes the pedestrian way different from other ways"*	ordinal (likert)

to be continued

Table 4.8. Variables set of housing unit's pedestrian way attr. (perceived quality) (cont.)

Sign	Code	Name/Explanation	Measure
(+)	VC2V54	perceived quality of pedestrian way (54) in terms of security and comfort due to pedestrian and vehicle interaction - *"Since it is not separated with vehicle traffic ways, I walk more comfortable through the pedestrian way"*	ordinal (likert)
(+)	VC2V55	perceived quality of pedestrian way (55) in terms of security-comfort due to pedestrian and vehicle interaction - *"Limiting the vehicle access to the way is more comfortable for pedestrians"*	ordinal (likert)
(+)	VC2V56	perceived quality of pedestrian way (56) in terms of convenience for vehicle access *"When it is allowed, the vehicles are able to move comfortable on the pedestrian way"*	ordinal (likert)
(+)	VC2V57	perceived quality of pedestrian way (57) in terms of quantity of car parking in the surrounding - *"It is not difficult to find a place for car parking in surrounding of the pedestrian way."*	ordinal (likert)
(+)	VC2V58	perceived quality of pedestrian way (58) in terms of convenience due to prohibition of car parking on the way during day - *"It is true to not park on the pedestrian way"*	ordinal (likert)
(+)	VC2V59	perceived quality of pedestrian way (59) in terms of convenience from the aspect of timing for vehicle access to way - *"The period for vehicle access to the pedestrian way is enough"*	ordinal (likert)
(+)	VC2V60	perceived quality of pedestrian way (60) in terms of convenience due to timing for vehicle access to way- *"Timing for vehicle access to pedestrian way is convenient"*	ordinal (likert)
(+)	VC2V61	perceived quality of pedestrian way (61) in terms of overall satisfaction - *"It is not good idea to re-design the pedestrian way as a vehicle way"*	ordinal (likert)

4.1.2. Determination of the Statistics Hypotheses

The study organized statistics hypotheses within eight sets:

1) Correlation between price of housing unit and pedestrian way characteristics
2) Correlation between price of housing unit and its location-environmental characteristics
3) Correlation between price of housing unit and its structural characteristics
4) Price differences depending on structural characteristics (t test)
5) Price differences depending on structural characteristics (F test)
6) Relation between zones and pedestrian way characteristics
7) Difference of zones in terms of the price, structural, location and environmental characteristics of the housing unit, and users' socio-economic characteristics
8) Relation between zones and structural, location and environmental characteristics of the housing unit, and users' socio-economic characteristics.

In the direction of the hedonic price method's assumptions and research question2-3, hypotheses2-3, the first five sets of statistics hypotheses were designed to understand the relation between the price of housing and its structural, location and environmental characteristics, and pedestrian way characteristics.

In the direction of the research question-3, hypothesis-3, and the hedonic price method's assumptions, the last three sets of statistics hypotheses were developed to test whether the zones represents or not the different segments of housing market, which offer houses in different prices with different structural, location and environmental, and pedestrian way characteristics. Below, all statistics hypotheses within these sets were listed. The statistical tests to be used in analyzing these hypotheses were briefly explained under the sub-heading of 4.1.4.

Within the context of the first set of the statistics hypotheses (correlation between price of housing unit and pedestrian way characteristics); the following statistics hypothesis was formulated to be tested by using correlation analysis technique;

- **$H_{0A1\text{-}1:}$** There is not a correlation between the rent price of housing unit-VB3V9 and distance from housing unit to pedestrian way-VC1V1.

Within the context of the second set of the statistics hypotheses (correlation between the price of housing unit and its location-environmental characteristics); the

following statistics hypotheses were formulated to be tested by using correlation technique;

- **H_{0A2-1}**: There is not a correlation between the rent price of housing unit -VB3V9 and distance from housing unit to district center-VB1V1.
- **H_{0A2-2}**: There is not a correlation between the rent price of housing unit -VB3V9 and distance from housing unit to bazaar-VB1V2.
- **H_{0A2-3}**: There is not a correlation between the rent price of housing unit -VB3V9 and distance from housing unit to supermarket (TANSAŞ)-VB1V3.
- **H_{0A2-4}**: There is not a correlation between the rent price of housing unit -VB3V9 and distance from housing unit to primary health service area-VB1V4.
- **H_{0A2-5}**: There is not a correlation between the rent price of housing unit -VB3V9 and distance from housing unit to hospital (public-SSK)-VB1V5.
- **H_{0A2-6}**: There is not a correlation between the rent price of housing unit -VB3V9 and distance from housing unit to hospital (private)-VB1V6.
- **H_{0A2-7}**: There is not a correlation between the rent price of housing unit -VB3V9 and distance from housing unit to nearest primary school-VB1V7.
- **H_{0A2-8}**: There is not a correlation between the rent price of housing unit -VB3V9 and distance from housing unit to socio-cultural service area-VB1V8.
- **H_{0A2-9}**: There is not a correlation between the rent price of housing unit -VB3V9 and distance from housing unit to district park-VB1V9.
- **H_{0A2-10}**: There is not a correlation between the rent price of housing unit -VB3V9 and distance from housing unit to district sport area-VB1V10.
- **H_{0A2-11}**: There is not a correlation between the rent price of housing unit -VB3V9 and distance from housing unit to hippodrome-VB1V11.
- **H_{0A2-12}**: There is not a correlation between the rent price of housing unit -VB3V9 and distance from housing unit to post office-VB1V12.
- **H_{0A2-13}**: There is not a correlation between the rent price of housing unit -VB3V9 and distance from housing unit to public transportation stationVB1V13.
- **H_{0A2-14}**: There is not a correlation between the rent price of housing unit -VB3V9 and distance from housing unit to railway station-VB1V14.
- **H_{0A2-15}**: There is not a correlation between the rent price of housing unit -VB3V9 and distance from housing unit to railway-VB1V15.
- **H_{0A2-16}**: There is not a correlation between the rent price of housing unit -VB3V9 and distance from house to nearest public transportation road-VB1V16.

- **$H_{0A2\text{-}17}$**: There is not a correlation between the rent price of housing unit -VB3V9 and distance from housing unit to municipality-VB1V17.
- **$H_{0A2\text{-}18}$**: There is not a correlation between the rent price of housing unit -VB3V9 and distance from housing unit to mosque-VB1V18.
- **$H_{0A2\text{-}19}$**: There is not a correlation between the rent price of housing unit -VB3V9 and distance from housing unit to gas station-VB1V19.
- **$H_{0A2\text{-}20}$**: There is not a correlation between the rent price of housing unit -VB3V9 and distance from housing unit to university-VB1V20.
- **$H_{0A2\text{-}21}$**: There is not a correlation between the rent price of housing unit -VB3V9 and distance from housing unit to police station-VB1V21.
- **$H_{0A2\text{-}22}$**: There is not a correlation between the rent price of housing unit -VB3V9 and distance from housing unit to abandoned covered bazaar-VB1V22.
- **$H_{0A2\text{-}23}$**: There is not a correlation between the rent price of housing unit -VB3V9 and distance from housing unit to prison-VB1V23.

Within the context of the third set of the statistics hypotheses (correlation between price of housing unit and its structural characteristics); the following statistics hypotheses were formulated to be tested by using correlation technique;

- **$H_{0A3\text{-}1}$**: There is not a correlation between the rent price of housing unit -VB3V9 and age of the building-VA1V1.
- **$H_{0A3\text{-}2}$**: There is not a correlation between the rent price of housing unit -VB3V9 and number of all floors-VA1V4.
- **$H_{0A3\text{-}3}$**: There is not a correlation between the rent price of housing unit -VB3V9 and floor number of the housing unit -VA1V5A.
- **$H_{0A3\text{-}4}$**: There is not a correlation between the rent price of housing unit -VB3V9 and size of the housing unit -VA1V6.
- **$H_{0A3\text{-}5}$**: There is not a correlation between the rent price of housing unit -VB3V9 and size of the plot-VA1V7.

Within the context of the fourth set of the statistics hypotheses (price differences depending on structural characteristics); the following statistics hypotheses were formulated to be tested by using *t*-test technique;

- **$H_{0A4\text{-}1}$**: The price of housing unit is not differentiated depending on the number of bathrooms-VA1V9.
- **$H_{0A4\text{-}2}$**: The price of housing unit is not differentiated depending on the construction type-VA1V3.

- **H_{0A4-3}**: The price of housing unit is not differentiated depending on the facade orientation-VA1V12a.
- **H_{0A4-4}**: The price of housing unit is not differentiated depending on the facade orientation -VA1V12b.
- **H_{0A4-5}**: The price of housing unit is not differentiated depending on the facade orientation -VA1V12c.
- **H_{0A4-6}**: The price of housing unit is not differentiated depending on the facade orientation -VA1V12d.
- **H_{0A4-7}**: The price of housing unit is not differentiated depending on the facade orientation -VA1V12e.
- **H_{0A4-8}**: The price of housing unit is not differentiated depending on the facade orientation -VA1V12f.
- **H_{0A4-9}**: The price of housing unit is not differentiated depending on the facade orientation -VA1V12g.
- **H_{0A4-10}**: The price of housing unit is not differentiated depending on the facade orientation -VA1V12h.
- **H_{0A4-11}**: The price of housing unit is not differentiated depending on the avaliability of storage-VA1V13.
- **H_{0A4-12}**: The price of housing unit is not differentiated depending on the avaliability of room looking light hole-VA1V14.
- **H_{0A4-13}**: The price of housing unit is not differentiated depending on the avaliability of elevator-VA2V7.
- **H_{0A4-14}**: The price of housing unit is not differentiated depending on the avaliability of shutter-VA2V9.
- **H_{0A4-15}**: The price of housing unit is not differentiated depending on the avaliability of satellite-VA2V10.
- **H_{0A4-16}**: The price of housing unit is not differentiated depending on the avaliability of cabled TV-VA2V11.
- **H_{0A4-17}**: The price of housing unit is not differentiated depending on the avaliability of doorkeeper-VA2V12.

Within the context of the fifth set of the statistics hypotheses (price differences depending on structural characteristics); the following statistics hypotheses were formulated to be tested by using F test technique (one way ANOVA);

- **H_{0A5-1}**: The price of housing unit is not differentiated depending on the age of the building-VA1V1A.
- **H_{0A5-2}**: The price of housing unit is not differentiated depending on the building type-VA1V2.
- **H_{0A5-3}**: The price of housing unit is not differentiated depending on the floor number of the housing unit -VA1V5.
- **H_{0A5-4}**: The price of housing unit is not differentiated depending on the number of bedrooms-VA1V8.
- **H_{0A5-5}**: The price of housing unit is not differentiated depending on the number of balconies-VA1V10.
- **H_{0A5-6}**: The price of housing unit is not differentiated depending on the number of facades-VA1V11.
- **H_{0A5-7}**: The price of housing unit is not differentiated depending on the material quality of wet spaces-VA2V1.
- **H_{0A5-8}**: The price of housing unit is not differentiated depending on the material quality of dry spaces-VA2V2.
- **H_{0A5-9}**: The price of housing unit is not differentiated depending on the overall building quality-VA2V3.
- **H_{0A5-10}**: The price of housing unit is not differentiated depending on the heating system-VA2V4.
- **H_{0A5-11}**: The price of housing unit is not differentiated depending on the door-window material-VA2V5.
- **H_{0A5-12}**: The price of housing unit is not differentiated depending on the main door material-VA2V6.
- **H_{0A5-13}**: The price of housing unit is not differentiated depending on the car parking location-VA2V8.
- **H_{0A5-14}**: The price of housing unit is not differentiated depending on the number of rooms viewing pedestrian way-VA3V1.
- **H_{0A5-15}**: The price of housing is not differentiated depending on the number of balconies viewing pedestrian way-VA3V2.

Within the context of the sixth set of the statistics hypotheses (relation between zones and pedestrian way characteristics); the following statistics hypotheses were formulated to be tested by using χ^2 test technique;

- **$H_{0A6\text{-}1}$**: There is not a relation between the zones as representatives of market segments and frequency of usage of pedestrian way-VC1V2.

Within the context of the seventh set of the statistics hypotheses (difference of zones in terms of the price, structural, location and environmental characteristics of the housing unit, and users' socio-economic characteristics); the following statistics hypotheses were formulated to be tested by using F test technique (one way ANOVA);

- **$H_{0A7\text{-}1}$**: The zones as representatives of market segments are not differentiated in terms of the present rent price-VB3V9.
- **$H_{0A7\text{-}2}$**: The zones as representatives of market segments are not differentiated in terms of the age of the building-VA1V1.
- **$H_{0A7\text{-}3}$**: The zones as representatives of market segments are not differentiated in terms of the number of all floors-VA1V4.
- **$H_{0A7\text{-}4}$**: The zones as representatives of market segments are not differentiated in terms of the floor number of the housing unit -VA1V5A.
- **$H_{0A7\text{-}5}$**: The zones as representatives of market segments are not differentiated in terms of the size of the housing unit -VA1V6.
- **$H_{0A7\text{-}6}$**: The zones as representatives of market segments are not differentiated in terms of the size of the plot-VA1V7.
- **$H_{0A7\text{-}7}$**: The zones as representatives of market segments are not differentiated in terms of the household population-VB3V2.
- **$H_{0A7\text{-}8}$**: The zones as representatives of market segments are not differentiated in terms of the household's montly income-VB3V4.
- **$H_{0A7\text{-}9}$**: The zones as representatives of market segments are not differentiated in terms of the apartment bill-VB3V6.
- **$H_{0A7\text{-}10}$**: The zones as representatives of market segments are not differentiated in terms of the year of rent-VB3V7.
- **$H_{0A7\text{-}11}$**: The zones as representatives of market segments are not differentiated in terms of the average age of household-VB3V15.

Within the context of the eight set of the statistics hypotheses (relation between zones and structural, location and environmental characteristics of the housing unit, and users' socio-economic characteristics); the following statistics hypotheses were formulated to be tested by using χ^2 test technique;

- **$H_{0A8\text{-}1}$**: There is not a relation between the zones as representatives of market segments and the age of the building-VA1V1A.

- **H_{0A8-2}**: There is not a relation between the zones as representatives of market segments and the building type-VA1V2.
- **H_{0A8-3}**: There is not a relation between the zones as representatives of market segments and the construction type-VA1V3.
- **H_{0A8-4}**: There is not a relation between the zones as representatives of market segments and the floor number of the housing unit -VA1V5.
- **H_{0A8-5}**: There is not a relation between the zones as representatives of market segments and the number of bedrooms-VA1V8.
- **H_{0A8-6}**: There is not a relation between the zones as representatives of market segments and the number of bathrooms-VA1V9.
- **H_{0A8-7}**: There is not a relation between the zones as representatives of market segments and the number of balconies-VA1V10.
- **H_{0A8-8}**: There is not a relation between the zones as representatives of market segments and the number of facades-VA1V11.
- **H_{0A8-9}**: There is not a relation between the zones as representatives of market segments and the facade orientation-VA1V12a.
- **H_{0A8-10}**: There is not a relation between the zones as representatives of market segments and the facade orientation -VA1V12b.
- **H_{0A8-11}**: There is not a relation between the zones as representatives of market segments and the facade orientation -VA1V12c.
- **H_{0A8-12}**: There is not a relation between the zones as representatives of market segments and the facade orientation -VA1V12d.
- **H_{0A8-13}**: There is not a relation between the zones as representatives of market segments and the facade orientation -VA1V12e.
- **H_{0A8-14}**: There is not a relation between the zones as representatives of market segments and the facade orientation -VA1V12f.
- **H_{0A8-15}**: There is not a relation between the zones as representatives of market segments and the facade orientation -VA1V12g.
- **H_{0A8-16}**: There is not a relation between the zones as representatives of market segments and the facade orientation -VA1V12h.
- **H_{0A8-17}**: There is not a relation between the zones as representatives of market segments and the avaliability of storage-VA1V13.
- **H_{0A8-18}**: There is not a relation between the zones as representatives of market segments and the availibility of room looking light hole-VA1V14.

