

**The Impact of Income and Demographic Characteristics
on
Housing prices
in
Big cities of Punjab**



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By

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Acknowledgement

CERTIFICATE

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Dedicated to my beloved Parents

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Abstract

This study explores the impacts of the income and demographic factors on housing prices. For this purpose, we used hedonic price model. The data of 8 urban areas of Province Punjab, Pakistan from PSLM/HIES survey of 2005-2006 and 2015-2016. Four regressions are estimated for both selected years for the purpose of comparison of both selected time periods. The results of our study tell us that though income is the major determinant but not the only determinant of the housing prices. There are other determinants of the housing prices that are significant education level, employment status, electricity, gas, school distance, hospital distance, source of drinking water and drainage facility. Results suggest that government should focus on providing schools and hospital close to housing units and focus on the provision of clean water for drinking and better drainage facility. This comparison will help to design the appropriate policies according to the current state of housing market.

Chapter 1

Introduction

1.1. Background

The supply of Housing and their affordability plays a great role in making differences in housing markets and labor markets across urban areas in any country. According to Jabeen et al. (2015) in year 2015, the level of urbanization was 36.2%, and for the population of 186 million only 21.7million houses were available in the country that mean in Pakistan there is shortage of 9 million residential houses that is growing with the ratio of 600,000 annually.

Housing is considered one of the most basic human rights and an essential component of the right to an adequate standard of living. For instance, Jabeen et al. (2015) argued adequate and affordable housing is not only necessary for security and comfort but is also critical in fostering social cohesion and development of a nation. Olga Baranoff (2016) revealed that there are serious implications on local economy and on labor market due to Housing affordability in an urban area. There is a constraint on the expansion of firm situated in any area or region due to labor availability. Firm cannot expand without affordable priced houses for new workers. A robust literature in housing economics examines the relationship between housing affordability and income inequality, which has become a pressing issue for many countries most popular metropolitan areas.

Especially this issue is relevant to the case of housing in Pakistan and especially in big cities of Punjab, which has been sky rising in recent years for its rising rent and housing prices. Big cities of Punjab have continuously growing population and demand for housing in recent

years have not been met by rising supply, and, while at the same time, the city has become increasingly unequal in terms of income, further exacerbating housing prices.

As the housing is the lifetime investment for most people and housing is also an essential and most fundamental need. In such context the relationship of demographic factors with housing prices and their influence on housing price is very important. Because the housing prices are not the only determinant of the housing choices there are also some other factors that affect the housing choices. These are demographic factors. Researchers have identified several of these demographic factors in their work such done Bujang et al. (2010) he narrated demographic factors are such as marital status, number of household's, location, number of rooms, year in which the structure is built, distances from schooling and hospitals. As it is a common phenomenon that marital status influences a demand for separate house. The family with a greater number of house hold's influences demand for big houses with a greater number of rooms or separate house for some of the households. Families with children in school going age prefer locations where schools are in close proximity. This all generates effect on demand of housing and hence this affect is reflected on the prices of housing units. In this research I hypothesized to find out the effect of those factors that are other than the demand for the Big cities of Punjab that are Rawalpindi, Sargodha, Faisalabad, Gujranwala, Sialkot, Lahore, Multan, Bahawalpur.

From the last 10-15 year there is a housing affordability crisis in the city due to steadily rising housing prices and rents in Punjab. Since past decade there is a housing affordability crisis in Pakistan due to rising trend of housing prices and rest. Punjab has also experienced high

growth at the low-end of its income distribution; the Province is on the top for highest increases in incomes in country. This situation suggests that, even though the income inequality is increasing in Province of Punjab, the Province is also offering socioeconomic mobility for those towards the tail end of the income distribution. A. H. Khan (2009) argued, however, housing affordability is badly affected due to rising income inequality in city deterring lower-income individuals from residing in the big cities, and thus they are unable to take advantage of the social mobility of the big cities. Because of that, around 35-40% of the total population of urban areas lives in the informal squatter settlements (National Housing Policy 2001).

Matlack et al. (2006) has shown that increases at the top end of the income distribution are associated with significantly higher rents and crowding out for those at the lower end of the income distribution. This crowding out effect also has potential impacts for local labor markets and economy. Keeping aside the fall in housing affordability and rising income inequality, the increasing pressure on existing housing stock is due to supply of housing failing to keep pace with housing demands of Punjab.

Furthermore, addition to rising demands of housing in big cities of Punjab and shortage in supply of housing, housing affordability is the matter of concern to those who rent and own property in the city. U.S. Department of Housing and Urban Development gave a criterion of affordable housing according to which, "Housing is "affordable" if it costs no more than 30% of a family's income". In light of the above criterion Baranoff (2016) studied the case of the US city San Francisco, Census estimates from 2012 suggest that over one-third of renters and

owners pay more than 35% of their gross income on housing costs, this has further exacerbated housing prices and has contributed to San Francisco's housing affordability crisis.

Owners are divided in two categories owners with and without mortgages or house loans. Here renter costs should be calculated as gross rent, while on other hand owner costs will be included in homeowner related costs. Owners with mortgages spend the most on monthly housing costs. Teles (2015) says supply constraints causes prices to increase, but the price of housing is not fully captured in land and construction costs; the expense of creating housing also stems from economic rents and zoning restrictions. Teles (2015) also said in his work that Zoning and land use restrictions in induce property owners to extract economic rents by allowing the "owners of capital have to extract an outsized share of the surplus generated by job creation".

But there are many factors that affect the housing prices. Ottensmann et al. (2008) explained that location of houses in determination of their prices is also significant in combination with other factors like housing characteristics, housing neighborhood variables and education facilities have also significant impact. Time and distance to different employment centers are important to add to determine the location. So, we aimed to find out the effects of these on housing prices.

1.2. Research Gap

Existing literature on the subject have a lot of focus on the issues like Jabeen et al. (2015), worked on difference between demand for housing and supply of housing and weaknesses of legal and administrative system of our country that causes it. Schleicher (2013) gave another point of view that researchers worked on is the effects of political decision making and its impacts on decisions of land use and zoning and how it affects the housing supply. Bayer

et al (2004) have focused on the preferences of housing on the base of housing characteristics and how these preferences changes with income as done by

Ahmad (2007) and Zaidi (2007) work on housing demand and its linkages and to mitigate the issues and problems of housing is also been done specially in context of Pakistan. E. L. Glaeser, J. Gyourko et al. (2005), explored how rising income, education and skills changes the taste for amenities and how they affect the growth of city.

But the how housing prices are affected by income & demographic factors and what will be magnitude of these factors on housing prices for the city and especially in Big Cities of Province of Punjab. Does income affect the pricing of houses more or whether its demographic factors like:

- Education,
- Family size.

