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Willingness to Pay for Public Park, Waste Disposal and Wide Roads: Hedonic Price Model

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Abstract
Neighborhood amenities and household characteristics are an important determinant of property value. Since these attributes is to examine how their presence or absence affects the housing market and house prices. The value of an environmental amenity thus, can be considered as the additional price at which a property will sell due to the presence of that amenity. There, however, seems to be a little disagreement about the fact that environmental amenities add up to the value of property as a whole but to specify exactly which environmental amenities and the extent to which they influence the prices of the property is less definite. Drawing upon the literature and conducting unstructured interviews from property dealers and house hold, three basic neighborhood characteristics i.e. the presence of waste disposal system, distance to nearest public park and presence of wide roads in the neighborhood have been analyzed with rents through hedonic property model. The results show that the presence of these attributes tends to increase the house rents with significant relationships.
Keywords: Hedonic price model, Environmental amenity.

1. Introduction

The subject of environmental economics has become important because of the growing interest of the economists as environment has certain economic implications. It has impacts on different markets in addition to the housing market. As a matter of fact a house can be defined as a set of many goods, including the number of bedrooms, bathrooms, the quality of local services and utilities, the tidiness of the neighborhood, and the quality of the local environment (Kiel, 2006).

Differences in the value of houses can be attributed therefore to housing and neighborhood characteristics with different amenity or disamenity values. Of these, location has always been an important determinant of property value. Before modern transportation, most people, in fact, preferred to live close to their places of work. Today, on the other hand, it is the quality of the neighborhood that determines the choice of residence for most people, with amenities such as green fields and fresh air, as opposed to disamenities such as noise, dust, open drains, odor, etc., often influencing housing decisions.

From the viewpoint of environmental policies the measurement of localized amenities and disamenities is important. Since there is no direct market for environmental goods, one way to understand the value of environmental goods is to examine how their presence or absence affects the housing market and housing prices. Thus, there are a number of studies that estimate the implicit price of an environmental attribute through an examination of the relationship between attributes preference and the price of property. The value of an environmental amenity is the additional price at which a property will sell due to the presence of that amenity.

The Hedonic property price approach is popular among economists for the purpose of estimating the value of environmental amenities and disamenities based on housing prices. For instance, Nelson et al. (1992), Reichert (1997), Michaels and Smith (1990) and Cameron et al. (2006), who examined the localized environmental disamenity of a superfund site for perceived risk, found that distance has a significant impact on housing prices.

Kolhase (1991), who estimated the impact of a toxic waste site on housing prices, found that the capital value of the house and the distance to the toxic site were positively correlated. Similarly, Sergio et al. (2002) found that apartments located in close proximity to a sewage treatment plant carried relatively low prices in comparison with those located at a greater distance from the plant. Most Hedonic studies are, however, based in Western countries, with comparatively fewer studies from the Asian region. In the case of Pakistan, no empirical work has been conducted so far to investigate preferences with respect to locational disamenities.

Hedonic price models are of great interest and are appealing because of the fact that they allow to examine the marginal willingness to pay for these discrete changes in the attributes. The limitations of hedonic price models are known but still they are of great use because they give us an idea about whether or not different neighborhood and environmental amenities are reflected in the housing market.

A number of other studies such as (Lee & Linneman, 1998), (Dale, Murdoch, Thayer, & Waddell, 1999),(Borkowska, Rozwadowska, Śleszyński, & Żylicz, 2001),(Rosen, 1974) and a lot more have used the hedonic price model in order to find out the willingness to pay for characteristics of houses. Apart from this there as a growing literature that uses this method to measure welfare changes as well in the implicit markets for environmental quality specially.

Despite the fact that a lot of research has been done and many studies have been conducted for this

purpose however if we go through the literature, it suggests that most of the studies are from the western countries. Asia in general and Pakistan in particular does not have many studies in this discipline. Irfan (2013), however, has conducted a research in Rawalpindi which has been taken as an inspiration for this study. The results of this study can be useful from the policy point of view as well and can help different policy makers to devise policies that can bring about betterment in land management.