- **$H_{0A8\text{-}19}$**: There is not a relation between the zones as representatives of market segments and the material quality of wet spaces-VA2V1.
- **$H_{0A8\text{-}20}$**: There is not a relation between the zones as representatives of market segments and the material quality of dry spaces-VA2V2.
- **$H_{0A8\text{-}21}$**: There is not a relation between the zones as representatives of market segments and the overall building quality-VA2V3.
- **$H_{0A8\text{-}22}$**: There is not a relation between the zones as representatives of market segments and type of the heating system-VA2V4.
- **$H_{0A8\text{-}23}$**: There is not a relation between the zones as representatives of market segments and the door-window material-VA2V5.
- **$H_{0A8\text{-}24}$**: There is not a relation between the zones as representatives of market segments and the main door material-VA2V6.
- **$H_{0A8\text{-}25}$**: There is not a relation between the zones as representatives of market segments and the avaliability of lift-VA2V7.
- **$H_{0A8\text{-}26}$**: There is not a relation between the zones as representatives of market segments and the car parking location-VA2V8.
- **$H_{0A8\text{-}27}$**: There is not a relation between the zones as representatives of market segments and the avaliability of shutter-VA2V9.
- **$H_{0A8\text{-}28}$**: There is not a relation between the zones as representatives of market segments and the avaliability of satellite-VA2V10.
- **$H_{0A8\text{-}29}$**: There is not a relation between the zones as representatives of market segments and the avaliability of cabled TV-VA2V11.
- **$H_{0A8\text{-}30}$**: There is not a relation between the zones as representatives of market segments and the avaliability of doorkeeper-VA2V12.
- **$H_{0A8\text{-}31}$**: There is not a relation between the zones as representatives of market segments and the number of rooms viewing pedestrian way-VA3V1.
- **$H_{0A8\text{-}32}$**: There is not a relation between the zones as representatives of market segments and the number of balconies viewing pedestrian way-VA3V2.
- **$H_{0A8\text{-}33}$**: There is not a relation between the zones as representatives of market segments and the present rent price-VB3V9A.
- **$H_{0A8\text{-}34}$**: There is not a relation between the zones as representatives of market segments and the household's montly income-VB3V4A.
- **$H_{0A8\text{-}35}$**: There is not a relation between the zones as representatives of market segments and the avaliability of car ownership-VB3V5.

- **H_{0A8-36}**: There is not a relation between the zones as representatives of market segments and the number of people working in house-VB3V10.
- **H_{0A8-37}**: There is not a relation between the zones as representatives of market segments and the number of children in house-VB3V11.
- **H_{0A8-38}**: There is not a relation between the zones as representatives of market segments and the number of children at the age of primary education-VB3V12.
- **H_{0A8-39}**: There is not a relation between the zones as representatives of market segments and the number of children at the age of high/unv. education-VB3V13.
- **H_{0A8-40}**: There is not a relation between the zones as representatives of market segments and the average age of household-VB3V15A.

The following statistics hypotheses were formulated to be tested by using *t*-test technique to understand the differences socio-economic characteristics of respondents in terms of perceived quality level of pedestrian way as ninth set of statistics hypotheses;

- **H_{0A9-1}**: The perceived quality level of pedestrian way-road is not differentiated depending on the marital status of the respondent-VB3V1.
- **H_{0A9-2}**: The perceived quality level of pedestrian way-enclosing buildings is not differentiated depending on the marital status of the respondent-VB3V1.
- **H_{0A9-3}**: The perceived quality level of pedestrian way-street furniture is not differentiated depending on the marital status of the respondent-VB3V1.
- **H_{0A9-4}**: The perceived quality level of pedestrian way-vehicle is not differentiated depending on the marital status of the respondent-VB3V1.
- **H_{0A9-5}**: The perceived quality level of pedestrian way- overall satisfaction-2 is not differentiated depending on the marital status of the respondent-VB3V1.

In addition, the following statistics hypotheses were formulated to be tested by using F test (one way ANOVA) technique to understand the differences socio-economic characteristics of respondents in terms of perceived quality level of pedestrian way;

- **H_{0A10-1}**: The zones as representatives of market segments are not differentiated in terms of the perceived quality level of pedestrian way-road.
- **H_{0A10-2}**: The zones as representatives of market segments are not differentiated in terms of the perceived quality level of pedestrian way-enclosing buildings.
- **H_{0A10-3}**: The zones as representatives of market segments are not differentiated in terms of the perceived quality level of pedestrian way-street furniture.
- **H_{0A10-4}**: The zones as representatives of market segments are not differentiated in terms of the perceived quality level of pedestrian way-vehicle.

- **H_{0A10-5}**: The zones as representatives of market segments are not differentiated in terms of the perceived quality level of pedestrian way- overall satisfaction-2.
- **H_{0A106}**: The floor number of the house-VA1V5 is not differentiated in terms of the perceived quality level of pedestrian way-road.
- **H_{0A10-7}**: The floor number of the house-VA1V5 is not differentiated in terms of the perceived quality level of pedestrian way-street furniture.
- **H_{0A10-8}**: The floor number of the house-VA1V5 is not differentiated in terms of the perceived quality level of pedestrian way-vehicle.
- **H_{0A10-9}**: The household's monthly income-VB3V4A is not differentiated in terms of the perceived quality level of pedestrian way-road.
- **$H_{0A10-10}$**: The household's monthly income-VB3V4A is not differentiated in terms of the perceived quality level of pedestrian way-enclosing buildings.
- **$H_{0A10-11}$**: The household's monthly income-VB3V4A is not differentiated in terms of the perceived quality level of pedestrian way-street furniture.
- **$H_{0A10-12}$**: The household's monthly income-VB3V4A is not differentiated in terms of the perceived quality level of pedestrian way-vehicle.
- **$H_{0A10-13}$**: The household's monthly income-VB3V4A is not differentiated in terms of the perceived quality level of pedestrian way- overall satisfaction-2.
- **$H_{0A10-14}$**: The age of respondent-VB3VA1A is not differentiated in terms of the perceived quality level of pedestrian way-road.
- **$H_{0A10-15}$**: The age of respondent-VB3VA1A is not differentiated in terms of the perceived quality level of pedestrian way-enclosing buildings.
- **$H_{0A10-16}$**: The age of respondent-VB3VA1A is not differentiated in terms of the perceived quality level of pedestrian way-street furniture.
- **$H_{0A10-17}$**: The age of respondent-VB3VA1A is not differentiated in terms of the perceived quality level of pedestrian way-vehicle.
- **$H_{0A10-18}$**: The age of respondent-VB3VA1A is not differentiated in terms of the perceived quality level of pedestrian way- overall satisfaction-2.
- **$H_{0A10-19}$**: The education of respondent-VB3VA2 is not differentiated in terms of the perceived quality level of pedestrian way-road.
- **$H_{0A10-20}$**: The education of respondent-VB3VA2 is not differentiated in terms of the perceived quality level of pedestrian way-vehicle.
- **$H_{0A10-21}$**: The education of respondent-VB3VA2 is not differentiated in terms of the perceived quality level of pedestrian way- overall satisfaction-2.

4.1.3. Determination of the Case Area - Forbes Pedestrian Way

In this part of the study, first, the considerations in choosing the sample area were explained, then, the characteristics of the case area were described and demonstrated with visual material.

The selection of the research area assured including different segments of the housing market, which offer houses in different prices with different structural, location-environmental, and pedestrian way characteristics. In selection of the research area, one another important consideration was the familiarity with the area during both pre-pedestrianized and existing situation. In the direction of these considerations, Forbes Pedestrian Way, which is called also as Sevgi Yolu (Way of Romance), was selected as the case area.

Located in Şirinyer District, İzmir, Forbes Street is an axis between the municipality service area (TANSAŞ) and hospital (SSK), indeed whose only about half kilometer is designed as a pedestrian way.

Figure 4.1. Air view of Forbes Pedestrian Way and its surrounding
(Source: Google Earth, 2007)

Table 4.9. General Characteristics of Forbes Pedestrian Way

Characteristics	**Explanation**
Location	In the center of Şirinyer District, Buca, İzmir
Construction year	1997 (27 October)
Developer	Municipality of Buca
Responsible institution for maintenance	Municipality of Buca
Dimensions	Approx. 500 meter in length, 15-17 meter in width
Allowance for car access	Between 10pm and 10am
Allowance for car parking	Only in property plots, during night, and till 10am
Functions	Access, recreation, shopping
Enclosing land uses	Housing and retail commercial units
Nearby land uses	district park, district sport area, bazaar, post office, municipality service area (TANSAŞ), primary health service area, primary education service areas, socio-cultural service areas, district main vehicle road, hippodrome, and abandoned covered bazaar in a very close surrounding; and district security office, municipality building, university area, hospital, and prison in the periphery.
General characteristics of the enclosing buildings	Mostly five storey buildings, not in so good condition but also not in so bad condition, on ground for commercial usage and on upper floors housing except some office usage at the beginning part of the way.
Population living on it	Approximately 1.000 people in 240 flats
Nearby population	Approximately 16.000 people in 4.000 flats within 300m radius circle
Landscaping and architectural elements	Enclosing buildings, small amphi, gates, pet shelters, pool, bridges, security cabin, resting places, street furniture (benches, trash, lighting, pavement, telephone boxes), and plant materials.

Forbes Pedestrian Way, in which there was terrible traffic congestion and many fatal accidents in the past, diagonally opens to the main intersection and district's main street as well as to the many minor roads. Before pedestrianization, it had very narrow sidewalks which were used as shop windows in the past. In addition, it was used as car parking. Since as if sidewalks belong to the shops and the road belongs to the cars, walking on Forbes Street was exactly difficult experience.

Figure 4.2. Activities and settings in Forbes Pedestrian Way
(Source: Cömertler Photo Collection, 2007)

In 1996, a part of Forbes Street was re-designed and constructed by the Municipality of Buca. Since 27 October 1997 this re-designed part has met with citizens as a pedestrian way together with limited allowance for car access (during night, till 10am) and parking (only in property plots, during night, till 10am). The re-designed part is approximately half kilometer and average 15m in width. But the street continues about 1 km. partly till the hospital (SSK).

Becoming a pedestrian way, Forbes Street has provided many social, economic, and environmental benefits to Şirinyer District citizens. First of all, it has enabled pedestrians' safe and comfortable access to the houses on it and on surrounding areas, as well as provided opportunities for social interaction, recreation and shopping where such areas are not varied and many. Also, it has contributed to the local economic development. Opening of new food and textile shops as well as its observed impact on property values is a clear sign of economic benefits. Furthermore, it is friendlier to the natural and built environment because of less pollution and improved aesthetic image of the road and its close environment.

The enclosing land uses of Forbes Pedestrian Way are mostly retail commerce on ground and housing on upper floors. Therefore, it can be considered both as a residential pedestrian way and a commercial pedestrian way.

Figure 4.3. Retail, housing, and recreation on Forbes Pedestrian Way
(Source: Cömertler Photo Collection, 2007)

There is District Park, district sport area, district bazaar, post office, municipality service area (TANSAŞ), primary health service area, primary schools, socio-cultural service areas, district main vehicle road, hippodrome, and abandoned covered bazaar in the very close surrounding of Forbes Pedestrian Way. Also, there is a bus stop close to the way. But, the relation between the bus stop and the pedestrian way is not well provided. On the other hand, there is not enough car parking areas in the close surrounding. Thus, the minor roads opening the way are used for parking. In its periphery within a walking distance, district security office, municipality building, hospital (SSK), prison, and the campus area of Faculty of Education (DEU) are located.

The major architectural and landscaping elements of the way are its enclosing buildings, a small amphi, gates, pet shelters, pool, bridges, security cabin, resting places, street furniture (benches, garbage, lighting, pavement, telephone boxes), and plant materials. In the following paragraphs, the pedestrian way's general physical characteristics and architectural - landscaping elements are described.

Figure 4.4. Architectural and landscaping elements of Forbes Pedestrian Way (Source: Cömertler Photo Collection, 2007)

On Forbes Pedestrian Way, there are mostly five storey buildings which are not in so good condition but also not in so bad condition. These buildings houses approximately 240 people. On the other hand, around 16.000 people live within the 300 radius circle of the way.

Forbes Pedestrian Way begins with a park and ends also with a small green area. The road enlarges at two entrances which are identifiable. There is a small amphi at one entrance which is mostly used by young people for varied activities such as dancing, shows and chatting. It is quite useful space for social interaction of citizens. At the other entrance, a street lamp takes place both for lighting and identification of space as a symbolic element. On the way, animals such as bird, duck and peacock within pet houses are enjoyed very much by citizens especially by children and young as it is seen in Figure 4.5. On the center of the way, a linear pool with some bridges takes place as a decorative element, as an identification element, and as an air conditioner element. There are also fire fountains under this pool. Except sittings elements street furniture is relatively sufficient and in a good condition. Drainage is provided though the rain water channels at two side of the way. The pedestrian way and its surrounding area are very hot especially in the summer. However, there aren't enough shady areas on the road because of poor vegetation. Therefore, comfortable walking is provided through shops tents. Nevertheless, standardization for the tents is not issued throughout the way.

Figure 4.5. Architectural and landscaping elements of Forbes Pedestrian Way (Source: Cömertler Photo Collection, 2007)

Figure 4.6. Architectural elements of Forbes Pedestrian Way
(Source: Cömertler Photo Collection, 2007)

Figure 4.7. Land use transformation on Forbes Pedestrian Way, from residential to service (Source: Cömertler Photo Collection, 2007)

Figure 4.8. Land use transformation on Forbes Pedestrian Way, from residential to service (Source: Cömertler Photo Collection, 2007)

4.1.4. Determination of Data Collection Techniques - Sampling Design

The study determined principally two sources and techniques to gather required information. Households and municipalities were the main sources of information. Questionnaire survey was used as the main method to collect the data set featuring the price and structural characteristics of housing, and some locality, environmental and pedestrian way attributes. Further, some information about the pedestrian way and locality factors was drawn from maps provided by the municipalities.

As a sampling technique for the questionnaire survey, the stratification and within the strata (four zones) the simple random sampling techniques were used. When determining the sample size, significance and confidence interval levels were aimed to be %5 and %95. Sample sizes for each zone and for the entire area are seen in Table 4.10. On the base of the aimed sample sizes, the survey was carried on April, May, and June in 2007. Nevertheless, on site, a great reaction against participation to the survey was observed. Therefore, it was needed to talk much more people (approximately 500) - to persuade for participation to the survey. Although 217 people were persuaded at the beginning, later some of them said that they changed their decision. Also, some of them could not be reached. Consequently, the questionnaire survey was applied to the 140 households within the entire sample area. This was bigger than the aimed sample size. Most of the surveys were carried out face to face. Nevertheless, some respondents said that they did not have enough time at that moment, therefore asked for time. In these situations, questionnaire form was left, and few days later it was received by hand.

Table 4.10. Sampling

ZONES	NUMBER OF UNITS	RATIO OF UNITS	AIMED RATIO OF SIGNIFICANCE & CONFIDENCE	AIMED SAMPLE SIZE	ACHIEVED SAMPLE SIZE
1st ZONE	240	6%	%5 SIGNIFICANCE % 95 CONFIDENCE	5	20
2nd ZONE	290	7%	%5 SIGNIFICANCE % 95 CONFIDENCE	6	23
3th ZONE	1120	28%	%5 SIGNIFICANCE % 95 CONFIDENCE	24	38
4th ZONE	2430	59%	%5 SIGNIFICANCE % 95 CONFIDENCE	50	59
TOTAL	4080	100%	%5 SIGNIFICANCE % 95 CONFIDENCE	85	140