Which will be significant? That must be known and is the least touched part in field of housing economics. As a few worked on it before in foreign countries and Pakistan but in Pakistan it's been mostly unexplored for pricing side. And for the case of Big Cities of Punjab it's almost un-known.

1.3. Objective of Research

As housing demand and supply are not only determinant of the housing prices. There are some other factors also that are called demographic factors as identified by the Bujang et al. (2010) are:

- Marital status,
- Number of households,
- Age,
- Education level, and
- Household income.

Our goal is to measure the impacts of income and demographic characteristics on prices of housing units in Big Cities of Punjab.

Our aim is to determine how much do these two income and demographic characteristics impact housing unit prices and what is there magnitude in Big Cities of Punjab.

1.4. Research Question

- Examine the effect of income on housing prices in Big Cities of Punjab?
- Analyze the impact of demographic characteristics on housing prices in Big Cities of Punjab ?

1.5. Organization of the study

In this study we gave introduction that consists of background of our study research gap, our objective of research and research questions. Now in coming chapter we review the literature in this chapter we will review the different research work. After that we describe our methodology & data source the methodology we used and the data source from which we obtained the data and the type of data is explained in that chapter. Then we will describe our results and then at the end we will give the conclusion and policy recommendations.

Chapter 2

Literature Review

While our research is concerned with effects of income and demographic factors on housing prices, so we studied a large number of literatures on effects of political and administrative factors, supply and demand of housing and income and their interplay for determination of prices and attributes e.g. age, education level, employment, locational, structural and availability of amenities like schools in neighborhood and availability of water and sewerage system.

2.1. Political and Administrative Effects

In the literature on housing economics there is vast portion on the role of politics, politicians and homeowners in determining the use of land and zoning policies. During past few years the supply of housing has not kept pace with the rising demand that leads to rising prices that had put a limit to development of fast-growing cities. Schleicher (2013) observed that growing cities have not seen a substantial growth in supply of housing to meet with the increasing housing demand in these cities that could end exponential increase in price that had restricted the development of the cities. Schleicher (2013) also analyzed the political influence and its role in decision making of land use and setting restrictions on the land use that could mitigate the possible negative externalities that are associated with the new development.

Political decision making on the use of land is to protect the benefits of the owners of the property and residents of the area. But bureaucrats and politicians of Pakistan are using it make black money. In Pakistan housing issues are responsibility of ministry of Housing. Since the

partition when Pakistan came into being shortage of housing is unsolved problem. Different governments have taken several initiatives, but all are in vain due to corruption and incompetence. Multiple factors are involved in the housing shortage in Pakistan. In past governments offered many schemes but no one offered an alternate place. Katchi Abadis (slums) development program was by the Bhutto's government in 1971. Instead the solution for slums by giving an alternate small cheap housing units scheme was ignored. In cooperative housing authority millions of taxpayer's money was looted.

A great sorrow is that since 1947 to 1992 there was no housing policy in our country first housing policy was made in 1992 and revised in 1994. At that time, it determines the backlog of 6.5million and suggested the remedial measures to improve existing housing stock and ways to develop new one. But it could not be implemented properly and effectively due to lack of interest of politicians and negligence bureaucrats. In 2001 second housing policy was introduced it gave an overview of different issues and provides a comprehensive set of guidelines to tackle them. But sadly, it also ended in the same as before it is shelved and has not been implemented properly. Ministry of housing that is responsible for implementation of National Housing policy is not performing its responsibilities properly. As per the evaluations of State Bank of Pakistan 2001 National Housing Policy is not implemented effectively.

Well how we can evaluate the prices of houses and what are the factors that affect the housing prices. According to Hayullahoglu et al. (2018) the most difficult part of evaluation of any real estate is to determine the factors that will affect its price and what will be or what is the level of influence of each factor, there are many factors that affect the housing prices such as environmental, structural and most important locational.

Quigley et al. (2005) said whenever the political process of decision making about the land use and local planning is influenced and controlled by the higher income group the housing can become less affordable due to price increase. For the case of big cities of punjab if we observe many of the residents are from high income group are participating in decision making as politicians or bureaucrats and as consequences these residents can influence on the decision making about the land use that can result in housing skewed in favor of the wealthy people.

Another considerable issue is the relationship between housing, local governments and economic rents. Diamond (2015) showed that governments abilities to generate revenue through taxes increases due to the less or inelastic housing supply. That increase in the income of the government that it receives provides extra funds that can be spent for providing more services to taxpayers. But in case of Pakistan the tax evasion through under writing the value of property and absence of suitable and complete system to determine the actual value on which property was sold millions of rupees damage is done to national treasure.

By designing an effective macroeconomic policy government can give relaxation to the low-income people and that makes housing affordable that will also have welfare effects. Baranoff (2016), said that policies that make housing finance available at low interest rate and at macro level provision of subsidy on construction material had direct relation to the supply of housing and are economically beneficial. As that all can be seen in broader prospective as it will reduce the crime rate and can create a peaceful environment for residence. According to Sheng (2003), economist and policy makers have realized that the financing of housing plays an important role in stabilizing the economy as whole and financial system. Baranoff (2016) said developing affordable housing in low income neighborhoods appears to be a viable strategy for revitalizing these areas. Government can make a policy for low income households by

subsidizing the housing and construction materials and providing soft in terms of housing finance for low-income households in cities where the income inequality is increasing, and shortage of housing exists.

2.2. Housing Prices, Supply and Demand

From economic prospective there are two components of housing prices, one is cost that is related to the price of land construction cost of structure on land. Second one is option cost or opportunity cost. That is related to the location of the housing unit how much near it is from a commercial area it is and in future is there a chance of conversion of area into commercial area. In that sense some areas have high option price or high opportunity cost and others have low option price or opportunity cost.

Well along demand side issues there is also literature available on the relationship between the prices of houses and supply of houses. Basically, housing is dependent on three things: first land, second is physical structure and third is the approval from authorities to build structure on the land. If any of these got short or become expensive or any new barrier is imposed by the government then the prices of housing increases. As result housing will become unaffordable for the low-income households. Glaeser et al. (2005) narrated rising prices are reflection of the increase in land prices, or increase in the cost of construction, or imposition of the new regulatory barriers to construction. In Pakistan there is no serious effort to develop a solution that can provide low cost housing for low income households. There is lack of soft loans for the middle lower income and poor borrowers in Pakistan. No subsidy or credit facility by government for poor to help build houses for themselves. That has made impossible for low income household and poor households to build houses. According to Zaidi (2007) downward

raiding by the higher income group on reserved small plots for low income households is a problem as market prices of these plots are much higher than the price determined for them, so it persuades poor to sell their plots to high income group. Hence market mechanism forces the low-income people to live in slums or unauthorized housing subdivisions by marginalizing them. Thus, we came to know that housing scarcity is ‘man-made’ as the supply of housing is constrained due to the increasing income-inequality, rising cost of construction, and regulatory barriers.