There are limitations of this study which, if are taken care of, in further researches can prove to be very beneficial for the area and well as the residents of Peshawar.

1.1. Objective

The objective of this study is to find out as to how different household, neighborhood and environmental amenities are reflected in house rents. The prices of different products observed and specific amount of characteristics that are associated with each product/good basically define a set of hidden, implicit or "Hedonic" prices. Hence goods are valued by the consumers for the attributes they bear or characteristics that they possess. The fact that there are no organized markets for environmental and neighborhood amenities therefore economists require the application of non market valuation technique. Econometrically, these implicit prices can be estimated by first step regression analysis i.e. regressing the price of product on the characteristics it has (Rosen, 1974).

2. Literature Review

It is one important aspect of good land management that policy makers must have enough information on the value people place on neighborhood and environmental amenities. Location has always played an important role in the determination of property values. As explained earlier, before the development of roads network, the trend of owing personal cars, people used to live in places that were comparatively in a nearby location to their work places but now as the times have changed and communication etc got easier, people do consider the quality of the neighborhood while deciding to buy property.

Not only are the implications of environmental amenities and disamenities important to the individuals when they are deciding to buy a house but also to the policy makers who design the environmental policies. There, however, seems to be a little disagreement about the fact that environmental amenities add up to the value of property as a whole but to specify exactly which environmental amenities and the extent to which they influence the prices of the property is less definite.

A house as a whole can be considered as a combination of multiple goods. Therefore the characteristics of the house such as number of bedrooms, washrooms, the availability and quality of services and utilities, as well as the characteristics of neighborhood such as the quality of the environment and the neatness of the neighborhood etc plays a very important role in the determination of house prices(Kiel, 1995)

2.1. Non market valuation technique/Hedonic property price approach

Organized markets exist for normal goods but unfortunately there are no organized markets in case of environmental goods therefore, it becomes difficult to find out the economic impacts of environmental goods. The measurement of economic impacts of environmental amenities or disamenities then requires a technique that is different from the conventional one. We refer to this technique as nonmarket valuation technique(Rosen, 1974).

Economists use the hedonic property price approach, as explained earlier, in order to estimate the value of different environmental amenities and disamenities on the basis of house prices. Several studies have been conducted for this purpose with most of the studies carried out in western counties as compared to Asian region.

Numerous studies use hedonic analysis of housing markets to measure the benefits of various environmental amenities: air-based amenities (Graves et al. 1988); water-based amenities Brown and Pollakowski (1977); Lansford and Jones (1995); Shabman and Bertelson (1979); Milon, Gressel, andMulkey (1984); and land-based amenities (Vaughn 1981; Mahan, Polasky, and Adams 1998). All of these studies apply the hedonic-price model, which assumes that a continuous function relates the price of a house to its attributes and that people select a house by equating the marginal utility of each house attribute to its marginal price.

2.2. Effect of distance

Relevant for this study are the many studies that have empirically estimated the effect of distance to an environment amenity/disamenity on property prices Brown and Pollakowski (1977) was an early study, which estimated the value of living near a lake in Seattle, Washington, and found that the degree of distance from the waterfront significantly reduced a property's selling price.

Another study regarding the distance of the house to leaking underground storage tanks examined, using hedonic price model, that how the prices of houses vary with the distance from an environmental disamenity and found out that the prices appreciates with an increased distance from the disamenity (Guignet, 2013).

A similar study was conducted using hedonic price model to find out the effect of distance from a major fuel pipeline on the prices of houses. The study was conducted in Bellingham and Washington which shows that

before the high profile accident there was no significant difference in the prices of houses but after the accident the property values dropped significantly but this price effect reduced with an increase in the distance from the pipeline(Hansen, Benson, & Hagen, 2006)

A study conducted in Franklin country, Ohio also demonstrates that environmental disamenity, landfills in this case, has a negative impact on the property values (Nelson, Genereux, & Genereux, 1992)

(Lewis & Acharya, 2006) shows in their study conducted in south central Connecticut, using the hedonic property model that water bodies such as rivers etc have an effect of a disamenity which affects the property prices with an increase in distance and thus the property prices are relatively low in the proximity of river and increases gradually by moving away from the dismenity.