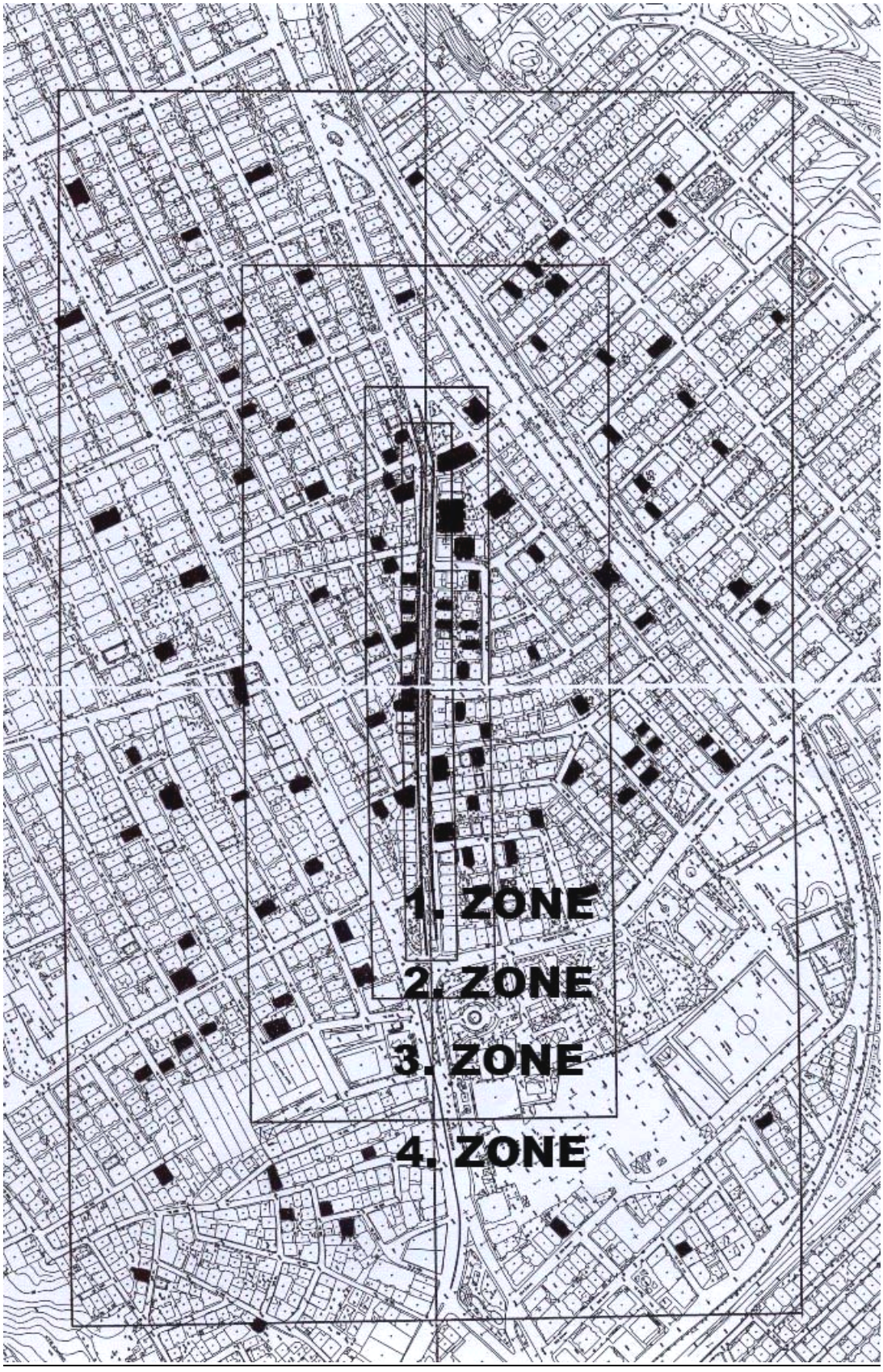

Figure 4.9. Questioned housing units and zones

(Source: base map was provided from Municipality of Buca 2007)

4.1.5. Determination of the Data Analysis Techniques

Statistical analyses which were carried out for data analysis in this study ranged from basic descriptive statistics, such as averages and frequencies, to advanced inferential statistics, such as analysis of variance, correlation, and regression models. This part gives a brief on these descriptive and inferential statistical techniques used in the study. Further and detailed information about these statistical tests can easily be found from the literature of statistics and econometrics disciplines (e.g., see Akkaya and Pazarlıoğlu 2000, Christensen and Stoup 1986, Çakıcı, et al. 2003, Edwards 1995, Gnandesikan 1990, Jacques 1997, Sharma 1996, Stevens 1996, Tabachnick and Fidel 1996, Turanlı and Güriş 2000).

In the study, as a software package SPSS and E-views were used for conducting statistical analyses and generating tables that summarize data (for information about SPSS package, see SPSS Survival Manuel by Pallant, 2003).

4.1.5.1. Descriptive Statistical Tests

The first step in the data analysis was to describe and summarize information about variables in the dataset in a clear and understandable way. For this, descriptives, frequencies, and cross tabs were done by using both numerical and graphical methods.

Descriptives: To analyze central tendencies of distribution, mean, median, and mode values; to analyze spread of distribution, range, variance, and standard deviation values; and to analyze shape of distribution, skew and kurtosis values were measured. This numerical information was also demonstrated graphically by using histogram, stem and leaf displays, and box plots.

Frequencies: While the descriptive statistics procedure described above was useful for summarizing continues data, it doesn't helpful for interpreting categorical data. Therefore, the frequencies were measured for categorical data. This allowed obtaining the number of cases within each category in the dataset.

Cross tabulation: While frequencies show the numbers of cases in each level of a categorical variable, they do not give information about the relationship between categorical variables. Therefore, the cross tabs procedure was used for investigating this type of information.

4.1.5.2. Inferential Statistical Tests

In the direction of the statistics hypotheses, inferential statistical tests were carried out to inspect the picture that will appear after operating the hedonic price models. Within the context of the inferential statistics, chi-square test, *t* test, analysis of variance, and regression analysis were carried out. The selection of the inferential statistical technique was determined depending on the measuring scale of the variables and the structure of the statistics hypotheses. The following paragraphs briefly describe these techniques.

Chi-Square Test: Chi-square test was operated for the 6^{th} and 8^{th} statistics hypotheses. Conducting a chi-square test of independence provided a statistic to evaluate if the observed pattern is statistically different from the pattern expected due to chance (A small value (<.05) in the column labeled *Sig*. indicates that the null hypothesis is false and there is a statistically significant relation).

Independent-samples *t* test: The *t* test was operated for the 4^{th} statistics hypotheses to compare mean values of two independent groups. The comparison provided a statistic to evaluate whether the difference between two means is statistically significant. By doing the independent-samples *t* test, two output tables were generated. The first output table, labeled group statistics, displays descriptive statistics. The second output table, labeled independent samples test, contains the statistics that are critical to evaluating the hypothesis. This table contains two sets of analyses: the first assumes equal variances and the second does not. To assess whether to use the statistics for equal or unequal variances, the significance level associated with the value under the heading, Levene's Test for equality of variances, was used. It tests the hypothesis that the variances of the two groups are equal (A small value (<.05) in the column labeled *Sig*. indicates that this hypothesis is false and that the groups have unequal variances).

Analysis of variance: The univariate general linear model was used to analyze variance to determine whether there are differences between groups on the basis of outcome variable. Before running the model, first, the assumption of the homogeneity of regression slopes was tested. The homogeneity of regression slopes assumption states that the regression slopes for all groups in the analysis are equal. This assumption is important because the means for each group are adjusted by averaging the slopes for each group so that group differences in the covariate are removed from the dependent

variable. Thus, it is assumed that the relationship between the covariate and the dependent variable is the same at all levels of the independent variables. The outputs for the univariate general linear models contained all main effects and interactions between fixed factors. Each factor, covariate, or other source of variance was listed in the left column. For each source of variance, there are several test statistics. To evaluate the influence of each independent variable, the *F* statistic and its associated significance level were used.

Correlation Analysis: Correlation is one of the most common forms of data analysis because it underlies many other analyses. In correlation analysis a coefficient is used, which has a value ranging from -1 to 1. Value closer to the absolute value of 1 indicates that there is a strong relationship between the variables being correlated, whereas value closer to 0 indicates that there is little or no linear relationship. The sign of a correlation coefficient describes the type of relationship between the variables being correlated. A positive correlation coefficient indicates that there is a positive linear relationship between the variables: as one variable increases in value, so does the other. A negative value indicates a negative linear relationship between variables: as one variable increases in value, the other variable decreases in value. In this study, correlation analyses were operated for the 1^{st}, 2^{rd}, and 3^{th} statistics hypotheses to analyze whether the linear relationship between two variables.

Regression Analysis: Regression is a technique that is used to investigate the effect of one or more predictor variables on an outcome variable. Regression analysis in the study allowed to make statements about how well one or more independent variables would predict the value of a dependent variable. To run the regression model, the study used the E-views package. Within the context of regression analysis, an output table was generated. This table includes information about the quantity of variance that is explained by predictor variables. The first statistic, *R*, is the multiple correlation coefficient between all of the predictor variables and the dependent variable. The next value, *R* Square, is simply the squared value of *R*. This is frequently used to describe the goodness-of-fit or amount of variance explained by a given set of predictor variables. The table also gives ANOVA test results that describes the overall variance accounted for in the model. The *F* statistic represents a test of the null hypothesis that the expected values of the regression coefficients are equal to each other and that they equal zero. This *F* statistic tests whether the R square proportion of variance in the dependent variable accounted for by the predictors is zero. If the null hypothesis is true, then that

will indicate that there is not a regression relationship between the dependent variable and the predictor variables. Further, the table provides information about the effects of individual predictor variables. There are two types of information in the coefficients table: coefficients and significance tests. The unstandardized coefficients indicate the increase in the value of the dependent variable for each unit increase in the predictor variable. A well-known problem with the interpretation of unstandardized coefficients is that their values are dependent on the scale of the variable for which they were calculated, which makes it difficult to assess the relative influence of independent variables through a comparison of unstandardized coefficients. In addition to the coefficients, the table also provides a significance test for each of the independent variables in the model. The significance test evaluates the null hypothesis that the unstandardized regression coefficient for the predictor is zero when all other predictors' coefficients are fixed to zero. This test is presented as a *t* statistic.

4.2. Results of the Data Analysis

Results of the data analysis were summarized in two groups: descriptive statistics results and inferential statistics results.

4.2.1. Descriptive Statistics Results

This part briefly summarized the measures of central tendencies by giving the mean, minimum, maximum values for metric scale variables, and maximum frequency values for nominal scale and ordinal scale variables. The descriptive statistics were summarized within each variable set.

4.2.1.1. Descriptive Statistics Results of Entire Sample Area

For the entire area, descriptive statistics (mean, minimum, maximum values for metric scale variables and maximum frequency values for nominal and ordinal scale variables) for variables were summarized within the variable sets of

1) housing unit’s structural attributes not affected from pedestrian way;
2) housing unit’s structural comfort attributes not affected from pedestrian way;

3) housing unit's structural attributes affected from pedestrian way;
4) housing unit's location attributes;
5) housing unit's perceived environmental quality attributes;
6) housing unit's socio-economic environmental attributes;
7) housing unit's pedestrian way attributes (distance - frequency of usage); and
8) housing unit's pedestrian way attr. (perceived quality of pedestrian way).

1) Within the variable set of housing unit's structural attributes not affected from pedestrian way:

The mean value for the variable VA1V1 (age of the building) is 22,4 years. The value of the variable ranges from 1 year to 45 years. 33,6 % of buildings are 10-19 years old (VA1V1A-age of the building).

65,7 % of buildings are attached (VA1V2-building type). 96,4 % of buildings is reinforced concrete (VA1V3-construction type). 41,4 % of buildings have four storey (VA1V4-number of all floors). The mean value for the variable VA1V4 (number of all floors) is 4 floors. The value of the variable ranges from 1 floor to 6 floors. 52,9 % of houses takes place in the mid-floors (VA1V5-floor number of the housing unit). The mean value for the variable VA1V5A (floor number of the housing unit) is 2,4 floor. The value of the variable ranges from 1 floor to 5 floors.

The mean value for the variable VA1V6 (size of the housing unit) is 110,4 m^2. The value of the variable ranges from 60 m^2 to 180 m^2. The mean value for the variable VA1V7 (size of the plot) is 217,6 m^2. The value of the variable ranges from 96 m^2 to 570 m^2. 67,9 % of housing units have three bedrooms (VA1V8-number of bedrooms). 94,3 % of housing units have one bathroom (VA1V9-number of bathrooms). 55 % of housing units have two balconies (VA1V10-number of balconies).

63,6 % of housing units have two facades (VA1V11-number of facades). 57 % of housing units do not look north (VA1V12A-facade orientation). 61 % of housing units do not look south (VA1V12B-facade orientation). 62 % of housing units do not look west (VA1V12C-facade orientation). 53 % of housing units do not look east (VA1V12D-facade orientation). 89 % of housing units do not look northwest (VA1V12E-facade orientation). 83 % of housing units do not look northeast (VA1V12F-facade orientation). 83 % of housing units do not look southwest (VA1V12G-facade orientation). 92 % of housing units do not look southeast (VA1V12H-facade orientation). 68,6 % of housing units do not have a storage

(VA1V13-avaliability of storage). 57,1 % of housing units do not have a room looking light hole (VA1V14-avaliability of room looking light hole).

2) Within the variable set of housing unit's structural comfort attributes not affected from pedestrian way:

Material quality of wet spaces is medium for 50 % of houses (VA2V1-material quality of wet spaces). Material quality of dry spaces is medium for 46,4 % of houses (VA2V2-material quality of dry spaces). Overall building quality is medium for 53,6 % of houses (VA2V3-overall building quality). Heating is provided with stove in 49,3 % of houses (VA2V4-heating system). Door and window material is wooden in 47,1 % of houses (VA2V5-door and window material). Main door material is wooden in 52,1 % of houses (VA2V6- main door material). Only in one building there is elevator. 99,3 % of buildings do not have lift (VA2V7-avaliability of lift). Car parking location is the road in front of the building in 55 % of cases (VA2V8-car parking location). 73,6 % of houses do not have shutter on windows (VA2V9-availability of shutter). 55 % of houses do not have satellite (VA2V10-avaliability of satellite). 85,7 % of housing units do not have cabled TV (VA2V11-avaliability of cabled TV). In no buildings, there is doorkeeper (VA2V12-avaliability of doorkeeper).

3) Within the variable set of housing unit's structural attributes affected from pedestrian way:

75,7 % of housing units does not have any room viewing pedestrian way (VA3V1-number of rooms viewing pedestrian way). 76,4 % of housing units does not have any balcony viewing pedestrian way (VA3V2-number of balconies viewing pedestrian way).

4) Within the variable set of housing unit's location attributes:

The mean value for the variable VB1V1 (distance from housing unit to district center) is 184 meter. The value of the variable ranges from 1 meter to 494 meter. The mean value for the variable VB1V2 (distance from housing unit to bazaar) is 388 meter. The value of the variable ranges from 20 meter to 810 meter. The mean value for the variable VB1V3 (distance from housing unit to supermarket-TANSAŞ) is 390,2 meter. The value of the variable ranges from 90 meter to 790 meter.

The mean value for the variable VB1V4 (distance from housing unit to primary health service area) is 258,8 meter. The value of the variable ranges from 12 meter to 730 meter. The mean value for the variable VB1V5 (distance from housing unit to hospital – public) is 853,4 meter. The value of the variable ranges from 434 meter to

1380 meter. The mean value for the variable VB1V6 (distance from housing unit to hospital - private) is 392,7 meter. The value of the variable ranges from 80 meter to 740 meter.

The mean value for the variable VB1V7 (distance from housing unit to nearest primary school) is 155,4 meter. The value of the variable ranges from 2 meter to 524 meter. The mean value for the variable VB1V8 (distance from housing unit to socio-cultural service area) is 334,5 meter. The value of the variable ranges from 14 meter to 726 meter.

The mean value for the variable VB1V9 (distance from housing unit to district park) is 296,8 meter. The value of the variable ranges from 36 meter to 704 meter. The mean value for the variable VB1V10 (distance from housing unit to district sport area) is 322,1 meter. The value of the variable ranges from 20 meter to 720 meter. The mean value for the variable VB1V11 (distance from housing unit to hippodrome) is 419,9 meter. The value of the variable ranges from 100 meter to 750 meter.

The mean value for the variable VB1V12 (distance from housing unit to post office) is 324,8 meter. The value of the variable ranges from 4 meter to 684 meter. The mean value for the variable VB1V13 (distance from housing unit to nearest public transportation stop) is 130,7 meter. The value of the variable ranges from 15 meter to 270 meter. The mean value for the variable VB1V14 (distance from housing unit to railway station) is 666,3 meter. The value of the variable ranges from 160 meter to 1090 meter. The mean value for the variable VB1V15 (distance from housing unit to railway) is 202,2 meter. The value of the variable ranges from 10 meter to 520 meter. The mean value for variable VB1V16 (distance from housing unit to nearest public transportation road) is 84,1 meter. The value of the variable ranges from 1 meter to 232 meter.

The mean value for the variable VB1V17 (distance from housing unit to city hall) is 877,3 meter. The value of the variable ranges from 410 meter to 1396 meter. The mean value for the variable VB1V18 (distance from housing unit to mosque) is 298,3 meter. The value of the variable ranges from 16 meter to 630 meter. The mean value for the variable VB1V19 (distance from housing unit to gas station) is 345,9 meter. The value of the variable ranges from 44 meter to 720 meter. The mean value for the variable VB1V20 (distance from housing unit to university) is 990,6 meter. The value of the variable ranges from 560 meter to 1504 meter. The mean value for the variable VB1V21 (distance from housing unit to police station) is 501 meter. The value of the variable ranges from 36 meter to 930 meter. The mean value for the variable

VB1V22 (distance from housing unit to abandoned covered bazaar) is 501 meter. The value of the variable ranges from 8 meter to 750 meter. The mean value for the variable VB1V23 (distance from housing unit to prison) is 690,4 meter. The value of the variable ranges from 210 meter to 1200 meter.