Economists are persistently focusing on the inelastic supply of housing. According to the census of the 1998 the Pakistan is facing the severe shortage of the housing units. In 2011, level of urbanization was 36.2, in the meantime there were 21.7 million houses available in the country against the population of 186 million. In Pakistan there is shortage of 9 million residential houses that is growing with the ratio of 600,000 annually. Ahmad (2007) explained that the pricing of houses is determined by the interplay of supply and demand and it determines what people will pay for housing what they receive in exchange of their money. Gyourko et al. (2013) revealed that the increase in the prices of houses in the metropolitan areas is a result of inelastic supply of land and is coupled with the increasing numbers of high-income households. This all results in the high prices of the houses and high price-to-rent ratio and this badly affects the housing affordability and will crowd out the low-income households. The demand and prices in any area is the reflection of its income trends. Well it's also necessary to consider the supply of housing. Gyourko et al. (2013) gave a definition that a “superstar city” is that which is preferred by most of population and that has some inelasticity in its housing supply and has some excess demand. As according to the above given definition, we can say that almost every big city of Punjab qualifies to this criterion to an extent.

As by the definition above the prices can increase in different cities due to change in the local income distribution while even the inherent value of housing units will remain the same. That growth in prices of housing will in turn lead to difference in price to rent ratio. Since housing is a durable good then according to theory the new construction is not feasible when rents are not high. In the case the demand is high the prices will be determined by the cost of construction i.e. physical cost plus the cost associated with regulatory barriers. Hence the areas that have high population density or where the income level of residents are high and where the regulatory controls are high the level of population will remain unchanged that will lead to the higher prices.

The difference in the supply and demand of housing and in result high prices badly affects the productivity of the city. When fresh migrated labor came to city, they face difficulty to get cheap and affordable houses. Hence the house construction industry is highly competitive and there are no visible natural barriers to entry. But the price markups over the cost of construction are very strong indicators of man-made barriers. It's generally observed that in most of the cities in Pakistan the prices are just near to the cost of construction and profit margin is low but the case of metropolitan cities is different. In metropolitans like all big cities of punjab property value is high. The difference between construction cost and prices is big and profit margins are high. It's because of the high demand of property in these cities. According to Baranoff (2016) the difference between the housing prices and market prices is the difference between cost of construction and price of land plus the demand of that area that has a huge impact on the prices.

Matlack et al. (2006) examines the relation between the housing affordability and income equality and they observed that markets which have experienced any increase in upper end of the

income distribution would result in higher rents and housing prices and would result in lower vacancy rates. Although inequality is not always associated with reduction of consumption by the poor and higher cost of housing. But the shocks of inequality are potent in the metropolises where supply of housing is inelastic. The price increase due to the change in income at the upper end of distribution is to be paid by the poor for housing. That's a trickle-down effect of change in income distribution.

2.3. Locational Factors and Amenities

Another concept that is related to the urban and housing economics is the concept of "sorting". Certain arrangement according to some criteria is called sorting. Diamond (2015) examines the implications of the residential sorting according to the education, skills and facilities. And she said that any change in the labor demand will not only affect the labor market skills, but it will also impact cities sorting and in higher skill cities facilities influence the "sorting". That means that developing cities are more dynamically sorted than developed cities and facilities in developed cities will be more advanced than the developing or semi-urban cities. The sorting of housing is very much affected by the one factor and that is education and its education that generates skills. Kuminoff et al. (2013) studied how households are sorted according to their wealth and preference of social goods and he observed that whenever the sorting is done by education level it aggravated the changes in facilities offered by the city to its residents. Glaeser et al. (2001) talks about five parameters that make a city attractive these five factors are: (i) its absolute population (ii) job opportunity (iii) infrastructure (iv) educational and health facilities (v) average level of housing cost.

Educated and skilled people are attracted towards a city that whose market demands educated labor and that offers facilities to high educated people. That is the case of every big city

of punjab province whose market demand educated, and skilled labor also offers advanced facilities to its residents. Bayer et al. (2004) said that selection of housing and preferences for the housing and neighborhood and his/her demand for certain attributes is affected by ones the income, race, education and family structure.

There is a factor that affects the prices of housing and that is location of housing many of the researches had made it clear that location of the house is also a determinant of its price. Ottensmann et al. (2008) explained that along other factors location of the house is also a statistically significant determinant of its price. Another author Richard J. Cebula (2009) said in his research that the price of the house is negatively influenced if its positioning is wrong e.g. it is located on a busy street, if it is across marketplace or located near to or adjacent to apartment complex. But that may not be the case another point of view on locational factor is that due to location near market or shopping center can increase its price and market offer price premium. Addae-Dapaah et al. (2010) in his work proved that buyers on average pay premium of 4.7% for the shopping center proximity factor but this varies from place to place he further explains that this price decreases as distance increases and the flats that are in 100m distance of shopping center have 15% premium on their price. So, it's clear that the locational factor in case of markets and shopping centers brings on benefit and disadvantage both benefit in term of extra price premium received and disadvantage of noise and crowd.

House is the place where we get peace and rest. So, it's often that people prefer to live in spacious place which is close to natural environment such as greenery like parks as explained above. Some studies show that housing prices are also affected by the environmental factors such as the green belts and forests. Melichar et al. (2014) described size of the house or flats and

distance from urban forests are significant and affects price as explained by him in his work each 1km distance from the urban forest will in turn 1.96% decrease in housing price, he further say size of housing positively affect the price and decreases the price if unit is away from urban forest and to nearest city center.

It's also important to consider another attribute age. Age, it is important to consider age as determinant of the housing prices. Question is how age affects the housing prices? The change in the working age group changes the income bracket and that would influence the any change in housing prices. As explained by Li (2014) change in the working age population influences the change in the housing prices as shown in his research 1% increase in the population of working age population causes 2.707% change in housing prices. This is because the change in population of the working age group would cause the demand for houses to change in upward direction and that would induce change the price of housing. In another research Essafi et al. (2015) found that population and income influence the pricing of housing positively while type of construction and interest rates have bad effect on prices but lower than explained by institutions. That mean that prices will increase with increase in income or population or both. And prices will decrease when interest rate increases, or the construction of structure is old, but magnitude of this bad impact would be much less than that predicted by institutions.