2.3 Effect of presence of an amenity or a disamenity

Hedonic property model has been used by several researchers for the purpose of finding out the economic impact of environmental amenities and disamenities. The effect of existence of toxic site in the nearby vicinity of the residence is also viewed as an environmental hazard and thus an environmental disamenity thus depressing the house prices(Kiel, 1995). Similarly another analysis regarding the quality of air has been conducted in U.S using the hedonic house price model which reveals somehow same results (Zabel & Kiel, 2000).

A study by Tse and Love (2000), interestingly, found that a cemetery view has a negative impact on property prices in Hong Kong since residents, mostly ethnic Chinese, avoided dwellings with a cemetery view because of its associations with death. A similar study conducted in the metropolitan area of Poland also confirmed that environmental attributes do explain the price differentials in real estate market(Borkowska et al., 2001).

Another study also implied hedonic price regression model in order to find out the relation of environmental amenities with the prices of houses in Los Angles metropolitan area the results came consistent with what has previously been discussed(Gillard, 1981).

As discussed earlier, most of the studies have been conducted in the western countries with very less studies been conducted in Asia. A study however has been conducted in Rawalpindi, Pakistan to find out the impact of odor of Nala Lai on property values. This study again employs hedonic price model and the results shows that prices of the houses gets depressed as the distance to Nala Lai decreases and the odor becomes intense (Irfan, 2013)

A similar study can thus be conducted in Peshawar to find out whether neighborhood and environmental amenities and disamenities affect the house prices, whether there exists a significant relationship between the property prices and environmental attributes and other household characteristics or not. Since only one study has so far been conducted in Pakistan and there is a broad scope of this study as it will prove to be useful from policy point of view and will help to develop better policies for this area

3. Methodology

The hedonic price model or hedonic property model aims to capture the impact of different attributes of houses on their prices. This model assumes that amenities have a positive effect on the prices while disamenities have a negative effect of the house prices. We further assume that the utility of each individual is a function of a composite good (X), housing characteristics H (where H = H1, H2, H3, … ,Hn), the characteristics of the neighborhood N (where N = N1, N2, N3, ... ,Nn) and environmental variables E (where E = E1, E2, E3, … ,E4). The utility function of the ith house can be represented as:

$U = f(X, Hi, Ni, Ei)$ (4.1)

The rental value of the ith house is given by:

$R = R (Hi, Ni, Ei)$ (4.2)

The individual faces the following budget constraint:

$Yi – Ri – Xi = 0$ (4.3)

Where Y is the income of the ith household.

According to basic microeconomic theory, the individual/household will maximize his/her utility Ui (4.1) by making a choice of selection of environmental good Ni, the characteristics of the house H, and a composite good X subject to the given budget constraint (4.3).

After reviewing the available literature and carrying out unstructured interviews from the households and experts on property i.e. property dealers, a number of explanatory variables were selected for the study to see their effect on the explained variable i.e. house rent.

The importance of the functional form used is hedonic analysis have been discussed by a number of studies(Milon, Gressel, & Mulkey, 1984). (Rosen, 1974) in his study gives an argument that the house characteristics can easily be unbundled by the consumers without incurring any cost on them. The hedonic studies that have been carried out in past generally use linear and log linear functional forms (Irfan, 2013). This study however uses the log linear functional form to evaluate how different house characteristics, facilities provided in the neighborhood and environmental attributes affect the house rent.

The log linear hedonic price estimates are provided below.

h Y= α1 + β1X1 + β2X2 + β3X3 + β4X4 + β5X5 +β6X6 + B7P (4.4)

h Y = α1 + β1X1 + β2X2 + β3X3 + β4X4 + β5X5 +β6X6 + β7W (4.5)

h Y = α1 + β1X1 + β2X2 + β3X3 + β4X4 + β5X5+ β6X6 + β7R (4.6)

"Y" in both of the above equations (4.4), (4.5) and (4.6) refers to the per marla rent of the ith house while X1 to X4 are different explanatory variables capturing the household characteristics that affect the rents of houses whereas the last variables W and P refer to waste disposal system in the neighborhood and distance to the nearest public park respectively.