5) Within the variable set of housing unit's perceived environmental quality attributes:

40,7 % of respondents completely disagree with the statement about the quality of surrounding environment in terms of sufficiency of parking areas (VB2V1-perceived quality of surrounding environment-1, *"it is not difficult to find a place for car parking in surrounding environment"*). 32,1 % of respondents disagree with the statement about the quality of surrounding environment in terms of sufficiency of recreation areas (VB2V2-perceived quality of surrounding environment-2, *"recreation areas in surrounding are sufficient"*).

32,1 % of respondents also disagree with the statement about the quality of surrounding environment in terms of air pollution (VB2V3-perceived quality of surrounding environment-3, *"there is not air pollution in surrounding environment"*). 29,3 % of respondents completely disagree, on the other hand, other 29,3 % of respondents agree with the statement about the quality of surrounding environment in terms of noise pollution (VB2V4-perceived quality of surrounding environment-4, *"noise level is not so high in surrounding environment"*). 30,7 % of respondents agree with the statement about the quality of surrounding environment in terms of security (VB2V5-perceived quality of surrounding environment-5, *"surrounding of the house is safe and secured"*).

27,9 % of respondents completely disagree with the statement about the quality of surrounding environment in terms of vehicle traffic density (VB2V6-perceived quality of surrounding environment-6, *"vehicle traffic density is not so high in surrounding environment"*). 35,7 % of respondents agree with the statement about the quality of surrounding environment in terms of population density (VB2V7-perceived quality of surrounding environment-7, *"population density is not so high in surrounding environment"*). 32,1 % of respondents agree with the statement about the quality of surrounding environment in terms of building density (VB2V8-perceived quality of surrounding environment-8, *"building density is not so high in surrounding environment"*). 32,9 % of respondents completely disagree with the statement about the quality of surrounding environment in terms of density of vehicles in parking on road

(VB2V9-perceived quality of surrounding environment-9, *"vehicle density is not so high in surrounding environment"*). 37,9 % of respondents agree with the statement about the quality of surrounding environment in terms of prestige (VB2V10-perceived quality of surrounding environment-10, *"prestige of surrounding environment is high"*).

6) Within the variable set of housing unit's socio-economic environmental attributes:

69,3 % of respondents are married (VB3V1-marital status of the respondent). In 33,6 % of cases, households are composed of four people (VB3V2-household population). The mean value for household population is 3,5 people. Household population ranges from 1 person to 7 people. 25 % of respondents' age is between 20 and 29 years (VB3VA1A-age of the respondent). The mean value for respondents' age is 41,3 years. Respondents' age ranges from 20 years to 74 years. 27,9 % of respondents have high school diploma (VB3V3A2-education of the respondent). The mean value for the variable VB3V3A3 (education of the respondent) is 10,2 years. The education period of respondents ranges from 4 years to 18 years. 29,3 % of respondents are house women (VB3V3A4-profession of the respondent). 60,7 % of respondents are women (VB3V3A5-sex of the respondent).

45 % of households' monthly entire income is between 1500 YTL - 2499 YTL (VB3V4A-household's monthly income). The mean value for household's monthly income is 1743,3 YTL. Household's monthly income value ranges from 450 YTL to 5000 YTL. 68,6 % of households do not have a car (VB3V5-availability of car ownership). 68,6 % of households do not have to pay apartment bill (VB3V6A-avaliability of apartment bill). The mean value for apartment bill is 3,9 YTL. Apartment bill ranges from 0 YTL to 30 YTL. 32,1 % of households have been living in their house for one year (VB3V7A-year of rent). The mean value for the year of rent is 4,5 years. Year of rent ranges from 1 year to 25 years. 37,9 % of households pay for rent between 300-399 YTL (VB3V9A-present rent price). The mean value for the present rent price is 395,6 YTL. The present rent prices range from 180 YTL to 750 YTL.

In 45,7 % of cases, there is only one people working in the house (VB3V10-number of people working in the house). In 32,9 % of cases, there are two children in the house (VB3V11-number of children in house). In 67,9 % of cases, there is not any children at the age of primary education in the house (VB3V12-number of children at the age of primary education). In 57,9 % of cases, there is not any children at the age of high/university education in the house (VB3V13-number of children at the age of

high/university education). The mean value for the variable VB3V14 (average education of household) is 9,3 year. The value of the variable ranges from 2 years to 17 years. In 43,6 % of cases, households' average age is between 20 and 29 years (VB3V15A-average age of household). The mean value for the average age of households is 32,9 years. The average age of households ranges from 15 years to 75 years.

7) Within the variable set of housing unit's pedestrian way attributes (distance - frequency of usage):

The mean value for the variable VC1V1 (distance from housing unit to pedestrian way) is 123,5 meter. The value of the variable ranges from 1 meter to 350 meter. 64,3 % of respondents use the pedestrian way everyday (VC1V2-frequency of usage of the pedestrian way).

8) Within the variable set of housing unit's pedestrian way attributes (perceived quality of pedestrian way):

41,4 % of respondents completely agree with the statement about the character of functionality in terms of the accessibility to home (VC2V1-perceived quality of pedestrian way-1, *"I use the pedestrian way to go my house"*). 41,4 % of respondents also completely agree with the statement about the character of functionality in terms of the accessibility to urban amenities (VC2V2-perceived quality of pedestrian way-2, *"I use the pedestrian way to go to the park, bazaar, market and so on"*). 50 % of respondents completely agree with the statement about the character of functionality in terms of the provision recreation and social interaction opportunities (VC2V3-perceived quality of pedestrian way-3, *"I use the pedestrian way for recreation"*). 47,1 % of respondents completely agree with the statement about the character of functionality in terms of the provision shopping opportunity (VC2V4-perceived quality of pedestrian way-4, *"I use the pedestrian way for shopping"*).

42,1 % of respondents completely agree with the statement about the quality of functionality in terms of accessibility for overall pedestrian way space (VC2V5-perceived quality of pedestrian way-5, *"I walk (access) throughout the pedestrian way not facing with any barrier"*). 35 % of respondents agree with the statement about the quality of equity-functionality in terms of accessibility for overall pedestrian way space (VC2V6-perceived quality of pedestrian way-6, *"Everybody (including also handicapped people, kids, elderly, pregnant, and so on) walk (access) throughout the pedestrian way not facing with any barrier"*).

29,3 % of respondents agree with the statement about length of the pedestrian way (VC2V7-perceived quality of pedestrian way-7, *"I wish the pedestrian way was longer"*). 35 % of respondents completely agree with the statement about the quality of memorability (VC2V8-perceived quality of pedestrian way-8, *"I easily remember the entire pedestrian way when I close my eyes"*).

41,4 % of respondents completely agree with the first statement about the quality of comfort in terms of climatic considerations - shade (VC2V9-perceived quality of pedestrian way-9, *"In pedestrian way, there are resting places and benches which are protected from sun in summer"*). 39,3 % of respondents agree with the second statement about the quality of comfort in terms of climatic considerations - shade (VC2V10-perceived quality of pedestrian way-10, *"I walk on the pedestrian way without discomforted from sun in the summer"*). 30,7 % of respondents disagree whereas other 30,7 % of respondents agree with the third statement about the quality of comfort in terms of climatic considerations - sun (VC2V11-perceived quality of pedestrian way-11, *"I walk on the pedestrian way benefiting from sun in the winter"*). 45,7 % of respondents agree with the fourth statement about the quality of comfort in terms of climatic considerations - wind (VC2V12-perceived quality of pedestrian way-12, *"The pedestrian way is protected from disturbing air turbulence"*). 35 % of respondents agree with the fourth statement about the quality of comfort in terms of climatic considerations - rain (VC2V13-perceived quality of pedestrian way-13, *"Drainage is well provided in the pedestrian way, there is not rain water on ground in rainy days"*).

37,1 % of respondents agree with the statement about the quality of spatial identity of overall pedestrian way space (VC2V14-perceived quality of pedestrian way-14, *"The pedestrian way some distinctive features which makes it different from other ways"*). 43,6 % of respondents agree with the statement about the aesthetic quality of overall pedestrian way space (VC2V15-perceived quality of pedestrian way-15, *"The pedestrian way design is aesthetically satisfactory"*). 37,1 % of respondents agree with the statement about the image quality (prestige) of overall pedestrian way space (VC2V16-perceived quality of pedestrian way-16, *"The pedestrian way makes a positive contribution to the nearby environment's prestige"*).

55 % of respondents completely agree with the statement about the management quality of overall pedestrian way space (VC2V17-perceived quality of pedestrian way-17, *"The pedestrian way is well maintained regularly"*). 40,7 % of respondents completely agree with the statement about the quality of security of overall pedestrian

way space during day (VC2V18-perceived quality of pedestrian way-18, *"The pedestrian way and its surrounding is secure for everybody during day"*). 32,9 % of respondents completely agree with the statement about the quality of security of overall pedestrian way space during night (VC2V19-perceived quality of pedestrian way-19, *"The pedestrian way and its surrounding is secure for everybody in the night"*).

28,6 % of respondents agree with the statement about the quality of comfort depending on pedestrian congestion during day (VC2V20-perceived quality of pedestrian way-20, *"The pedestrian way is not so crowded that the pedestrians have difficulties for comfortable walking and short communications with others on the way during day"*). 32,1 % of respondents disagree with the statement about the quality of comfort depending on pedestrian congestion during evening (VC2V21-perceived quality of pedestrian way-21, *"The pedestrian way is not so crowded that the pedestrians have difficulties for comfortable walking and short communications with others on the way in the evening"*). 25 % of respondents completely disagree whereas other 25 % of respondents agree with the statement about the quality of security depending on pedestrian congestion during day (VC2V22-perceived quality of pedestrian way-22, *"The pedestrian way is not so crowded that the pedestrians have a feeling of unsecurity because of congestion during day"*). 33,6 % of respondents agree with the statement about the quality of security depending on pedestrian congestion in the evening (VC2V23-perceived quality of pedestrian way-23, *"The pedestrian way is not so crowded that the pedestrians have a feeling of unsecurity because of congestion in the evening"*).

30,7 % of respondents agree with the statement about the quality of comfort in terms of noise pollution resulting from pedestrian density during day (VC2V24-perceived quality of pedestrian way-24, *"The pedestrian way is not so noisy because of pedestrian congestion that the pedestrians have a discomfort during day"*). 35,7 % of respondents agree with the statement about the quality of comfort in terms of noise pollution resulting from pedestrian density in the evening (VC2V25-perceived quality of pedestrian way-25, *"The pedestrian way is not so noisy because of pedestrian congestion that the pedestrians have a discomfort in the evening"*). 32,1 % of respondents agree with the statement about the quality of comfort in terms of noise pollution resulting from shops during day (VC2V26-perceived quality of pedestrian way-26, *"The pedestrian way is not so noisy because of shops that the pedestrians have a discomfort during day"*). 40,7 % of respondents agree with the statement about the

quality of comfort in terms of noise pollution resulting from shops in the evening (VC2V27-perceived quality of pedestrian way-27, *"The pedestrian way is not so noisy because of shops that the pedestrians have a discomfort in the evening"*).

40 % of respondents disagree with the statement about the convenience of adjacent land uses (VC2V28-perceived quality of pedestrian way-28, *"I enjoy with land uses taking place on the pedestrian way such as food and clothe stores"*). 46,4 % of respondents completely agree with the statement about the quality of functionality in terms of social interaction (VC2V29-perceived quality of pedestrian way-29, *"For me, food stores such as restaurants and cafes provide an opportunity for social contact with others"*). 47,1 % of respondents agree with the statement about the quality of equity-functionality in terms of the social interaction (VC2V30-perceived quality of pedestrian way-30, *"Food stores such as restaurants and cafes on the pedestrian way is sufficiently diverse that the different groups such as the rich, the poor, families, and youth are able to afford"*). 44,3 % of respondents agree with the statement about the quantity of places for social interaction (VC2V31-perceived quality of pedestrian way-31, *"There is enough food stores and cafes on the pedestrian way"*).

47,9 % of respondents completely agree with the statement about the aesthetic quality of buildings enclosing the pedestrian way (VC2V32-perceived quality of pedestrian way-32, *"The enclosing buildings of pedestrian way are beautiful"*). 30,7 % of respondents agree with the statement about the quality of façade identity of enclosing buildings (VC2V33-perceived quality of pedestrian way-33, *"Façade of enclosing buildings makes the pedestrian way different from other ways"*).

27,1 % of respondents disagree with the statement about the quality of convenience in terms of the distances between sitting areas and benches (VC2V34-perceived quality of pedestrian way-34, *"In the pedestrian way, I don't have to walk so much to a bench when I need to rest"*). 37,9 % of respondents agree with the statement about the quantity of benches (VC2V35-perceived quality of pedestrian way-35, *"There are enough benches in the pedestrian way"*). 31,4 % of respondents disagree with the statement about the quality of comfort of benches (VC2V36-perceived quality of pedestrian way-36, *"The benches in the pedestrian way are comfortable"*).

39,3 % of respondents agree with the statement about the quality of convenience in terms of the distances between two trashes (VC2V37-perceived quality of pedestrian way-37, *"In the pedestrian way, I don't have to walk so much to a trash when I need it"*). 42,1 % of respondents agree with the statement about the quality of equity-

convenience in terms of the distances between two trashes (VC2V38-perceived quality of pedestrian way-38, *"In the pedestrian way, also others don't have to walk so much to a trash when they need it"*). 32,1 % of respondents agree with the statement about the quality of convenience in terms of easy usage of trash (VC2V39-perceived quality of pedestrian way-39, *"The trashes in the pedestrian way are convenient to use"*). 35,7 % of respondents agree with the statement about the quantity of trashes (VC2V40-perceived quality of pedestrian way-40, *"There are enough trashes in pedestrian way"*).

28,6 % of respondents disagree with the statement about the quantity and quality of lighting (VC2V41-perceived quality of pedestrian way-41, *"The entire pedestrian way is sufficiently lighted in the night"*). 36,4 % of respondents agree with the statement about the quantity of phone boxes (VC2V42-perceived quality of pedestrian way-42, *"There are enough telephone boxes in the pedestrian way"*). 31,4 % of respondents disagree with the statement about the quality of convenience of street pavement (VC2V43-perceived quality of pedestrian way-43, *"The pavements in the pedestrian way are convenient to walk"*). 39,3 % of respondents agree with the statement about the quality of equity-convenience of street pavement (VC2V44-perceived quality of pedestrian way-44, *"The pavements in the pedestrian way are convenient to walk as well as for others such as handicapped, women, pregnant"*).

30,7 % of respondents agree with the statement about the quality of safety of street furniture (VC2V45-perceived quality of pedestrian way-45, *"Street furniture such as bench, lighting, and trash in the pedestrian way are safe to use"*). 39,3 % of respondents agree with the statement about the maintenance quality of street furniture (VC2V46-perceived quality of pedestrian way-46, *"Street furniture such as bench, lighting, and trash in the pedestrian way are undamaged and in good condition"*). 44,3 % of respondents agree with the statement about the quality of durability of street furniture material (VC2V47-perceived quality of pedestrian way-47, *"Street furniture such as bench, lighting, and trash in the pedestrian way are made of durable materials"*). 36,4 % of respondents agree with the statement about the aesthetic quality of street furniture (VC2V48-perceived quality of pedestrian way-48, *"Street furniture such as bench, lighting, and trash in the pedestrian way makes a contribution to the streetscape"*). 32,9 % of respondents agree with the statement about the quality of identity of street furniture (VC2V49-perceived quality of pedestrian way-49, *"Street furniture such as bench and lighting in the pedestrian way makes the pedestrian way different from other ways"*).

32,9 % of respondents also agree with the statement about the aesthetic quality of natural landscaping elements (plant material) (VC2V50-perceived quality of pedestrian way-50, *"Trees and flowers in the pedestrian way makes a contribution to the streetscape"*). 40 % of respondents agree with the statement about the quality of identity of natural landscaping elements (plant material) (VC2V51-perceived quality of pedestrian way-51, *"Trees and flowers in the pedestrian way makes the pedestrian way different from other ways"*).

41,4 % of respondents agree with the statement about the aesthetic quality of water elements (VC2V52-perceived quality of pedestrian way-52, *"The pool in the pedestrian way makes a contribution to the streetscape"*). 47,1 % of respondents completely agree with the statement about the quality of identity of water elements (VC2V53-perceived quality of pedestrian way-53, *"The pool in the pedestrian way makes the pedestrian way different from other ways"*).

46,4 % of respondents completely agree with the first statement about the quality of security and comfort in terms of pedestrian and vehicle interaction (VC2V54-perceived quality of pedestrian way-54, *"Since it is not separated with vehicle traffic ways, I walk more comfortable through the pedestrian way"*). 57,9 % of respondents completely agree with the second statement about the quality of security and comfort in terms of pedestrian and vehicle interaction (VC2V55-perceived quality of pedestrian way-55, *"Limiting the vehicle access to the way is more comfortable for pedestrians"*). 57,9 % of respondents also completely agree with the statement about the quality of convenience for vehicle access (VC2V56-perceived quality of pedestrian way-56, *"When it is allowed, the vehicles are able to move comfortable on the pedestrian way"*).