Another situation that has impact on the housing prices is urbanization due to rapid industrialization. The rapid movement of the people from the villages and small towns to big cities is increasing day by day and this exerts a pressure on housing supply. In a study Alkan et al. (2014) described that housing problems will rise as result of rapid urbanization that would

create excess demand. He also studied the motives of housing demand. According the Alkan et al. (2014) there are three types of motives to own a house or property that are owner & children occupancy, rental income and investment. And he described in his work that most people have children occupancy tendency than other motives. As in his research the age group of retired to 31 year have mostly children occupancy motives for their housing demand. They consider it the future of their children. While and other important fact that was observed by him is rental income and investment housing demand has been influenced by the occupation significantly.

While most of the researchers focused on number of bedrooms and bathrooms as attributes playing role in determination of housing prices. There are some who think different and took into consideration little different aspect the size of the house as an influential characteristic. Mo et al. (2014) he proved in his work that size of the house is a significant attribute of housing price and it has positive relation with value of property he showed that one square foot will increase the prices SGD 950-980\$ and mean while it has negative relation with per square foot that mean as size increases the increase in value is less so for big properties cost of per square feet is less than small size properties so they are sold cheaper, age is another significant characteristic that has negative relation with prices. But what will be the case of apartments it is also explained by Mo et al. (2014) in his work showed that in apartments level of floor effects the prices but it significant above 20floors.

The believes of society, norms and religion are important part of our life but do these play roles in valuation of property and is their impact significant enough to consider as demographic characteristic. Some researchers focused on this like Brandt et al. (2014) worked on

does housing price affected by places of worship and Babawale (2011) worked on impact of churches on neighborhood. Brandt et al. (2014) said that places of worship have positive effects on area that lies in $\leq 1000\text{m}$ distance from them, he said there is a premium on area that is in distance of 100m to 200m distance of places of worship but houses or apartments less than $\leq 100\text{m}$ distance have no primum but their price is low due to noise problem. But this will not be the case always it may be vice versa in hid work Babawale (2011) showed that there are negative effects of religious properties on the housing properties prices. This effect is different for different places as Brant (2014) conducted his study in Germany and Babawale (2011) did his work in Lagos, Nigeria. Well believes of a society and religious believes play a role in the housing prices is tested by another researcher researched on this factor. C.Bourassa (1999) researched on the traditional believe of chines society feng shui that is a set of concepts about luck and unluck. C.Bourassa (1999) in his research showed that lucky numbers have significant positive prices and they are capitalized in the sale of the houses in Auckland for chines society. So, there is a controversy that weather the religious and social norms play a role in housing prices or not. And should these be considered as demographic characteristics or not because they don't have consistence influence on housing price like other characteristics e.g. no. of rooms and area have on housing prices.

Different researchers have focused on different prospective some focused on the provision of cheap loans or low interest rate loans like Baranoff (2016) and Sheng (2003). While some others focused on the factors that affect demand of housing like Ahmad (2007). Some of them studied effects of income and inequality as Matlack et al. (2006). Others studies the impact of size of housing unit on the demand and price as did by Melichar et al. (2014). Researchers like Ottensmann et al. (2008) ,Addae-Dapaah et al. (2010), Babawale (2011), Brandt et al. (2014),

Mo et al. (2014) also focused on the locational factors of the houses as their distances to the shopping centers, schools, hospitals and parks and city centers. Researchers checked the influence of education and employment type of neighborhood on the housing demand and value as did by Kuminoff et al. (2013) and Bayer et al. (2004). The relation of age and income and motives to hold housing unit with housing demand and value determination is and is important factor and researcher's Li (2014), Alkan et al. (2014), Essafi et al. (2015 explored these in their work. Meanwhile few researchers from developing countries also focused on the amenities like availability of electricity, drainage facility and water availability like Ihuah et al. (2014), Ajibola et al. (2013) and Choumert et al. (2014) did. But the impact of these all-in combined set on prices is not being studied to determine the value of housing unit this is also the case of Pakistan up till now.

2.4. Conclusion

Literature shows us that there are different factors that affect the housing prices. The political decision making in the use of land and zoning policies play a vital role. The differences of supply of housing and demand for housing also play an important role in the determination of prices. But these are not the only factors there are some other factors that affect the prices there are other factors that are demographic factors such as income, no. of households, no. of rooms, locational factors, schools & hospitals, education level and nature of jobs in the close proximity these factors also affect the housing prices.

Chapter 3

Methodology

3.1. Theoretical Framework

The neoclassical consumer theory of housing demand provides the basis for housing demand analysis. For housing demand analysis, this theory uses various assumption regarding consumer behavior, the nature of housing commodity and the housing market. First, consumer maximize their utility in the light of the income and price constraints they face in the marketplace. Second, the objective of consumer decision-making is considered not to be the observable heterogeneous commodity of housing but rather an unobservable homogeneous commodity called housing services. Third, a perfectly competitive market in housing services is assumed to exist. In addition, the housing market is assumed to operate in a tax-free world where capital and asset markets are perfect and in equilibrium (Megbolugbe. Et al. 1991)

Initially, this framework was applied by Muth (1960) and Olsen (1969) to examine the housing market. According to this theory, the determinants of housing demand are principally income, price and taste. According to this theory, rational consumers maximize their utility with respect to different goods and services including housing services, which they can purchase. Market price and consumer income act as binding constraints in this maximization solution. Every household chooses between non-housing commodities and housing commodities. The objective of household is to balancing the non-housing commodity and housing commodities in such a way that its utility is maximized. Demand equation is defined by this.

Megbolugbe, et al. (1991) explain that factors that determine the housing consumption are household income, relative price of housing, prices of other goods and services and taste factor. As there is no direct way to measure the households taste. So different researchers used

different demographic factors e.g. age, marital status and consumption of household as proxy of demand equation to quantify the role of taste in housing demand. Different housing characteristics are included in the demand equation by several researchers on the base that income and effective prices of houses to household. For the better understanding of the phenomenon of housing demand several modifications have been made in the neoclassical theory of housing demand. Many of the assumptions have been relaxed such as the features of perfectly competitive housing market. The objective of these modifications is to broaden the modeling framework of the housing demand determinants that provides conceptually correct analysis of the housing market.

3.2. Empirical Model

We will use hedonic price regression to measure the effect of different characteristics on the prices of housing. The Hedonic in Greek word that means Pleasure. Hedonic Pricing Method is valuation method that uses revealed preference. The idea behind the Hedonic Price Method is that any commodity is characterized by its properties, so we can evaluate it by separately estimating the values of its properties. The price of a house is generated by its attributes/characteristics. The effect of these attributes/characteristics on prices of property are best defined by Hedonic Price Method. It uses the information provided by the households when they make their choices for location. The price of the property is determined by the characteristics it possess. The property with greater number of good characteristics will have high price and that with small number of good characteristics will have low price. The property or specifically house is defined by its qualities such as structure (no. of rooms, no. of bathrooms, age of house, type e.g. apartment or separate house, size of house and amenities it possess) environmental aspects (quality of air, noise pollution, location of beach, alongside park, near

mountains), location (weather area belong to high income group or low income group, quality of roads, distances from school hospital and grocery stores & shopping malls). So, the function that represents the price of the property in terms of its characteristics is known as Hedonic Function.