Per Marla House Rent (Y): The per marla house rent has been taken as the dependent variable for the study. There are however on a few well maintained records of the data regarding the sale and purchases of houses in the area selected for study therefore, self reported values of the house rents have been used as a proxy for the purpose of estimating the hedonic property price function in this model. The monthly rent of the ground floor portion of the houses has been collected irrespective of the fact whether the person residing in the house was an owner or a tenant. Other than collecting the information from the occupants, to make sure that the reported values were correct, they were confirmed from the property dealers in that area through discussions.

Bathrooms (X1): This variable is a discrete variable used to identify the number of bathrooms in the house. For the houses that have multiple stories, it was taken care of that the number of bathrooms for only the ground floor of the house was calculated.

Drawing room (X2): This is again a dummy variable that refers to the presence of a place that is used by the households for visitors or guests only and not for any other purpose frequently. We consider it as a drawing room.

Distance to Hospital (X3): This variable represents the distance calculated in kilometers to the nearest public hospital.

Distance from the market (X4): This variable shows the distance calculated in kilometers to the nearest market.

Distance to Mosque (X5): It is the distance (in Kilometers) to the nearest mosque in the neighborhood.

Size of Plot (X6): The size of the plot has been measured in "marlas". The data on the size of plot include both the covered and the uncovered area of the ground portion of the house.

Roads (R): This is a dummy variable used for wide roads of the neighborhood. Wide roads are defined as those roads that can easily accommodate two cars at a time.

Distance of park (P): It is the distance calculated in kilometers to nearest Public Park in the neighborhood.

Waste disposal (W): This is again a dummy variable used to find out whether if there is a proper system to take away the disposed of from the houses on daily basis or not.

3.1 Data

The whole city of Peshawar i.e. urban Peshawar has been divided into 47 union councils on the basis of area and population. Out of which 2 union councils, Nasir Bagh and Tajabad were selected for the collection of data. A questionnaire was developed to collect information from the households. A total of 200 questionnaires were distributed, 100 in each union council for this purpose.

There is a vast variety of houses specifically in Tajabad and in Nasir Bagh as well up to some extent therefore to ensure homogeneity the study did not consider the rental value of the entire house and thus only ground floor was selected for this purpose. It is a common practice nowadays that the house is rented out in different portions to different tenants. Moreover the presence of garage and drawing room is usually found on the ground floor of the house therefore the rent of only the ground floor is taken into consideration for analysis.

The questionnaire also included demographic characteristics of the household head such as Age, income level, number of dependents, and education level of the household head etc.

4. Results and discussion

4.1 Descriptive statistics

Table 4.1.1

	Pooled				Tajabad				Nasir Bagh			
Variable	**Mean**	**Std.Dev.**	**Max**	**Min**	**Mean**	**Std.Dev.**	**Max**	**Min**	**Mean**	**Std.Dev**	**Max**	**Min**
Income	49932.59	30571.97	150000	7000	24812.17	10338.9	55000	7000	74425	22863.81	1,50,000	45,000
Family size	5.943038	1.593153	9	3	7.153846	1.045422	9	5	4.7625	1.058345	7	3
Size of plot	9.031646	3.16916	20	3	6.551282	2.709519	20	3	11.45	0.898663	12	10
Per Marla Rent	2472.402	674.6291	4500	1000	1925.153	453.5174	3000	1000	2980.625	347.4687	2083.333	4500
Distance Hospital	3.066456	1.280804	5	1.5	4.282051	0.584373	5	3.5	1.88125	0.214118	2	1.5
Distance to Market	0.68038	0.669486	2	0.1	1.173077	0.653795	2	0.5	0.2	0.027559	0.3	0.1
Distance to Mosque	0.342405	0.097937	0.5	0.2	0.394872	0.114979	0.5	0.2	0.29125	0.028435	0.3	0.2
Distance to park	3.125949	3.066839	7	0.1	6.153846	0.91278	7	4	0.17375	0.044277	0.2	0.1