29,3 % of respondents undetermined with the statement about the quantity of car parking area in the surrounding (VC2V57-perceived quality of pedestrian way-57, *"It is not difficult to find a place for car parking in the surrounding of the pedestrian way"*). 49,3 % of respondents completely disagree with the statement about the quality of convenience in terms of prohibition of car parking on the pedestrian way in the day (VC2V58-perceived quality of pedestrian way-58, *"It is true to not park on the pedestrian way"*).

46,4 % of respondents completely agree with the first statement about the convenience in terms of timing for vehicle access to road (VC2V59-perceived quality of pedestrian way-59, *"The period for vehicle access to the pedestrian way is enough"*). 34,3 % of respondents undetermined with the second statement about the convenience

in terms of timing for vehicle access to road (VC2V60-perceived quality of pedestrian way-60, *"The timing for vehicle access to the pedestrian way is convenient"*).

69,3 % of respondents completely agree with the statement about the overall satisfaction level for the pedestrian way (VC2V61-perceived quality of pedestrian way-61, *"It is not good idea to re-design the pedestrian way as a vehicle traffic way"*).

4.2.1.2. Descriptive Statistics Results of Zones of the Case Area

In this part of the study, descriptive statistics for each zone of the entire area were presented for the variable VB3V9A (present rent price).

Table 4.11. Cross tabulation of present rent price and zone

			present rent price							
			0-199	200-299	300-399	400-499	500-599	600-699	700+	Total
Zone	1st zone	Count			2	9	4	4	1	20
		% within zone			10,0%	45,0%	20,0%	20,0%	5,0%	100,0%
	2nd zone	Count		2	5	10	4	2		23
		% within zone		8,7%	21,7%	43,5%	17,4%	8,7%		100,0%
	3th zone	Count	1	5	17	9	5		1	38
		% within zone	2,6%	13,2%	44,7%	23,7%	13,2%		2,6%	100,0%
	4th zone	Count	1	8	29	20			1	59
		% within zone	1,7%	13,6%	49,2%	33,9%			1,7%	100,0%
Total		Count	2	15	53	48	13	6	3	140
		% within zone	1,4%	10,7%	37,9%	34,3%	9,3%	4,3%	2,1%	100,0%

37,9 % of households in the entire area pay for rent between 300 YTL and 399 YTL. The mean value for the present rent price is 395,6 YTL. The present rent prices range from 180 YTL to 750 YTL. Nevertheless, as it is seen in the following cross tab, these values differ depending on the zones. In the first zone, 45 % of households pay for rent between 400 YTL and 499 YTL. The mean value for the present rent price is 493 YTL. The present rent prices range from 350 YTL to 700 YTL. In the second zone, 43,5 % of households pay for rent between 400 YTL and 499 YTL. The mean value for the present rent price is 426,7 YTL. The present rent prices range from 200 YTL to 650 YTL. In the third zone, 44,7 % of households pay for rent between 300 YTL and 399 YTL. The mean value for the present rent price is 375 YTL. The present rent prices range from 180 YTL to 750 YTL. And finally, in the fourth zone, 49,2 % of households pay for rent between 300 YTL and 399 YTL. The mean value for the present rent price is 363,7 YTL. The present rent prices range from 180 YTL to 750 YTL.

4.2.2. Inferential Statistics Results

In this part of the study, inferential statistics results were presented within the context of the eight sets of the statistics hypotheses.

1) Within the context of the first set of the statistics hypotheses, $H_{0A1\text{-}1}$ statistics hypothesis was tested by using correlation analysis technique to understand the relation between the price of housing unit and pedestrian way characteristics. According to the tests results;

Parallel to the expectation:

- there is a statistically significant negative correlation [r= -0.411(0.000)] between present rent price and distance from housing unit to pedestrian way, indicating that the linear relationship between these two variables is one in which the values of one variable increase as the other decrease, that is, the more distant the housing unit from pedestrian way, the less rent price is. This relation can be considered as the result of the positive externalities of the pedestrian way such as the provision of various social, physical and environmental, and economic benefits.

2) Within the context of the second set of the statistics hypotheses; $H_{0A2\text{-}1}$, $H_{0A2\text{-}2}$, $H_{0A2\text{-}3}$, $H_{0A2\text{-}4}$, $H_{0A2\text{-}5}$, $H_{0A2\text{-}6}$, $H_{0A2\text{-}7}$, $H_{0A2\text{-}8}$, $H_{0A2\text{-}9}$, $H_{0A2\text{-}10}$, $H_{0A2\text{-}11}$, $H_{0A2\text{-}12}$, $H_{0A2\text{-}13}$, $H_{0A2\text{-}14}$, $H_{0A2\text{-}15}$, $H_{0A2\text{-}16}$, $H_{0A2\text{-}17}$, $H_{0A2\text{-}18}$, $H_{0A2\text{-}19}$, $H_{0A2\text{-}20}$, $H_{0A2\text{-}21}$, $H_{0A2\text{-}22}$, $H_{0A2\text{-}23}$ statistics hypotheses were tested by using correlation analysis technique to understand the relation between the price of housing unit and its location-environmental characteristics. According to the tests results;

Parallel to the expectation based on the previous hedonic price studies;

- there is a statistically significant negative correlation [r= -0.299(0.000)] between present rent price and distance from housing unit to district center, indicating that the linear relationship between these two variables is one in which the values of one variable increase as the other decrease, that is, the more distant the housing unit from district center, the less rent price is. This relation can be considered as the result of the positive externalities of the district center through various benefits.

On the contrary to the expectation based on the previous hedonic price studies:

- Although there is a fairly weak negative correlation coefficient [(r= -0.041(0.630)] between present rent price and distance from housing unit to bazaar, it

does not indicate a statistically significant linear relationship. This can be considered as the result of the unobserved factors.

- Although there is a fairly weak negative correlation coefficient [(r= -0.094(0.269)] between present rent price and distance from housing unit to supermarket (TANSAŞ), it does not indicate a statistically significant linear relationship. This can be considered as the result of the unobserved factors.

- Although there is a weak negative correlation coefficient [(r= -0.150(0.078)] between present rent price and distance from housing unit to primary health service area, it does not indicate a statistically significant linear relationship. This can be considered as the result of the unobserved factors.

- Although there is a fairly weak negative correlation coefficient [(r= -0.031(0.717)] between present rent price and distance from housing unit to health service area (hospital-public-SSK), it does not indicate a statistically significant linear relationship. This can be considered as the result of the unobserved factors.

- Although there is a fairly weak negative correlation coefficient [(r= -0.056 (0.509)] between present rent price and distance from housing unit to health service area (hospital-private), it does not indicate a statistically significant linear relationship. This can be considered as the result of the unobserved factors.

- Although there is a fairly weak negative correlation coefficient [(r= -0.062 (0.468)] between present rent price and distance from housing unit to nearest primary school, it does not indicate a statistically significant linear relationship. This can be considered as the result of the unobserved factors.

- Although there is a weak negative correlation coefficient [(r= -0.117 (0.167)] between present rent price and distance from housing unit to socio-cultural service area, it does not indicate a statistically significant linear relationship. This can be considered as the result of the unobserved factors.

- Although there is a fairly weak negative correlation coefficient [(r= -0.093 (0.274)] between present rent price and distance from housing unit to district park, it does not indicate a statistically significant linear relationship. This can be considered as the result of the unobserved factors.

- Although there is a fairly weak negative correlation coefficient [(r= -0.048 (0.573)] between present rent price and distance from housing unit to district sport area, it does not indicate a statistically significant linear relationship. This can be considered as the result of the unobserved factors.

- Although there is a fairly weak negative correlation coefficient [(r= -0.017 (0.842)] between present rent price and distance from housing unit to hippodrome, it does not indicate a statistically significant linear relationship. This can be considered as the result of the unobserved factors.
- Although there is a weak negative correlation coefficient [(r= -0.145 (0.086)] between present rent price and distance from housing unit to post office, it does not indicate a statistically significant linear relationship. This can be considered as the result of the unobserved factors.
- Although there is a fairly weak positive correlation coefficient [(r= 0.021 (0.807)] between present rent price and distance from housing unit to nearest public transportation stop, it does not indicate a statistically significant linear relationship. This can be considered as the result of the unobserved factors.
- Although there is a fairly weak negative correlation coefficient [(r= -0.022 (0.796)] between present rent price and distance from housing unit to railway station, it does not indicate a statistically significant linear relationship. This can be considered as the result of the unobserved factors.
- Although there is a fairly weak positive correlation coefficient [(r= 0.026 (0.764)] between present rent price and distance from housing unit to railway, it does not indicate a statistically significant linear relationship. This can be considered as the result of the unobserved factors.
- Although there is a fairly weak positive correlation coefficient [(r= 0.043(0.616)] between present rent price and distance from housing unit to nearest public transportation road, it does not indicate a statistically significant linear relationship. This can be considered as the result of the unobserved factors.
- Although there is a fairly weak negative correlation coefficient [(r= -0.067 (0.434)] between present rent price and distance from housing unit to municipality, it does not indicate a statistically significant linear relationship. This can be considered as the result of the unobserved factors.
- Although there is a weak negative correlation coefficient [(r= -0.101 (0.237)] between present rent price and distance from housing unit to the mosque, it does not indicate a statistically significant linear relationship. This can be considered as the result of the unobserved factors.
- Although there is a weak negative correlation coefficient [(r= -0.128 (0.132)] between present rent price and distance from housing unit to gas station, it does not

indicate a statistically significant linear relationship. This can be considered as the result of the unobserved factors.

▪ Although there is a fairly weak negative correlation coefficient [(r= -0.042 (0.625)] between present rent price and distance from housing unit to university, it does not indicate a statistically significant linear relationship. This can be considered as the result of the unobserved factors.

▪ Although there is a fairly weak negative correlation coefficient [(r= -0.051 (0.551)] between present rent price and distance from housing unit to police station, it does not indicate a statistically significant linear relationship. This can be considered as the result of the unobserved factors.

▪ Although there is a fairly weak negative correlation coefficient [(r= -0.094 (0.270)] between present rent price and distance from housing unit to abandoned covered bazaar, it does not indicate a statistically significant linear relationship. This can be considered as the result of the unobserved factors.

▪ Although there is a fairly weak negative correlation coefficient [(r= -0.082 (0.338)] between present rent price and distance from housing unit to prison, it does not indicate a statistically significant linear relationship. This can be considered as the result of the unobserved factors.

3) Within the context of the third set of the statistics hypotheses; $H_{0A3\text{-}1}$, $H_{0A3\text{-}2}$, $H_{0A3\text{-}3}$, $H_{0A3\text{-}4}$, $H_{0A3\text{-}5}$ statistics hypotheses were tested by using correlation analysis technique to understand the relation between the price of housing unit and its structural characteristics. According to the tests results;

Parallel to the expectation based on the previous hedonic price studies:

▪ There is a statistically significant negative correlation [r=-0.302(0.000)] between present rent price and age of the building, indicating that the linear relationship between these two variables is one in which the values of one variable increase as the other decrease, that is, the older the building is, the less rent price is. This relation can be considered as the result of the decrease in satisfaction level because of oldness in terms of the comfort, convenience, durability, and functionality qualities.

▪ There is a statistically significant positive correlation [r= 0.438(0.000)] between present rent price and number of all floors, indicating that the linear relationship between these two variables is one in which the values of one variable increase as the other increases, that is, the more floors the building has, the larger rent

price is. This relation can be considered as the result of the more satisfaction provided by apartments which are newer than one-two storey houses.

▪ There is a statistically significant positive correlation [r= 0.308(0.000)] between present rent price and floor number of the housing unit, indicating that the linear relationship between these two variables is one in which the values of one variable increase as the other increases, that is, in the upper floors the housing unit is, the larger rent price is. This relation can be considered as the result of the more opportunity for view or increase in the sense of security provided by upper floors.

▪ There is a statistically significant positive correlation [r= 0.349(0.000)] between present rent price and size of the housing unit, indicating that the linear relationship between these two variables is one in which the values of one variable increase as the other increases, that is, the bigger the housing unit is, the larger rent price is. This relation can be considered as the result of the more benefits provided by larger area.

On the contrary to the expectation based on the previous hedonic price studies:

▪ Although there is a fairly weak positive correlation coefficient [(r= 0.059 (0.487)] between present rent price and size of the plot, it does not indicate a statistically significant linear relationship. This can be considered as result of unobserved factors.

4) Within the context of the fourth set of the statistics hypotheses; $H_{0A4\text{-}1}$, $H_{0A4\text{-}2}$, $H_{0A4\text{-}3}$, $H_{0A4\text{-}4}$, $H_{0A4\text{-}5}$, $H_{0A4\text{-}6}$, $H_{0A4\text{-}7}$, $H_{0A4\text{-}8}$, $H_{0A4\text{-}9}$, $H_{0A4\text{-}10}$, $H_{0A4\text{-}11}$, $H_{0A4\text{-}12}$, $H_{0A4\text{-}13}$, $H_{0A4\text{-}14}$, $H_{0A4\text{-}15}$, $H_{0A4\text{-}16}$, $H_{0A4\text{-}17}$ statistics hypotheses were tested by using *t*-test technique to understand the price differences depending on structural characteristics. According to the tests results;

Parallel to the expectation based on the previous hedonic price studies:

▪ Rent price differs depending on number of bathrooms [t-stat=-3.196(0.014), df=7.251]. The rent price of houses having two bathrooms is bigger than that of houses having one bathroom. This can be considered as the result of the more comfort.

▪ Rent price differs depending on the construction type [t-stat=-2.505(0.013), df=138]. The rent price of reinforced concrete houses is bigger than that of yigma houses. This can be considered as the result of the increase in satisfaction level because reinforced concrete houses are newer than yigma houses.

▪ Rent price differs depending on the facade orientation of the housing unit (west-other) [t-stat=-3.377(0.001), df=138]. The rent price of housing units having west façade is lower than that of housing units not having west façade.

▪ Rent price differs depending on the facade orientation of the housing unit (east-other) [t-stat=-2.970(0.004), df=138]. The rent price of housing units having east façade is lower than that of housing units not having east façade.

▪ Rent price differs depending on the facade orientation of the housing unit (northeast-other) [t-stat=3.478(0.001), df=138]. The rent price of housing units having northeast façade is bigger than that of housing units not having northeast façade.

▪ Rent price differs depending on the facade orientation of the housing units (southwest-other) [t-stat=3.105(0.004), df=27.662]. The rent price of housing units having southwest façade is more than that of housing units not having southwest façade.

▪ Rent price differs depending on the facade orientation of the housing units (southeast-other) [t-stat=3.672(0.000), df=138]. The rent price of housing units having southeast façade is bigger than that of housing units not having southeast façade.

On the contrary to the expectation; rnt price does not differ depending on the

▪ facade orientation (north-other) [t-stat=-1.074(0.285), df=138],

▪ facade orientation (south-other) [t-stat=-1.303(0.195), df=138],

▪ facade orientation (northwest-other) [t-stat=1.743(0.084), df=138],

▪ avaliability of storage in the housing unit [t-stat=1.016(0.313), df=64.739],

▪ avaliability of room looking light hole [t-stat=-0.862(0.390), df=135.360],

▪ avaliability of shutter on windows [t-stat=-3.196(0.014), df=7.251],

▪ availability of satellite [t-stat=0.542(0.588), df=138],

▪ availability of cabled TV [t-stat=1.618(0.120), df=22.025].

These results can be considered as the result of the other influential factors. The independent samples table could not be produced in testing $H_{0A4\text{-}13}$ statistics hypotheses (the price of housing unit is not differentiated depending on the avaliability of doorkeeper) since there is not any sample having doorkeeper.

5) Within the context of the fifth set of the statistics hypotheses; $H_{0A5\text{-}1}$, $H_{0A5\text{-}2}$, $H_{0A5\text{-}3}$, $H_{0A5\text{-}4}$, $H_{0A5\text{-}5}$, $H_{0A5\text{-}6}$, $H_{0A5\text{-}7}$, $H_{0A5\text{-}8}$, $H_{0A5\text{-}9}$, $H_{0A5\text{-}10}$, $H_{0A5\text{-}11}$, $H_{0A5\text{-}12}$, $H_{0A5\text{-}13}$, $H_{0A5\text{-}14}$, $H_{0A5\text{-}15}$ statistics hypotheses were tested by using F test technique (one way ANOVA) to understand the price differences depending on structural characteristics. According to the tests results;

Parallel to the expectation based on the previous hedonic price studies:

▪ Rent price differs depending on the age of the building [F-stat=4.170(0.003); df=4;135]. According to the Tukey HSD test results (p_i<0.05), in terms of the rent price, 0-9 years old housing units differs from houses in other age groups. This relation can be considered as the result of the decrease in satisfaction level because of oldness in terms of the comfort, convenience, durability, and functionality qualities.