In this analysis we estimate the hedonic price function of the property through regression analysis. This function relates the prices of properties/houses that are sold in one market with the characteristics of the property/houses.

Hedonic price Model is estimated using ordinary least square (OLS) regression. It is a statistical tool that enables us to determine the value of property by estimating the relationship between the characteristics of property and its market value. Hedonic price regression is conventional regression that shows how the characteristic of a housing unit affects its price. Characteristics are collectively defined as X and are linked to prices of real estate price P through hedonic function as following:

$$P = H(X)$$

The above function is a linear function, in which:

$$P = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \dots + \alpha_k X_k$$

Here from X_1 to X_k are attributes level for selected characteristics and α_1 to α_k are weights assigned to a attribute. The linear function here denotes the relationship that one unit increase in X_1 would results in increase of the price by α_1 dollars.

For estimating the housing prices first, the parameters of the function α_1 through α_k must be estimated. We can estimate the parameters by using the model in which number of equations

(N) is greater than number of unknowns (k+1) that will leave us with an error term e_i model is as following:

$$P = \alpha_0 + \alpha_1 X_{1i} + \alpha_2 X_{2i} + \dots + \alpha_k X_{ki} + e_i$$

The goal of this estimation is to minimize the errors by choosing the appropriate parameters α_i that allows us to claim that how characteristics are related to housing prices because hedonic price is estimated in way that it represents it the best.

The functional form in it can be of liner, non-linear, semi-log, log-log and log-linear. For accuracy we will use log-linear functional form. Non-linear pricing more accurately represents the housing pricing than liner pricing, but this kind of pricing creates opportunity for the arbitrage but in reality, arbitrage do not actually take advantage of this so it suggests that it is not z

Here coefficients are semi-elastic coefficients gives percentage in price caused by unit change in any independent variable.

We will be estimating 4 OLS regressions by adding and dropping out some variables.

Our regression model will be as:

$$\begin{aligned} \text{Ln (housing unit prices)} = & \alpha_0 + \alpha_1 \text{Ln(age)} + \alpha_2 \text{Ln(Annual income)} + \alpha_3 \text{Ln(No. of} \\ & \text{rooms)} + \alpha_4 \text{EDU}_i + \alpha_5 \text{EMP}_i + \alpha_6 \text{SCHL_DIS}_i + \alpha_7 \text{DKR_WTR_SR_DIS}_i + \alpha_8 \text{SWRG} + \\ & \alpha_9 \text{OCUP_ST}_i + \alpha_{10} \text{DWL_TYPE} + \alpha_{11} \text{PWR_S} + \alpha_{12} \text{GAS_S} + \alpha_{13} \text{WTR_DKR_SR}_i + \\ & \alpha_{14} \text{WC_TYPE}_i + e_i \end{aligned}$$

3.3. Definition & Construction of variables

- Ln of Median House Unit prices = Dependent variable proxy of prices
- Ln of age = Log natural of Age in years of household head

- Ln of annual income = Log natural Annual income of household head
- Ln of number of rooms = Log natural total number of rooms in a housing unit

- **EDU_i will be as :**

EDU1 = 1 if 10 class or less, 0 otherwise

EDU2 = 1 if F.Sc/FA/Diploma, 0 otherwise

EDU3 = 1 if B.Sc/BA, 0 otherwise

EDU4 = 1 if M.Sc/MA, 0 otherwise

EDU5 = 1 if Professional degrees e.g. engineering, medical, law, 0 otherwise

EDU6 = 1 if M.Phil/Ph.D., 0 otherwise

- **EMP_i will be as :**

EMP1 = 1 if Employer, 0 otherwise

EMP2 = 1 if self-employed, 0 otherwise

EMP3 = 1 if Paid employee, 0 otherwise

EMP4 = 1 if Own cultivation/contract cultivator/livestock, 0 otherwise

- **SCH_DIS_i will be as :**

SCH_DIS_1 = 1 if 0-14min consumed in covering the distance, 0 otherwise

SCH_DIS_2 = 1 if 15-44min consumed in covering the distance, 0 otherwise

SCH_DIS_3 = 1 if 45min or more than 45min travel distance, 0 otherwise

- **HOS_DIS_i will be as :**

HOS_DIS_1 = 1 if 0-14min consumed in covering the distance, 0 otherwise

HOS_DIS_2 = 1 if 15-44min travel distance, 0 otherwise

HOS_DIS_3 = 1 if 45min or more than 45min travel distance, 0 otherwise

- **DKR_WTR_SR_DIS_i will be as :**

DKR_WTR_SR_DIS_0 = 1 if source of water inside, 0 otherwise

DKR_WTR_SR_DIS_1 = 1 if distance is less than or equal to 0.5km, 0 otherwise

DKR_WTR_SR_DIS_2 = 1 if distance is 0.5-2km, 0 otherwise

- **SWRG** = If connected to sewerage 1 if yes, 0 otherwise

- **OCUP_ST_i will be as :**

OCUP_ST_1 = 1 if Owner occupied, 0 otherwise

OCUP_ST_2 = 1 if on rent/subsidized rent, 0 otherwise

- **DWL_TYPE** = For dwelling type 1 if independent, 0 other

- **PWR_S** = For electricity available 1 if yes, 0 otherwise

- **GAS_S** = For gas available 1 if yes, 0 otherwise

- **WTR_DKR_SR_i will be as :**

WTR_DKR_SR_1 = 1 if piped water, otherwise 0

WTR_DKR_SR_2 = 1 if hand pump/motorized/tube well or hand pump/motorized/tube well/ open or closed well, 0 other wise

WTR_DKR_SR_3 = 1 if mineral water/water tanker/filtration water or open well/closed well, 0 otherwise

- **WC_TYPE_i will be as :**

WC_TYPE_1 = 1 if flush, 0 otherwise

WC_TYPE_2 = 1 if dry raised/dry pit, 0 otherwise

The House prices, age of household head, income of household head and number of rooms are used as continues variables. While dummies are generated for level of education obtained, nature of employment, distance from school, distance from hospital and distance from

main source of drinking water, type of sewerage facility with which house is connected, occupancy status, electricity, gas, source of drinking water and toilet facility available.

For both data sets of 2005-2006 and 2015-2016 level of education obtained there are six categories made and six dummies generated for each of them as following EDU1 for 1 if having education up to 10 class or less otherwise 0, EDU2 1 if F.Sc/FA/Diploma otherwise 0, EDU3 1 if B.Sc/BA otherwise 0 , EDU4 1 if having education up to M.Sc/MA otherwise 0, EDU5 1 if having education in Professional degrees e.g. engineering, medical, law otherwise 0, EDU6 1 if having M.Phil/Ph.D. otherwise 0.