Nasir Bagh is considered to be comparatively developed than Tajabad and hence the household's level

of education was found out to be different for both the areas. Almost all of the household heads had completed their higher education (16 years of education) whereas most of the household heads had only completed their education till intermediate level in Tajabad

The means value of Per Marla rent for Tajabad came out to be Rs. 1925.153 however, that for the area of Nasir Bagh was Rs. 2980.625. The houses in Nasir Bagh have more structural characteristics such as the presence of TV lounge, Garage, drawing room and more neighborhood facilities such as proper waste disposal system, wide roads etc which explains the difference in per marla rent of both the areas

4.2 Regression analysis

Separate regression analysis were done once using the variable "distance to the nearest community park", second with "waste disposal system" in the community and third with the "wide roads" due the problem of exact co linearity between these variables in the model.

Table 4.2.1

	Coefficient	*t- ratio*
Const	8.63262 ***	67.5101
Bathrooms	0.0111084	0.6257
Drawing room	0.195594***	2.6667
Hospital	-0.0693128***	-3.1494
Market	-0.00862733	-0.3295
Mosque	-0.184708	-1.3234
Size of plot	0.0594787***	10.1817
Park	-0.0565464***	-3.7879

The results from the first regression analysis comes out as significant for drawing room, distance to the nearest hospital, size of the plot and distance to the nearest community park. However, other variables that are number of bathrooms, distance to the nearest market and distance to the nearest mosque, are insignificant. A negative relationship between the house rent and distance to the nearest public park shows a negative relationship i.e. with a decrease in the distance of the park to the house, the house rents tends to increase. Similarly the relationship of rent with the distance to hospital also exhibits negative nature which shows that with a decrease in the distance of public hospital, the house rents rise and vice versa. The results are consistent with those of (Irfan, 2013). However the size of plot and house rent shows a significant but negative relation which implies that with an increase in the size of plot the house rents tend to decrease which is contrary to common observation.

Table 4.2.2

	Coefficient	*t-ratio*
Const	7.89983***	66.1595
Waste disposal	0.838473***	4.1764
Bathrooms	0.000641458	0.0334
Drawing room	-0.007712	-0.1482
Hospital	0.0217573	0.6286
Market	-0.00874501	-0.3232
Mosque	-0.00916617	-0.0696
Size of plot	0.0677243***	4.4257

In second regression analysis we include waste disposal system and eliminate the distance to parks to avoid exact co linearity. The results show a positive and significant relation between house rent and waste disposal system while the rest of variables become insignificant however the relationship of house rent with the size of plot remains significant and negative in this model as well.

Table 4.2.3

	Coefficient	*t-ratio*
Const	7.89983***	66.1595
Bathrooms	0.000641458	0.0334
Drawing room	-0.007712	-0.1482
Hospital	0.0217573	0.6286
Market	-0.00874501	-0.3232
Mosque	-0.00916617	-0.0696
Size of plot	0.0677243***	4.4257
Roads	0.838473***	4.1764

In third regression analysis we include wide roads in the neighborhood and remove the waste disposal system to avoid the problem of exact co linearity among the two. The results from this analysis show that there

exists a positive and significant relationship between house rent and the presence of wide roads in the neighborhood however the rest of the variables become in significant and the relationship between the size of plot and house rent remains the same as in the two previous analysis.

5. Conclusion

The results show that people do value neighborhood and environmental amenities and hence they are willing to pay more if they are provided with these amenities that results in an increase in their utility. This supports our hypothesis that house rents tends to rise with the presence of these amenities such as the presence of a community park in the nearby vicinity of the neighborhood, the presence of a public hospital nearby, proper waste disposal system in the community etc. Therefore people are willing to pay more for these facilities and house rents in areas where these facilities or amenities are available, tend to be high.

There are however some limitations to this study, the market data on the prices of houses was not available, not even with the property dealers therefore we had to relay on the primary data from the households. Our hedonic price function was developed on the basis of self reported values of rents by the households and there is a probability that they could not provide accurate values.

Further research with more accurate data can be carried out to fill the information gap faced in during this study. The results can be used to motivate investment in building more public parks, making proper waste disposal arrangements in the community, development of roads network etc.

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