▪ Rent price differs depending on the floor number of the housing unit [F-stat=7.063(0.000); df=4;135]. Nevertheless, Post hoc tests were not performed for present rent price because some groups have fewer than two cases.

▪ Rent price differs depending on the number of bedrooms [F-stat=6.206(0.003); df=2;137]. According to the Tukey HSD test results (p_i<0.05), difference between the prices results from housing units having two bedrooms. This can be considered as the result of the more benefits provided by more rooms.

▪ Rent price differs depending on the number of balconies [F-stat=9.896(0.000); df=3;136]. According to the Tukey HSD test results (p_i<0.05), difference between the prices results from housing units having three balconies. This can be considered as the result of the more opportunity for view, extra storage, and benefiting from open air.

▪ Rent price differs depending on the heating system [F-stat=5.256(0.002); df=3;136]. According to the Tukey HSD test results (p_i<0.05), in terms of the rent price, housing units heated with flat heater differ from houses heated with stove and electricity.

▪ Rent price differs depending on the main door material [F-stat=3.558(0.009); df=4;135]. Nevertheless, Post hoc tests were not performed for present rent price because some groups have fewer than two cases.

▪ Rent price differs depending on the car parking location [F-stat=6.092(0.003); df=2;137]. According to the Tukey HSD test results (p_i<0.05), in terms of the rent price, housing units whose car parking location is front of the building differ from housing units whose car parking locations are plot garden and back roads.

▪ Rent price differs depending on the number of rooms viewing pedestrian way [F-stat=10.561(0.000); df=3;136]. According to the Tukey HSD test results (p_i<0.05), in terms of the rent price, housing units not having any bedrooms looking pedestrian way differ from housing units having two and three bedrooms looking pedestrian way, and housing units having one bedroom looking pedestrian way differ from housing units having three bedrooms looking pedestrian way. This price difference can be considered as the result of the more opportunity to benefit from pedestrian way visually.

▪ Rent price differs depending on the number of balconies looking pedestrian way [F-stat=11.809(0.000); df=3;136]. According to the Tukey HSD test results (p_i<0.05), in terms of the rent price, housing units not having any balconies looking pedestrian way differ from housing units having one, two, and three balconies looking pedestrian way. This price difference can be considered as the result of the more opportunity to benefit from pedestrian way visually.

On the contrary to the expectation based on the previous hedonic price studies, the rent price does not differ depending on

▪ the building type [F-stat=1.036(0.358); df=2;137],

▪ the number of facades [F-stat=0,176(0.912); df=3;136],

▪ the material quality of wet spaces [F-stat=0.505(0.732); df=4;135],

▪ the material quality of dry spaces [F-stat=1.248(0.294); df=4;135],

▪ the overall building quality [F-stat=0.788(0.535); df=4;135],

▪ the door-window material [F-stat=1.718(0.150); df=4;135]. These results can be considered as the result of the unobserved factors.

6) Within the context of the sixth set of the statistics hypotheses; $H_{0A6\text{-}1}$ statistics hypotheses was tested by using χ^2 test technique to understand the relation between the zones and pedestrian way characteristics (frequency of usage). According to the tests results; parallel to the expectation it was seen that there is a relationship between the frequency of usage of pedestrian way and the zones.

Table 4.12. Cross tabulation of zones and frequency of usage of pedestrian way

			frequency of usage of pedestrian way				
			everyday	few times in a week	few times in a month	so rare	Total
zone number	first zone (on road)	Count	20				20
		% within zone number	100,0%				100,0%
	second zone (10-50m)	Count	21	2			23
		% within zone number	91,3%	8,7%			100,0%
	third zone (51-200m)	Count	26	12			38
		% within zone number	68,4%	31,6%			100,0%
	forth zone (201-300m)	Count	23	26	7	3	59
		% within zone number	39,0%	44,1%	11,9%	5,1%	100,0%
Total		Count	90	40	7	3	140
		% within zone number	64,3%	28,6%	5,0%	2,1%	100,0%

7) Within the context of the seventh set of the statistics hypotheses; $H_{0A7\text{-}1}$, $H_{0A7\text{-}2}$, $H_{0A7\text{-}3}$, $H_{0A7\text{-}4}$, $H_{0A7\text{-}5}$, $H_{0A7\text{-}6}$, $H_{0A7\text{-}7}$, $H_{0A7\text{-}8}$, $H_{0A7\text{-}9}$, $H_{0A7\text{-}10}$, $H_{0A7\text{-}11}$ statistics hypotheses were tested by using F test technique (one way ANOVA) to understand differences of zones in terms of price, structural, location-environmental characteristics of the housing, and users' socio-economic characteristics. According to the tests results;

Zones as representatives of market segments differs depending on

▪ the present rent price [F-stat=10.441(0.000); df=3;136]. According to the Tukey HSD test results (p_i<0.05), in terms of the rent price, the first zone in which the pedestrian way takes place differs from the third and fourth zones, and the second zone which is adjacent to the first zone differs from the fourth zone.

▪ the number of all floors [F-stat=9.846(0.000); df=3;136]. According to the Tukey HSD test results (p_i<0.05), in terms of the number of all floors, the first zone differs from other all zones.

▪ the floor number of the house [F-stat=5.470(0.001); df=3;136]. According to the Tukey HSD test results (p_i<0.05), in terms of the floor number of the house, the first zone differs from the third and fourth zones. The zones as representatives of market segments do not differ depending on the size of the house [F-stat=1.609(0.190); df=3;136].

▪ the household's montly income [F-stat=5.806(0.001); df=3;136]. According to the Tukey HSD test results (p_i<0.05), in terms of the household's montly income, the first zone, in which also present rent price is the highest, differs from third and fourth zones.

▪ the year of rent [F-stat=3.564(0.016); df=3;136]. According to the Tukey HSD test results (p_i<0.05), in terms of the year of rent, the second zone differs from the third zone.

The zones as representatives of market segments do not differ depending on

- the age of the building [F-stat=0.630(0.597); df=3;136],
- the size of the plot [F-stat=0.891(0.448); df=3;136],
- the household population [F-stat=1.368(0.255); df=3;136],
- the apartment bill [F-stat=0.279(0.840); df=3;136],
- the average age of household [F-stat=1.066(0.366); df=3;136].

8) Within the context of the eighth set of the statistics hypotheses; $H_{0A8\text{-}1}$, $H_{0A8\text{-}2}$, $H_{0A8\text{-}3}$, $H_{0A8\text{-}4}$, $H_{0A8\text{-}5}$, $H_{0A8\text{-}6}$, $H_{0A8\text{-}7}$, $H_{0A8\text{-}8}$, $H_{0A8\text{-}9}$, $H_{0A8\text{-}10}$, $H_{0A8\text{-}11}$, $H_{0A8\text{-}12}$, $H_{0A8\text{-}13}$, $H_{0A8\text{-}14}$, $H_{0A8\text{-}15}$, $H_{0A8\text{-}16}$, $H_{0A8\text{-}17}$, $H_{0A8\text{-}18}$, $H_{0A8\text{-}19}$, $H_{0A8\text{-}20}$, $H_{0A8\text{-}21}$, $H_{0A8\text{-}22}$, $H_{0A8\text{-}23}$, $H_{0A8\text{-}24}$, $H_{0A8\text{-}25}$, $H_{0A8\text{-}26}$, $H_{0A8\text{-}27}$, $H_{0A8\text{-}28}$, $H_{0A8\text{-}29}$, $H_{0A8\text{-}30}$, $H_{0A8\text{-}31}$, $H_{0A8\text{-}32}$, $H_{0A8\text{-}33}$, $H_{0A8\text{-}34}$, $H_{0A8\text{-}35}$, $H_{0A8\text{-}36}$, $H_{0A8\text{-}37}$, $H_{0A8\text{-}38}$, $H_{0A8\text{-}39}$, $H_{0A8\text{-}40}$ statistics hypotheses were tested by using χ^2 test technique to understand the relation between the zones and structural, location and environmental characteristics of the housing, and users' socio-economic characteristics. According to the tests results;

On the contrary to the location, physical and socio-economic environmental attributes, there are fewer differences between the zones in terms the structural attributes of houses. Differences between zones in terms of the structural attributes of houses are mostly related with the attributes affected from pedestrian way.

There is not a relationship between zones and age of the building, building and construction type, floor number of the house, number of bedrooms and bathrooms, number of balconies and facades. Further, there is not a relationship between zones and facade orientation (east) and facade orientation (southwest). Nevertheless, there is a relationship between the zones and facade orientation (north), facade orientation (south), facade orientation (west), facade orientation (northwest), facade orientation (northeast), facade orientation (southeast), the avaliability of cabled TV. On the contrary to expectation, there is not a relationship between zones and avaliability of depot and room looking light hole, material quality of wet spaces and dry spaces, overall building quality, heating system, door and window material, main door material, avaliability of lift and doorkeeper, avaliability of shutter and satellite.

There is a relationship between car parking location and zones. There is a relationship between zones and number of rooms and balconies looking pedestrian way. Parallel to the expectation, there is a relationship between zones and present rent price and household's montly income. Cross tabulations were presented in the next page. Whereas, on the contrary to expectations, there is not a relationship between zones and avaliability of car ownership, number of people working in house, number of children in housing unit, number of children at the age of primary education, number of children at the age of high/university education, and average age of household.

Table 4.13. Cross tabulation of zones and car parking location

			car parking location			
			within plot	on road in front of the building	on back roads	Total
zone number	first zone (on road)	Count	1		19	20
		% within zone number	5,0%		95,0%	100,0%
	second zone (10-50m)	Count	2	13	8	23
		% within zone number	8,7%	56,5%	34,8%	100,0%
	third zone (51-200m)	Count	11	23	4	38
		% within zone number	28,9%	60,5%	10,5%	100,0%
	forth zone (201-300m)	Count	7	41	11	59
		% within zone number	11,9%	69,5%	18,6%	100,0%
Total		Count	21	77	42	140
		% within zone number	15,0%	55,0%	30,0%	100,0%

Table 4.14. Cross tabulation of zones and number of rooms viewing pedestrian way

			number of rooms looking pedestrian way				
			0	1	2	3	Total
zone number	first zone (on road)	Count	1	3	10	6	20
		% within zone number	5,0%	15,0%	50,0%	30,0%	100,0%
	second zone (10-50m)	Count	12	4	6	1	23
		% within zone number	52,2%	17,4%	26,1%	4,3%	100,0%
	third zone (51-200m)	Count	35	2	1		38
		% within zone number	92,1%	5,3%	2,6%		100,0%
	forth zone (201-300m)	Count	58	1			59
		% within zone number	98,3%	1,7%			100,0%
Total		Count	106	10	17	7	140
		% within zone number	75,7%	7,1%	12,1%	5,0%	100,0%

Table 4.15. Cross tabulation of zones and number of balconies viewing pedestrian way

			number of balconies looking pedestrian way				
			0	1	2	3+	Total
zone number	first zone (on road)	Count	1	9	7	3	20
		% within zone number	5,0%	45,0%	35,0%	15,0%	100,0%
	second zone (10-50m)	Count	11	11	1		23
		% within zone number	47,8%	47,8%	4,3%		100,0%
	third zone (51-200m)	Count	37	1			38
		% within zone number	97,4%	2,6%			100,0%
	forth zone (201-300m)	Count	58	1			59
		% within zone number	98,3%	1,7%			100,0%
Total		Count	107	22	8	3	140
		% within zone number	76,4%	15,7%	5,7%	2,1%	100,0%

Table 4.16. Cross tabulation of zones and present rent price

			present rent price							
			0-199	200-299	300-399	400-499	500-599	600-699	700+	Total
Zone	1st zone	Count			2	9	4	4	1	20
		% within zone			10,0%	45,0%	20,0%	20,0%	5,0%	100,0%
	2nd zone	Count		2	5	10	4	2		23
		% within zone		8,7%	21,7%	43,5%	17,4%	8,7%		100,0%
	3th zone	Count	1	5	17	9	5		1	38
		% within zone	2,6%	13,2%	44,7%	23,7%	13,2%		2,6%	100,0%
	4th zone	Count	1	8	29	20			1	59
		% within zone	1,7%	13,6%	49,2%	33,9%			1,7%	100,0%
Total		Count	2	15	53	48	13	6	3	140
		% within zone	1,4%	10,7%	37,9%	34,3%	9,3%	4,3%	2,1%	100,0%

Table 4.17. Cross tabulation of zones and household's monthly income

			household's montly income						
			0-549	550-999	1000-1499	1500-2499	2500-4999	5000+	Total
Zone	1st zone	Count			3	7	10		20
		% within zone			15,0%	35,0%	50,0%		100,0%
	2nd zone	Count			5	11	7		23
		% within zone			21,7%	47,8%	30,4%		100,0%
	3th zone	Count	1	1	9	25	2		38
		% within zone	2,6%	2,6%	23,7%	65,8%	5,3%		100,0%
	4th zone	Count	1	8	24	20	4	2	59
		% within zone	1,7%	13,6%	40,7%	33,9%	6,8%	3,4%	100,0%
Total		Count	2	9	41	63	23	2	140
		% within zone	1,4%	6,4%	29,3%	45,0%	16,4%	1,4%	100,0%

9) Within the context of the ninth set of the statistics hypotheses; $H_{0A9\text{-}1}$, $H_{0A9\text{-}2}$, $H_{0A9\text{-}3}$, $H_{0A9\text{-}4}$, $H_{0A9\text{-}5}$, statistics hypotheses were tested by using *t*-test technique to understand the differences in perceived quality level of pedestrian way depending on the marital status of the respondent. According to the tests results;

On the contrary to the expectation:

- Perceived quality level of pedestrian way (road itself) does not differ depending on the marital status of the respondent [t-stat=0.335(0.738), df=138].
- Perceived quality level of pedestrian way (enclosing buildings) does not differ depending on the marital status of the respondent [t-stat=1.228(0.221), df=1.228].
- Perceived quality level of pedestrian way (street furniture) does not differ depending on the marital status of the respondent [t-stat=0.371(0.711), df=138].
- Perceived quality level of pedestrian way (vehicles) does not differ depending on the marital status of the respondent [t-stat=-0.929(0.355), df=138].
- Perceived quality level of pedestrian way (overall satisfaction-2) does not differ depending on the marital status of the respondent [t-stat=0.317(0.752), df=138].

These findings can be considered as the result of the other influential factors.

10) Within the context of the tenth set of the statistics hypotheses; $H_{0A10\text{-}1}$, $H_{0A10\text{-}2}$, $H_{0A10\text{-}3}$, $H_{0A10\text{-}4}$, $H_{0A10\text{-}5}$, $H_{0A10\text{-}6}$, $H_{0A10\text{-}7}$, $H_{0A10\text{-}8}$, $H_{0A10\text{-}9}$, $H_{0A10\text{-}10}$, $H_{0A10\text{-}11}$, $H_{0A10\text{-}12}$, $H_{0A10\text{-}13}$, $H_{0A10\text{-}14}$, $H_{0A10\text{-}15}$, $H_{0A10\text{-}16}$, $H_{0A10\text{-}17}$, $H_{0A10\text{-}18}$, $H_{0A10\text{-}19}$, $H_{0A10\text{-}20}$, $H_{0A10\text{-}21}$ statistics hypotheses were tested by using F test technique (one way ANOVA) to understand the differences of zones and socio-economic characteristics of respondents in terms of perceived quality level of pedestrian way. According to the tests results;

Parallel to the expectation;

▪ Perceived quality level of pedestrian way (road itself) differs depending on the zones [F-stat=3.678(0.014); df=3;139]. According to the Tukey HSD test results (p_i<0.05), in terms of the perceived quality level of pedestrian way (road itself), fourth zone differs from first and second zones. This relation can be considered as the result of the decrease in benefits resulted from distance.

▪ Perceived quality level of pedestrian way (enclosing buildings) differs depending on the zones [F-stat=3.206(0.025); df=3;139]. According to the Tukey HSD test results (p_i<0.05), in terms of the perceived quality level of pedestrian way (enclosing buildings), fourth zone differs from first zone. This relation can be considered as the result of the decrease in benefits resulted from distance.

On the contrary to the expectation;

▪ Perceived quality level of pedestrian way (street furniture) does not differ depending on the zones [F-stat=0.650(0.584); df=3;139].

▪ Perceived quality level of pedestrian way (vehicles) does not differ depending on the zones [F-stat=2.403(0.070); df=3;139].