For both data sets of 2005-2006 and 2015-2016 nature of employment there are five categories made and five dummies generated for each of them as following EMP1 1 if Employer otherwise 0, EMP2 1 if self-employed otherwise 0, EMP3 1 if Paid employee otherwise 0, EMP4 1 if Own cultivation/contract cultivator/livestock, otherwise 0.

For distance from school in 2005-2006 data set there are 3 categories made and 3 dummies generated for them as following SCHOOL_DIS_1 is 1 if distance is equal or less than 2km, otherwise 0, SCHOOL_DIS_2 is 1 if distance is 2km-10km, otherwise 0, SCHOOL_DIS_3 is 1 if distance more than 10km otherwise 0. There will be same case for data set of 2015-2016 but their distance is estimated in time explained as following SCHOOL_DIS_1 is 1 if 0-14min consumed in covering the distance otherwise 0, SCHOOL_DIS_2 is 1 if 15-44min consumed in covering the distance otherwise 0, SCHOOL_DIS_3 1 if 45min or more than 45min consumed in covering the distance otherwise 0.

Same is the case for distance from hospital/health clinic in 2005-2006 and 2015-2016 data set data is arranged in three categories but for 2005-2006 distance is recorded in kilometers and

for 2015-2016 its in minutes as following HOS_DIS_1 in 2005-2006 is 1 if distance of hospital is equal or less than 2km otherwise 0 and for the same in 2015-2016 1 if 0-14min consumed in covering the distance otherwise 0, HOS_DIS_2 in 2005-2006 is 1 if distance of hospital 2km-10km otherwise 0 for the same in 2015-2016 is 1 if 15-44min consumed in covering the distance otherwise 0, HOS_DIS_3 is 1 if distance of hospital is more than 10km otherwise 0 for the same in 2015-2016 1 if 45min or more than 45min consumed in covering the distance otherwise 0.

For distance of main source of drinking water there are four categories are made for both data sets DKR_WATER_SR_DIS_0 is 1 if source of water inside otherwise 0, DKR_WATER_SR_DIS_1 is 1 if distance is less than or equal to 0.5km otherwise 0, DKR_WATER_SR_DIS_2 1 if distance is more than 0.5km, 0 otherwise

For the sewerage amenity dummy is generated SWRG 1 if connected to any type of sewerage otherwise 0. Occupancy status is categorized into 2 categories OCUP_STATUS_1 is 1 if Owner occupied otherwise 0, OCUP_STATUS_2 1 if on rent/subsidized rent otherwise 0. For type of dwelling dummy is DWL_TYPE 1 if independent otherwise 0. Electricity and gas amenity dummies are PWR_S & GAS_S if Electricity/Gas is available then 1 otherwise 0.

For both data set 2005-2006 & 2015-2016 main source of drinking water is categorized in four categories. For data set of 2005-2006 WATER_DKR__SR_1 is 1 if piped otherwise 0, WATER_DKR__SR_2 is 1 if hand pump/motorized/tube well otherwise 0, WATER_DKR__SR_3 is 1 if open well/closed well otherwise 0. And for data set of 2015-2016 WATER_DKR_SR_1 is 1 piped water otherwise 0, WATER_DKR_SR_2 will be 1 if hand pump/motorized/tube well/ open or closed well other wise 0, WATER_DKR_SR_3 1 if mineral

water/water tanker/filtration water otherwise 0. For toilet amenity three categories are made WC_TYPE_1 1 if flush otherwise 0, WC_TYPE_2 1 if dry raised/dry pit otherwise 0.

3.4. Data and Data Source

For estimations the housing characteristics are collected from Household Integrated Economic Survey (HIES) that focuses in addition on income and consumption and is conducted under the umbrella of the Pakistan Social and Living Standards Measurement Survey (PSLM). In our study we have taken data from survey year 2005-2006 and 2015-2016.

Selected cities for our research are Rawalpindi, Sargodha, Faisalabad, Gujranwala, Sialkot, Lahore, Multan, Bahawalpur. The data for these cities is sorted out. Then data sets under use that is from HIES/PSLM was cleaned by treating missing values that are for the income of house hold head, value of houses, nature of occupation of household head then dummies are generated and information that is not relevant to the housing is dropped out. The people with no information on income, houses price, nature of occupation and education status are dropped out.

Household Head Information: Information regarding the age, income, education status and nature of occupation of head of household is considered here. Age of the household head is taken here in number of years. Income is taken on annual basis. And education status is considered as highest level of education learned in the form of highest class passed. Occupation status is considered as the nature of occupation of household head that weather he is Employer, self-employed, Paid employee, Unpaid/Family worker, Shared cropper, Own cultivator, contract cultivator or livestock is his main source of earning.

Housing characteristics: Information regarding the housing units are occupancy status, dwelling type, Number of rooms, availability of gas, availability of electricity, which type of sewerage amenity is available, what is the source of drinking water, which type of toilet is available for household, what is the distance from school, what is the distance from hospital/health clinic, what is the distance covered in one trip to fetch water. For these variable's dummies are generated e.g. 1 for availability of gas and 0 for not available. For distances the distances are divided into categories and then dummies are generated for each of these categories same will be the case for the source of drinking water and type of toilet available.

3.5. Descriptive Statistics

Table 3.5.1. Descriptive Statistics for Continuous Variables of 2005-06

Variables	Description	Observations	Mean	Std. Dev	Min	Max
House Prices	What is the value of house you live in?	8,053	1227240	1908.93	150000	45000000
Age	Age in years of household head	8,053	47.98113	14.4819	18	90
Income	Annual income of household head	8,053	105991.2	400.3536	4000	3014000
No. of Rooms	How many rooms are in dwelling?	8,053	2.91742	1.54515	1	15

Average Houses prices of is 1227240 rupees in 2005-2006. The standard deviation describes the diversion from mean value so the standard deviation from mean of housing prices is 1908.93. Average Age of household head is 47.98113 year for 2005-2006. The standard deviation describes the diversion from mean value so the standard deviation from mean of age is 14.4819. Annual of household head 105991.2 and minimum variability 400.3536. The average no. of rooms in a household is 2.91742. The standard deviation describes the diversion from mean value so standard deviation from mean no. of rooms is 1.54515.

Table 3.5.2 Table of Frequencies & Percentages for Qualitative Variables of 2005-2006

Variables	Description	Frequencies	Percentage
EDU1	1 if 10 class or less, 0 otherwise	6281	78.00
EDU2	1 if F.Sc/FA/Diploma, 0 otherwise	754	9.36
EDU3	1 if B.Sc/BA, 0 otherwise	514	6.38
EDU4	1 if M.Sc/MA, 0 otherwise	335	4.16
EDU5	1 if Professional degrees e.g. engineering, medical, law, 0 otherwise	134	1.66
EDU6	1 if M.Phil/Ph.D., 0 otherwise	20	0.25
EMP1	1 if Employer, 0 otherwise	267	3.32
EMP2	1 if self-employed, 0 otherwise	2279	28.30
EMP3	1 if Paid employee, 0 otherwise	3360	41.72
EMP4	1 if Own cultivation/contract cultivator/livestock, 0 otherwise	1986	24.66
SCH_DIS_1	1 if distance is equal or less than 2km, 0 otherwise	6057	75.21
SCH_DIS_2	1 if distance 2km-10km, 0 otherwise	1581	19.63
SCH_DIS_3	1 if distance more than 10km, 0 otherwise	256	3.18
HOS_DIS_1	1 if distance of hospital is equal or less than 2km, 0 otherwise	4001	49.68
HOS_DIS_2	1 if distance of hospital 2km-10km, 0 otherwise	2834	35.19
HOS_DIS_3	1 if distance of hospital is more than 10km, 0 otherwise	1040	12.91
DKR_WTR_SR_DIS_0	1 if source of water inside, 0 otherwise	7336	91.10
DKR_WTR_SR_DIS_1	1 if distance is less than or equal to 0.5km, 0 otherwise	581	7.21
DKR_WTR_SR_DIS_2	1 if distance is more than 0.5km, 0 otherwise	118	1.47
SWRG	If connected to sewerage 1 if yes, 0 otherwise	6461	80.23

OCUP_ST_1	otherwise 1 if Owner occupied, 0 otherwise	7827	97.19
OCUP_ST_2	1 if on rent/subsidized rent, 0 otherwise	183	2.27
DWL_TYPE	For dwelling type 1 if independent, 0 other	7274	90.33
PWR_S	For.com electricity 1 if yes, 0 otherwise	7689	95.48
GAS_S	For gas 1 if yes, 0 otherwise	3153	39.15
WTR_DKR_SR_1	1 if piped, 0 otherwise	2433	30.21
WTR_DKR_SR_2	1 if hand pump/motorized/tube well, 0 other wise	5208	64.67
WTR_DKR_SR_3	1 if open well/closed well, 0 otherwise	252	3.13
WC_TYPE_1	1 if flush, 0 otherwise	6750	83.82
WC_TYPE_2	1 if dry raised/dry pit, 0 otherwise	94	1.17

The education is described by dummies EDU1 represents the education level of 0 to 10class and it has 78% in the data. While the EDU2 represents the education up to FA/F.Sc./Diploma and they are 9.36% of total in 2005-2006. Similarly, EDU3 represents the education up to graduation level and it is 6.38% of total. Next is EDU4 that shows the education up to level of master MA/M.Sc. and it is 4.16% of total. EDU5 denotes the education up to professional degrees e.g. engineering, medical science and law etc. They are 1.66% of the total. While EDU6 represents the education till M.Phil/Ph.D. and they are 0.25% of the total. Our next set of dummies represents employment status. EMP1 is for employer and it 3.32% of the total sample. EMP2 is self-employed and it is 28.30% of the total. While the EMP3 denotes paid employee and they are 41.72% of the total sample data. EMP4 is Own cultivation/contract cultivator/livestock and they are 24.66% of the total number of sample data. SCH_DIS represents the distance from the school. SCH_DIS_1 is the distance from house to school up to 2km and less so 75.21 percent have schools in range of 2km. While SCH_DIS_2 is distance from

2km to 10km and 19.63% people have houses at distance of 2km to 10km from their schools. SCH_DIS_3 represents distance more than 10km and 3.1% people have hospitals at this distance from houses. HOS_DIS_1 is the distance from house to hospital up to 2km and less so 49.68% percent have schools in range of 2km. While HOS_DIS_2 is distance of 2km to 10km to hospital and 35.19% people have houses at distance of 2km to 10km from their schools. HOS_DIS_3 represents distance more than 10km and 12.91% people have hospitals at this distance from houses. DKR_WTR_SR_DIS is representing drinking water source distance. DKR_WTR_SR_DIS_0 is representing inside water source and 91.10% of total sample having internal source. DKR_WTR_SR_DIS_1 represents distance of drinking water source less than 0.5km and 7.21% of total sample have houses at distance of 0.5km and less. DKR_WTR_SR_2 is distance of drinking water source more than 0.5km and 1.47% have houses in range of more than 0.5km. SWRG represents the availability of drainage system and 80.23% have drainage system. OCUP_ST_1 is representing the owner occupied and 97.19% of the total sample is owner occupied. OCUP_ST_2 is representing the rented and subsidized rented housing units and they are 2.27% of the total sample. DWL_TYPE is representing whether the dwelling is independent or not and 90.33% have independent. PWR_S is representing the availability of electricity and 95.48% have electricity. GAS_S is representing availability of gas and 39.15% have gas. WTR_DKR_SR_1 is for piped water and around 30% have piped water supply. While WTR_DKR_SR_2 is denoting the hand pump/motorized/tube well and 64.67% people have this facility in their house. DKR_WTR_SR_3 is open well/closed well and 3.13% people have this facility. WC_TYPE_1 is for flush and 83.82% people have flush facility. WC_TYPE_2 is denoting dry raisin/dry pit and there is only 1.17% have this type of facility.

Table 3.5.3. Descriptive Statistics for Continuous Variables of 2015-16

Variable	Description	Observations	Mean	Std. Dev.	Min	Max
Houses Prices	What is the value of house you live in?	10,598	3016388	2717.1446	200000	120000000
Age	Age in years of household head	10,598	43.43499	11.36707	19	92
INCOME	Annual income of household head	10,598	323138.4	630.9013	6650	9600000
No. of Rooms	How many rooms are in dwelling?	10,598	2.54651	1.45404	1	18

Average Houses prices of is 3016388 for 2015-2016. The standard deviation describes the diversion from mean value so the standard deviation from mean of housing prices is 2717.1446. Average Age of household head is 43.43499 in 2015-2016. The standard deviation describes the diversion from mean value so the standard deviation from mean of age is 11.36707 for 2015-2016. Mean annual income of household head 323138.4 and minimum variability 630.9013. The average no. of rooms in a household is 2.54651. The standard deviation describes the diversion from mean value so standard deviation from mean no. of rooms is 1.45404.