▪ Perceived quality level of pedestrian way (overall satisfaction-2) does not differ depending on the zones [F-stat=2.690(0.049); df=3;139].

▪ Perceived quality level of pedestrian way (road) does not differ depending on the floor number of the house [F-stat=2.346(0.058); df=3;139].

▪ Perceived quality level of pedestrian way (street furniture) does not differ depending on the floor number of the house [F-stat=1.578(0.184); df=4;139].

▪ Perceived quality level of pedestrian way (vehicles) does not differ depending on the floor number of the house [F-stat=2.436(0.050); df=4;139].

▪ Perceived quality level of pedestrian way (road itself) does not differ depending on the household's monthly income [F-stat=0.434(0.824); df=5;139].

▪ Perceived quality level of pedestrian way (enclosing buildings) does not differ depending on the household's monthly income [F-stat=1.025(0.405); df=5;139].

▪ Perceived quality level of pedestrian way (street furniture) does not differ depending on the household's monthly income [F-stat=0.814(0.542); df=5;139].

▪ Perceived quality level of pedestrian way (vehicles) does not differ depending on the household's monthly income [F-stat=1.334(0.254); df=5;139].

▪ Perceived quality level of pedestrian way (overall satisfaction-2) does not differ depending on the household's monthly income [F-stat=0.424(0.831); df=5;139].

- Perceived quality level of pedestrian way (road itself) does not differ depending on the age of respondent [F-stat=0.745(0.563); df=4;139].
- Perceived quality level of pedestrian way (enclosing buildings) does not differ depending on the age of respondent [F-stat=1.182(0.321); df=4;139].
- Perceived quality level of pedestrian way (street furniture) does not differ depending on the age of respondent [F-stat=0.583(0.676); df=4;139].
- Perceived quality level of pedestrian way (vehicles) does not differ depending on the age of respondent [F-stat=0.461(0.764); df=4;139].
- Perceived quality level of pedestrian way (overall satisfaction-2) does not differ depending on the age of respondent [F-stat=0.570(0.685); df=4;139].
- Perceived quality level of pedestrian way (road itself) does not differ depending on the education of respondent [F-stat=0.861(0.539); df=7;139].
- Perceived quality level of pedestrian way (vehicles) does not differ depending on the education of respondent [F-stat=0.592(0.761); df=7;139].
- Perceived quality level of pedestrian way (overall satisfaction-2) does not differ depending on the education of respondent [F-stat=1.268(0.271); df=7;139]. These findings can be considered as the result of the unobserved factors.

4.3. Hedonic Price Models

With a sample of 140 observations and by using least squares method, linear regression analyses were operated through E-views statistics package. In consequence, two price models were developed: first, housing characteristics model (hedonic model), and second, demographic model. Results of each model were presented in Table 4.18 and Table 4.19.

In both models, dependent variable was housing unit's rent price. However, the housing characteristics model included independent variables related to housing unit's structural, locality-environmental, and pedestrian way attributes. In this first model, the focus variable was Z1 which means proximity to the pedestrian way. On the other hand, Demographic model compromised independent variables concerning with socio-economic-demographic characteristics of households and their perceived quality level of pedestrian way. In this second model, the focus variable was OVERALL which means overall perceived quality level of pedestrian way.

In the first model (housing characteristics model), initially 61 variables related to housing structural, locality-environmental, and pedestrian way attributes were tested:

- as housing unit's structural attributes not affected from pedestrian way; age of the building-VA1V1, number of bedrooms-VA1V8, number of bathrooms-VA1V9, number of balconies-VA1V10, number of facades-VA1V11, availability of storage-VA1V13, avaliability of room looking light hole-VA1V14, building type (detached)-VA1V2A, building type (attached)-VA1V2C, building type (twin)-VA1V2D, number of all floors-VA1V4, floor number of the housing unit (ground)-VA1V5A, floor number of the housing unit (mid-floor)-VA1V5B, floor number of the housing unit (roof)-VA1V5C, size of the housing unit-VA1V6, and size of the plot-VA1V7.

- as housing unit's structural comfort attributes not affected from pedestrian way; avaliability of satellite-VA2V10, avaliability of cabled TV-VA2V11, type of heating system (heater)-VA2V4A, type of heating system (natural gas)-VA2V4B, type of heating system (stove)-VA2V4C, type of heating system (electricity)-VA2V4D, door and window material (wooden)-VA2V5A, door and window material (PVC)-VA2V5B, door and window material (aliminium)-VA2V5C, door and window material (other)-VA2V5D, main door material (wooden)-VA2V6A, main door material (metal)-VA2V6B, main door material (iron)-VA2V6C, car parking location (within plot)-VA2V8A, car parking location (on road in front of the building)-VA2V8B, car parking location (on back roads)-VA2V8C, and avaliability of shutter-VA2V9.

- as housing unit's structural attributes affected from pedestrian way; number of rooms looking pedestrian way-VA3V1 and number of balconies looking pedestrian way-VA3V2.

- as housing unit's locality-environmental environmental attributes; distance from house to district center-VB1V1, distance from house to bazaar-VB1V2, distance from house to supermarket (TANSAS)-VB1V3, distance from house to primary health service area-VB1V4, distance from house to health service area (public hospital)-VB1V5, distance from house to health service area (private hospital)-VB1V6, distance from house to nearest primary school-VB1V7, distance from house to socio-cultural service area-VB1V8, distance from house to district park-VB1V9, distance from house to district sport area-VB1V10, distance from house to hippodrome-VB1V11, distance from house to post office-VB1V12, distance from house to the nearest mass transportation stop-VB1V13, distance from house to railway station-VB1V14, distance from house to railway-VB1V15, distance from house to the nearest mass transportation

road-VB1V16, distance from house to municipality-VB1V17, distance from house to nearest religous service area-VB1V18, distance from house to oil station-VB1V19, distance from house to university area-VB1V20, distance from house to police station-VB1V21, distance from house to abandoned covered bazaar-VB1V22, and distance from house to prison-VB1V23.

- as housing unit's socio-economic environmental attributes; year of rent-VB3V7.
- as housing unit's pedestrian way attributes; distance from housing unit to pedestrian way- VC1V1, and zone number-Z1.

Consequently, 10 variables were included in the model:

- zone number-Z1,
- number of all floors-VA1V4,
- floor number of the housing unit (mid-floor)-VA1V5B,
- number of bedrooms-VA1V8,
- number of bathrooms-VA1V9,
- number of balconies-VA1V10,
- type of heating system (stove)-VA2V4C,
- main door material (wooden)-VA2V6A,
- distance from housing unit to district center-VB1V1, and
- year of rent-VB3V7

The sign of all variables included in the model was as expected. Table 4.18 presents R^2, F-statistic for the model, and t-statistics and coefficient values for each variable entered the model.

The model is significant at the 5% level and it has a 55% explanatory power. Parallel to the expectation, **zone number-Z1** was found to be negatively and significantly related to the rent price of house at the 5% level. One unit increase in zone number leads to 20,75YTL decrease in rent price, in other words, increase in distance to the pedestrian way, results with a decrease in rent price.

Number of all floors-VA1V4 was found one of the most significant attributes affecting house rent price positively at the 5% level. One unit increase in number of all floors leads to 21,66 YTL increase in rent price. As expected, also **floor number of the housing unit (mid-floor)-VA1V5B** was found positive and significant at the 10% level in the model. The rent price of flats in mid-floors is higher than that of in other floors.

Table 4.18. Results of housing characteristics model

Dependent Variable: RENTPRICE				
Method: Least Squares				
Sample: 1 140				
Included observations: 140				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
VA1V8	36.72740	12.64707	2.904024	0.0043
VA1V9	121.9123	26.98526	4.517736	0.0000
VA1V10	19.89839	9.027854	2.204111	0.0293
VA1V4	21.66695	7.035710	3.079569	0.0025
VB1V1	-0.121019	0.057605	-2.100835	0.0376
Z1	-20.75812	6.521470	-3.183043	0.0018
VB3V7	-5.046216	1.396454	-3.613593	0.0004
C	143.7131	57.53536	2.497822	0.0138
VA1V5B	23.10326	13.81457	1.672383	0.0969
VA2V4C	-21.94569	12.71039	-1.726595	0.0866
VA2V6A	-26.21852	12.49722	-2.097948	0.0379
R-squared	0.583213	Mean dependent var		395.6071
Adjusted R-squared	0.550904	S.D. dependent var		105.2224
S.E. of regression	70.51440	Akaike info criterion		11.42482
Sum squared resid	641424.3	Schwarz criterion		11.65595
Log likelihood	-788.7377	F-statistic		18.05105
Durbin-Watson stat	1.829447	Prob(F-statistic)		0.000000

Parallel to the results of many previous hedonic price studies, **number of bedrooms-VA1V8** has a positive and significant impact on rent price at the 5% level. One unit increase in number of bedrooms leads to 36,72 YTL increase in rent price. **Number of bathrooms-VA1V9** was found positive and the most significant as expected at the 5% level. One unit increase in number of bathrooms leads to 121,91 YTL increase in rent price. **Number of balconies-VA1V10** has a positive and significant impact on price. One unit increase in number of balconies leads to 19,89 YTL increase in rent price.

As housing unit's structural comfort attribute not affected from pedestrian way, **type of heating system (stove)-VA2V4C** is negative and significant at the 10% level. Housing units heated with stove have lower rent price than those heated with other means. Also, **main door material (wooden)-VA2V6A** was found negative and

significant in the model at the 5% level. The rent price of housing units having wooden main door is lower than that of housing units having metal main door.

As very expected, **distance from house to district center-VB1V1** has a negative impact on price at the 5% level. It means one unit increase in distance to the district center results with 0,12YTL decrease in rent price. Finally, **year of rent-VB3V7** was found negative at the 5% level. One unit increase in year of rent leads to 5,04YTL decrease in rent price.

In the second model (demographic model), initially 16 variables related to socio-economic-demographic characteristics of households and their perceived quality level of pedestrian way were tested:

- as socio-economic-demographic attributes; household population-VB3V2, household's montly income-VB3V4, availability of car ownership-VB3V5, avaliability of apartment bill-VB3V6A, number of people working in house-VB3V10, number of children in house-VB3V11, number of children at the age of primary education-VB3V12, number of children at the age of high/university education-VB3V13, average education of household-VB3V14, and average age of household-VB3V15.
- as perceived quality level of pedestrian way; perceived quality level of pedestrian way (sum of grades given to the variables questioning the design and maintenance quality of road itself)-ROAD, perceived quality level of pedestrian way (sum of grades given to the variables questioning the design and functional quality of enclosing buildings of the pedestrian way) BUILDING, perceived quality level of pedestrian way (sum of grades given to the variables questioning the design and maintenance quality of street furniture taking place on pedestrian way)-FURNISH, perceived quality level of pedestrian way (sum of grades given to the variables questioning pedestrian and vehicle interaction)-VEHICLE, perceived quality level of pedestrian way (in terms of the overall satisfaction level for the pedestrian way - *"It is not good idea to re-design the pedestrian way as a vehicle traffic way"*) OVERALL1, and perceived quality level of pedestrian way (sum of grades given to the variables questioning all pedestrian way attributes)-OVERALL2.

Table 4.19 presents entered variables into the model, R^2 and F-statistic for the model, and t-statistics and coefficient values for each variable entered into the model.

Table 4.19. Results of demographic model

Dependent Variable: RENTPRICE				
Method: Least Squares				
Sample: 1 140				
Included observations: 140				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	311.1366	42.69978	7.286609	0.0000
VB3V14	4.034904	2.403370	1.678853	0.0955
VB3V4	0.056679	0.009632	5.884294	0.0000
VB3V6A	31.38018	16.69164	1.879993	0.0623
OVERALL1	-13.99910	7.134678	-1.962121	0.0518
R-squared	0.331102	Mean dependent var		395.6071
Adjusted R-squared	0.311282	S.D. dependent var		105.2224
S.E. of regression	87.32302	Akaike info criterion		11.81217
Sum squared resid	1029417.	Schwarz criterion		11.91722
Log likelihood	-821.8516	F-statistic		16.70609
Durbin-Watson stat	1.791122	Prob(F-statistic)		0.000000

Consequently, 4 variables entered into the model: household's montly income-VB3V4, perceived quality level of pedestrian way (in terms of the overall satisfaction level for the pedestrian way - *"It is not good idea to re-design the pedestrian way as vehicle traffic way"*) OVERALL1, avaliability of apartment bill-VB3V6A, and average education of household-VB3V14. The sign of all variables included in the model was as expected. The model is significant at the 5% level and it has a 31% explanatory power.

Parallel to the expectation, **household's montly income-VB3V4** was found positive but not significant in the demographic model at the 5% level. **Avaliability of apartment bill-VB3V6A** is positive and the most significant at the 10% level in the demographic model. Further, **average education of household-VB3V14** was found positive in the demographic model at the 10% level. Perceived quality level of pedestrian way (in terms of the overall satisfaction level for the pedestrian way - ***"It is not good idea to re-design the pedestrian way as a vehicle traffic way"*****) OVERALL1** is negative and significant at the 10% level in the model.

CHAPTER 5

CONCLUSION

In this part first, the findings of the study were summarized. Second, these findings were evaluated in terms of the general framework of the study, results of the case study, and application of hedonic price method to pedestrian ways. Finally, suggestions for policy implications and further researches were presented.

5.1. Findings

Within the context of open space valuation, and to analyze the impact of pedestrian ways on residential property's rental prices and to determine the factors affecting this impact, this study employed hedonic price method in the case of Forbes Pedestrian Way, İzmir. The study asked three major research questions. Do pedestrian ways as public open spaces have a relative measurable economic value like other public open spaces have? Are the pedestrian ways one of the attributes which impact the price of houses, in other words, do they have an impact on house prices. If yes, what are the factors affecting impact of pedestrian ways on house values? As a response to these questions, it developed three main hypotheses: first, pedestrian ways as a public open space have a relative measurable economic value like other public open spaces; second, pedestrian ways are one of the effective attributes which impact the price of property, that is, they have an impact on property prices; and third, the impact of pedestrian ways on property values differs depending on their different quantitative and qualitative characteristics.

With a sample of 140 observations and by using least squares method, linear regression analyses were operated. In consequence, two price models were developed: first, housing characteristics model (hedonic model), and second, demographic model. While dependent variable was determined to be rental price of housing unit for both models, independent variables differed in two models. The housing characteristics model included independent variables related to housing unit's structural, locality, and pedestrian way attributes. Whereas, demographic model involved independent variables

concerning with socio-economic-demographic characteristics of households and their perceived quality level of pedestrian way. In the first model, the focus variable was "zone number" which means proximity to the pedestrian way. In the second model, the focus variable was "overall" which means overall perceived quality level of pedestrian way.

In the first model (housing characteristics model), initially 61 variables related to housing unit's structural, locality, and pedestrian way attributes were tested. Consequently, 10 variables were included in the model. The sign of all variables included in the model was as expected. Parallel to the expectation, zone number was found to be negatively related to the rental price of housing unit. Increase in zone number, in other words, increase in distance to the pedestrian way results with a decrease in rent price. Number of all floors was found one of the most significant attributes affecting housing unit's rent price positively. As expected, also floor number of the housing unit (mid-floor) was found positive and significant in the model. The rent price of housing unit in mid-floors is higher than that of in other floors. Parallel to the results of many previous hedonic price studies, number of bedrooms has a positive and significant impact on rent price. Number of bathrooms was found positive and very influential as expected. Number of balconies has a positive and significant impact on housing unit's prices. As housing unit's structural comfort attribute not affected from pedestrian way, type of heating system (stove) is negative and significant. Housing units heated through stove have lower rent price than those heated with other tools. Also, main door material (wooden) was found negative and significant in the model. The rental price of housing units having wooden main door is lower than that of housing units having metal main door. As very expected, distance from house to district center is negative. It means, increase in distance to the district center results with a decrease in rent price. Finally, year of rent is negative and significant in the model.

In the second model (demographic model), initially 16 variables related to socio-economic-demographic characteristics of households and their perceived quality level of pedestrian way were tested. Consequently, 4 variables were included in the demographic model. The sign of all variables included in the model was as expected. Parallel to the expectation, household's monthly income-VB3V4 was found positive and significant in the model. Availability of apartment bill-VB3V6A is positive and significant. Further, average education of household-VB3V14 was found positive and significant in the model. Perceived quality of pedestrian way (in terms of the overall

satisfaction level for the pedestrian way - *"It is not good idea to re-design the pedestrian way as a vehicle traffic way"*) OVERALL1 is negative and significant as expected.

As a response to first research question, the findings of the research put forward that pedestrian way as a public open space -in the case of Forbes Pedestrian Way- has a relative measurable economic value like other public open spaces. As a response to second research question, the results proved that the pedestrian way is one of the attributes which impact the rental price of housing. It was found that pedestrian way -in the case of Forbes Pedestrian Way- has a significant impact on property prices. Finally, as a response to third research question, which aimed to understand the factors affecting the impact of pedestrian ways on housing unit's rental prices, the study revealed that the impact of pedestrian way differs depending principally on its proximity to the housing unit and perceived quality levels.

Besides, the results of inferential analysis (correlation analysis, *t* test, one way ANOVA, χ^2 tests) to test statistics hypotheses, which were formulated in the direction of the research questions and main hypotheses, supported the results of regression models:

- Correlation analysis results: Parallel to the expectation, there is a statistically significant negative correlation between present rent price and distance from housing unit to pedestrian way, indicating that the linear relationship between these two variables is one in which the values of one variable increase as the other decrease, that is, the more distant the housing unit from pedestrian way, the less rent price is. This relation can be considered as the result of the positive externalities of the pedestrian way such as the provision of various social, physical and environmental, and economic benefits.

- One Way ANOVA analysis results: Parallel to the expectation, rent price differs depending on the number of rooms viewing the pedestrian way. According to the Tukey HSD test results, in terms of the rent price, housing units not having any bedrooms viewing the pedestrian way differ from housing units having two and three bedrooms viewing the pedestrian way, and housing units having one bedroom viewing the pedestrian way differ from housing units having three bedrooms viewing the pedestrian way. This price difference can be considered as the result of the more opportunity to benefit from pedestrian way visually. Parallel to the expectation, rent price differs also depending on the number of balconies viewing the pedestrian way. According to the Tukey HSD test results, in terms of the rent price, housing units not

having any balconies viewing the pedestrian way differ from housing units having one, two, and three balconies viewing the pedestrian way. This price difference can be considered as the result of the more opportunity to benefit from pedestrian way visually.

Parallel to the expectation, the zones as representatives of market segments differs depending on the present rent price. According to the Tukey HSD test results, in terms of the rent price, the first zone in which the pedestrian way takes place differs from the third and fourth zones, and the second zone which is adjacent to the first zone differs from the fourth zone. In addition, the zones differ depending on the household's monthly income. According to the Tukey HSD test results, in terms of the household's monthly income, the first zone, in which also present rent price is the highest, differs from third and fourth zones.

Further, parallel to the expectation, perceived quality level of pedestrian way for road itself differs depending on the zones. According to the Tukey HSD test results, in terms of the perceived quality level of pedestrian way for road itself, fourth zone differs from first and second zones. In addition, parallel to the expectation, perceived quality level of pedestrian way also for enclosing buildings differs depending on the zones. According to the Tukey HSD test results, in terms of the perceived quality level of pedestrian way for enclosing buildings, fourth zone differs from first zone. These relations can be considered as the result of the decrease in benefits resulted from distance. Nevertheless, on the contrary to the expectation, perceived quality levels of pedestrian way for street furniture, vehicles and overall satisfaction-2 (as sum of all qualities) do not differ depending on the zones. On the contrary to the expectation, depending on the household's monthly income, the age of respondent, and the education of respondent; perceived quality levels of pedestrian way for road itself, enclosing buildings, street furniture, vehicles, and overall satisfaction-2 (as sum of all qualities) do not differ. Further, according to the *t* tests results; on the contrary to the expectation, perceived quality levels of pedestrian way for road itself, enclosing buildings, street furniture, vehicles and overall satisfaction-2 (as sum of all qualities) do not differ depending on the marital status of the respondent. These findings can be considered as the result of other influential or unobserved factors.

- χ^2 tests results; differences between zones in terms of the structural attributes of housing units are mostly related with the attributes affected from pedestrian way. There is a relationship between zones and car parking location, number of rooms and balconies viewing pedestrian way, present rent price and household's monthly income.

Further, the results of descriptive statistics analysis revealed the qualities of pedestrian way which have the role on its impact. Respondents use Forbes Pedestrian Way for varied purposes and almost everyday. 64,3 % of respondents use Forbes Pedestrian Way everyday. 41,4 % of respondents preferably or not but always use it to go their house, of 41,4 % strongly prefer accessing to a sort of urban amenities such as park, bazaar, and market through the pedestrian way, of 50 % strongly prefer to use the pedestrian way for recreation and social purposes such as social interaction and to see and to be seen, and of 47,1 % strongly prefer shopping in the stores enclosing the pedestrian way.

In general, respondents are satisfied with many features of Forbes Pedestrian Way. But they are not satisfied sufficiently in terms of some qualitative and quantitative attributes as well. For instance, 29,3 % of respondents are not satisfied with the length of the road. They wish the pedestrian way was longer. On the other hand, 42,1 % of respondents are strongly satisfied with the quality of functionality in terms of accessibility for overall road space. They stated that they walk (access) throughout the pedestrian way not facing with any barrier. 35 % of respondents are satisfied with the quality of equity-functionality in terms of accessibility for overall road space. They think that everybody including also handicapped people, kids, elderly, and pregnant can walk (access) throughout the pedestrian way not facing with any barrier.

In general, respondents are satisfied with the quality of comfort in terms of climatic considerations in Forbes Pedestrian Way. 41,4 % of respondents completely agree that in the pedestrian way, there are resting places and benches which are protected from sun in summer. 39,3 % of respondents agree that they walk on the pedestrian way without discomforted from sun in the summer. 30,7 % of respondents agree whereas other 30,7 % of respondents disagree that they walk on the pedestrian way benefiting from sun in the winter. 45,7 % of respondents agree that the pedestrian way is protected from disturbing air turbulence. And, 35 % of respondents agree that drainage is well provided in the pedestrian way, that is, there is not rain water on ground in rainy days.

Many respondents consider that Forbes Pedestrian Way has a distinctive spatial identity and aesthetic quality. 35 % of respondents strongly and easily remember the entire pedestrian way. Of 37,1 % agree that the pedestrian way some distinctive features which makes it different from other ways. 43,6 % of respondents agree that the

pedestrian way design is aesthetically satisfactory. 37,1 % of respondents agree that the pedestrian way makes a positive contribution to the nearby environment's prestige.

Most of the respondents are satisfied with maintenance and management issues of Forbes Pedestrian Way. 55 % of respondents strongly agree that the pedestrian way is well maintained regularly. Respondents consider that the pedestrian way is more secure during day. Of 40,7 % strongly agree that the pedestrian way and its surrounding is secure for everybody during day. Nevertheless, of 32,9 % strongly agree that the pedestrian way and its surrounding is secure for everybody in the night.

Respondents consider that the pedestrian way is more crowded during the day than it is in the evening. 28,6 % of respondents agree that the pedestrian way is not so crowded that the pedestrians have difficulties for comfortable walking and short communications with others on the way during day. On the other hand, 32,1 % of respondents disagreed that the pedestrian way is not so crowded that the pedestrians have difficulties for comfortable walking and short communications with others on the way in the evening. 25 % of respondents completely disagree whereas other 25 % of respondents agree that the pedestrian way is not so crowded that the pedestrians have a feeling of insecurity because of congestion during day. But, of 33,6 % agree that the pedestrians have not feeling of the insecurity because of congestion in the evening.

According to 30,7 % of respondents the pedestrian way is not so noisy because of pedestrian congestion that the pedestrians have a discomfort during day. Of 35,7 % agree that the pedestrian way is not so noisy because of pedestrian congestion that the pedestrians have a discomfort in the evening. Further, 32,1 % of respondents consider that the pedestrian way is not so noisy because of shops that the pedestrians have a discomfort during day. But, of 40,7 % agree that the pedestrian way is not so noisy because of shops that the pedestrians have a discomfort in the evening.

Although 40 % of respondents do not enjoy with land uses on Forbes Pedestrian Way such as food and clothe stores, of 46,4 strongly agree that food stores such as restaurants and cafes provide an opportunity for social contact with others. 47,1 % of respondents agree that food stores such as restaurants and cafes on the pedestrian way is sufficiently diverse that the different groups such as the rich, the poor, families, and youth are able to afford. According to the respondents (of 44,3 %) there is enough food stores and cafes on the pedestrian way. Of 47,9 % strongly consider that the enclosing buildings look beautiful. Nevertheless, only 30,7 % of respondents consider that the façade of enclosing buildings makes the pedestrian way different from other ways.

Respondents have different satisfactions and dissatisfactions about the street furniture on Forbes Pedestrian Way. 27,1 % of respondents are dissatisfied with the distances between sitting areas and benches. They think that they have to walk so much to a bench when they need to rest. But they are more satisfied with the amount of benches. Of 37,9 % consider that there are enough benches in the pedestrian way. 31,4 % of them disagree that the benches in the pedestrian way are comfortable. Comparable to benches, it is clear that, the respondents are more satisfied about the distribution of garbage along the way. Of 39,3 % think that along the pedestrian way they don't have to walk so much to a trash when they need it. 32,1 % of them agree that the trashes in the pedestrian way are convenient to use. Of 35,7 % are satisfied with the amount of trashes in the pedestrian way. On the other hand, 28,6 % of respondents disagree that the entire pedestrian way is sufficiently lighted in the night. Of 36,4 % agree that there are enough telephone boxes in the pedestrian way. But, 31,4 % of respondents disagree that the pavements in the pedestrian way are convenient to walk. 30,7 % of them consider that street furniture such as bench, lighting, and trash in the pedestrian way are safe to use. Of 39,3 % agree that street furniture such as bench, lighting, and trash in the pedestrian way are undamaged and in good condition. According to the most of respondents (of 44,3 %) street furniture such as bench, lighting, and trash in the pedestrian way are made of durable materials. 36,4 % of respondents are satisfied with the aesthetic quality of street furniture. They agree that street furniture such as bench, lighting, and trash in the pedestrian way makes a contribution to the streetscape. 32,9 % of respondents consider that street furniture such as bench and lighting in the pedestrian way makes the pedestrian way different from other ways. of 32,9 % are also satisfied with the aesthetic quality of natural landscaping elements (plant material) on the way. According to them, trees and flowers in the pedestrian way makes a contribution to the streetscape. Of 40 % consider that natural landscaping elements (plant material) make the pedestrian way different from other ways. Respondents are much satisfied with the aesthetic quality of water elements. Of 41,4 % agree that the pool in the pedestrian way makes a contribution to the streetscape. And it is very clear that, the most identical element on the way is the linear pool. Of 47,1 % strongly agree that the pool in the pedestrian way makes the pedestrian way different from other ways.

In general, respondents appreciate positively the regulations about vehicle access to the way. 46,4 % of respondents strongly agree that they walk more comfortable through the pedestrian way since it is not separated with vehicle traffic ways. 57,9 % of

respondents strongly consider that limitation of the vehicle access to the way is more comfortable for pedestrians. Of 57,9 % also strongly agree that when it is allowed, the vehicles are able to move comfortable on the pedestrian way. Whereas, 29,3 % of respondents undetermined about the sufficiency of car parking area in the surrounding. According to 49,3 % of respondents it is not good to not park on the pedestrian way. While 46,4 % of respondents strongly consider that the period for vehicle access to the pedestrian way is enough, 34,3 % of them undetermined about the convenience of timing for vehicle access to road. Finally, 69,3 % of respondents are strongly satisfied with the pedestrian way in overall. They think that it is not good idea to re-design the pedestrian way as a vehicle traffic way.

To sum, in general, respondents are much satisfied with many features of Forbes Pedestrian Way. Regardless, they are not satisfied sufficiently in terms of some qualitative and quantitative attributes as well. The most satisfactory features of the way are maintenance and regulations about the vehicle access. In general, respondents are satisfied with the quality of comfort in terms of climatic considerations in Forbes Pedestrian Way. Respondents are also satisfied with functionality of the way from many aspects – access, recreation, social interaction with others, shopping. Many respondents consider that Forbes Pedestrian Way has a distinctive spatial identity and aesthetic quality, and makes a positive contribution to the nearby environment's prestige. In this point, the most enjoyed attributes is the linear pool and natural landscaping elements. On the other hand, the less enjoyed attributes are its length, noise and crowdness, and depending on this crowd a sense of insecurity in the evening, distance between benches and some other street furniture. Consequently, as a result of benefits provided by the way, respondents are strongly satisfied with the pedestrian way in overall. They do not think that that it is good idea to re-design the pedestrian way as a vehicle traffic way.

5.2. Evaluation

The case of Forbes Pedestrian Way has shown that pedestrian way is desirable and valuable from a housing-market perspective. This evidence has supported previous researches reporting that open space provides a premium for residential property prices.

In this study, it has not been claimed that this is the best approach to assess the impacts of pedestrian way attributes on residential property values. Nevertheless, it has

been argued that, the approach developed in this study has advanced the knowledge about open space valuation and provided the first evidence -in Turkey as well as in the world wide- of the impact of pedestrian ways on rental values of residential properties by using hedonic price method and tracing the factors shaping this impact.

The noteworthy impact of Forbes Pedestrian Way on rental values of residential properties can be considered as the result of user's satisfaction due to the certain aspects of the way:

- First of all, it provides different opportunities such as recreation, access, shopping at the same time. Since many people have suffered to find an opportunity for refreshment, recreation and social interaction with others because of time and money considerations, this aspect of the pedestrian way is favored much.
- Indeed, one of the most important reasons for this impact is the weakness of substitution in terms of the benefits provided by Forbes Pedestrian Way. There is not any alternative pedestrian axis in the surrounding. Besides, open space for refreshment, social interaction and recreation is very limited in the district.
- Further, in a very hot climate, air conditioning through the water elements and plant materials makes Forbes Pedestrian Way more comfortable and attractive for users.
- In addition, the way contributes to the district's image and aesthetic in a positive way. Consequently, people appreciate and use the pedestrian way preferably. The measured impact on rent price of residential properties is the clear sign of this appreciation.

Regardless, it should not be overlooked that the price increasing impact of Forbes Pedestrian Way on residential properties leads a land use transformation from residential to service sector as well. Such transformation is observed at the park side of the way. Based on the research results and observation on site, it can be expected that this transformation will progress. When this progress is completed, there will be a different land use pattern and different users on the way. Therefore, it is time for local government to consider the possible results of this transformation. Local government should produce its strategies to overcome new problems as well as to benefit from new opportunities which might occur as a result of this transformation and gentrification.

Based on this study, it can be considered that Hedonic Price Method is promising in measuring the impact of pedestrian ways on residential properties' rental values. Nevertheless, the application of hedonic price method into pedestrian way is not without problems. First of all, data collection is time consuming, and many people resist

to participate to the survey. Further, the hedonic price method requires advanced technical knowledge. These aspects can be an obstacle for widespread use of hedonic price method in urban affairs.

5.3. Policy Implications and Suggestions for Further Research

Analysis of the impact of pedestrian ways as well as that of other open spaces can be used not only to measure the economic value but also as a useful and strong mean to demonstrate:

- demand of citizens for pedestrian ways / open spaces;
- willingness to pay for pedestrian way / open spaces;
- desired features of pedestrian ways / open spaces;
- public authority's demand to get a share from the profits obtained from provision of pedestrian ways / open spaces financed by public resources.
- alternative funding possibilities for pedestrian ways / open spaces (public-private partnership), and
- contribution of a pedestrian way / open space to become a flag-ship in urban regeneration efforts through its varied benefits (including economic benefits).

Nevertheless, although there is a body of knowledge, there is still a need for further valuation studies for open spaces. For further researches, the following suggestions might be useful.

- First, since the most common method employed in the previous studies is hedonic price method and the use of other methods are very rare, further researches on economic valuation of open should be carried out also by using other methods such as contingent valuation method and travel cost method.
- Second, further researches to investigate the impact of open spaces on property values should be carried out also in different property markets because most of previous hedonic analysis of open spaces were carried out in Northern America and in Europe.
- Third, since revealing merely the amount or sign of value is not fully enough for properly assessment in decision-making process, further studies should investigate causalities for better understanding the relationship between open space attributes and their values. Nevertheless, such studies will require urban designer outlook since open space attributes can be properly evaluated only by a designer.

- Finally, since previous studies focused on some open space types, there are other open spaces, whose impact on property values have not yet been analyzed. Hence, further researches should be on other kinds of open spaces which have not been yet studied.

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Seval Cömertler was born on 19 May 1975 in Söke, Aydın. She graduated from the Department of City and Regional Planning, Faculty of Architecture, Dokuz Eylül University in 1996. After attending to English Preparatory School for one year, she started master study at the Program of Urban Design, Faculty of Architecture in Izmir Institute of Technology in 1998, and completed her master thesis on the subject of "Cemeteries, Planning and Design Principles" in 2001. As a visiting doctoral researcher, she studied in Tampere University, Finland, for three months (2004), and in Warsaw University of Technology, Poland, for one year (2005-2006).

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