Table 3.5.4. Frequencies & Percentages for Qualitative Variables of 2015-2016

Variables	Description	Frequencies	Percentage
EDU1	1 if 10 class or less, 0 otherwise	8248	78.17
EDU2	1 if F.Sc/FA/Diploma, 0 otherwise	991	9.35
EDU3	1 if B.Sc/BA, 0 otherwise	680	6.42
EDU4	1 if M.Sc/MA, 0 otherwise	405	3.82
EDU5	1 if Professional degrees e.g. engineering, medical, law, 0 otherwise	202	1.91
EDU6	1 if M.Phil/Ph.D., 0 otherwise	36	0.34
EMP1	1 if Employer, 0	423	3.99

	otherwise		
EMP2	1 if self-employed, 0 otherwise	3139	29.62
EMP3	1 if Paid employee, 0 otherwise	5705	53.83
EMP4	1 if Own cultivation/contract cultivator/livestock, 0 otherwise	1297	12.24
SCH_DIS_1	1 if 0-14min consumed in covering the distance, 0 otherwise	5332	50.31
SCH_DIS_2	1 if 15-44min consumed in covering the distance, 0 otherwise	4469	42.17
SCH_DIS_3	1 if 45min or more than 45min consumed in covering the distance, 0 otherwise	797	7.52
HOS_DIS_1	1 if 0-14min consumed in covering the distance, 0 otherwise	6465	61.00
HOS_DIS_2	1 if 15-44min consumed in covering the distance, 0 otherwise	3415	32.22
HOS_DIS_3	1 if 45min or more than 45min consumed in covering the distance, 0 otherwise	718	6.77
DKR_WTR_SR_DIS_0	1 if source of water inside, 0 otherwise	8427	79.52
DKR_WTR_SR_DIS_1	1 if distance is less than or equal to 0.5km, 0 otherwise	1532	14.46
DKR_WTR_SR_DIS_2	1 if distance is more than 0.5km, 0 otherwise	576	5.43
SWRG	If connected to sewerage 1 if yes, 0 otherwise	9422	88.90
OCUP_ST_1	1 if Owner occupied, 0 otherwise	9371	88.42
OCUP_ST_2	1 if rented or subsidized rent, 0 otherwise	1227	11.58
DWL_TYPE	For dwelling type 1 if independent, 0 other	8475	79.97
PWR_S	For electricity 1 if yes, 0 otherwise	10287	97.07
GAS_S	For gas 1 if yes, 0 otherwise	7381	69.65
WTR_DKR_SR_1	1 if piped water, otherwise 0	2845	26.84

WTR_DKR_SR_2	1 if hand pump/motorized/tube well/ open or closed well, 0 other wise	5996	56.58
WTR_DKR_SR_3	1 if mineral water/water tanker/filtration water, 0 otherwise	1679	15.84
WC_TYPE_1	1 if flush, 0 otherwise	10068	95.00
WC_TYPE_2	1 if dry raised/dry pit, 0 otherwise	22	0.21

The education is described by dummies EDU1 represents the education level of 0 to 10class and it has 78.17% in the sample data. While the EDU2 represents the education up to FA/F.Sc./Diploma and they are 9.35% of total sample in 2005-2006. Similarly, EDU3 represents the education up to graduation level and it is 6.42% of total. Next is EDU4 that shows the education up to level of master MA/M.Sc. and it is 3.82% of total sample. EDU5 denotes the education up to professional degrees e.g. engineering, medical science and law etc. They are 1.91% of the total sample. While EDU6 represents the education till M.Phil/Ph.D.. and they are 0.34% of the total sample. Our next set of dummies represents employment status. EMP1 is for employer and it 3.99% of the total sample. EMP2 is self-employed and it is 29.62% of the total sample. While the EMP3 denotes paid employee and they are 52.83% of the total. EMP4 is Own cultivation/contract cultivator/livestock and they are 12.24% of the total number of sample. SCH_DIS represents the distance from the school. SCH_DIS_1 is the distance from house to school up to 0-14min and 50.31 percent have schools in range of 0-14min travel time. While SCH_DIS_2 is distance of 14-44min and 42.17% people have houses at distance of 14-44min from their schools. SCH_DIS_3 represents distance of 45min or more and 7.52% people have hospitals at travel time more than 45min distance from houses. HOS_DIS_1 is the distance from house to hospital 0-14min and 61% percent have schools in range of 0-14min travel time. While HOS_DIS_2 is distance of 15-44min and 32.22% people have houses at distance of 15-44min

travel time from their houses. HOS_DIS_3 represents distance of 45min or more and 6.77% people have hospitals at this distance from houses. DKR_WTR_SR_DIS is representing drinking water source distance. DKR_WTR_SR_DIS_0 is representing inside water source and 79.52% of total sample having internal source. DKR_WTR_SR_DIS_1 represents distance of drinking water source less than 0.5km and 14.46% of total sample have houses at distance of 0.5km and less. DKR_WTR_SR_2 is distance of drinking water source more than 0.5km and 5.43% have houses in range of more than 0.5km. SWRG represents the availability of drainage system and 88.90% have drainage system. OCUP_ST_1 is representing the owner occupied and 88.42% of the total sample is owner occupied. OCUP_ST_2 is representing the rented and subsidized rented housing units and they are 11.58% of the total sample. DWL_TYPE is representing whether the dwelling is independent or not and 79.97% have independent. PWR_S is representing the availability of electricity and 97.07% have electricity. GAS_S is representing availability of gas and 69.65% have gas. WTR_DKR_SR_1 is for piped water and around 26.84% have piped water supply. While WTR_DKR_SR_2 is denoting the hand pump/motorized/tube well/open well/closed well and 56.58% people have this facility in their house. DKR_WTR_SR_3 is mineral water/water tanker/filtration water and 15.84% people have this facility. WC_TYPE_1 is for flush and 95% people have flush facility. WC_TYPE_2 is denoting dry rasion/dry pit and there is only 0.21% have this type of facility.

Chapter 4

Estimation Technique

We estimated the log-liner form of hedonic model by using OLS technique for estimation. In this context we have estimated four regressions for each of the selected years to estimate the expected price of the housing unit. By varying the variables, we intend to capture the effects of different variables on prices of housing units. Hedonic model is estimating the housing prices on the characteristics of housing, these are age, annual income, no. of rooms, education level, employment status, distance from school, distance from hospital, distance from source of drinking water, availability of sewerage, occupancy status, type of dwelling, availability of electricity, availability of gas, main source of drinking water, type of toilet used by the household. Dummies are generated for variables education level, employment status, distance from school, distance from hospital, distance from source of drinking water, availability of sewerage, occupancy status, type of dwelling, availability of electricity, availability of gas, main source of drinking water, type of toilet used by the household.

4.1. Regression No. 1

Table 4.1. Hedonic Price Regression No. 1 of 2005-06 & 2015-2016 (dependent variable is log prices of houses)

Variables	2005-2006	2015-2016
Age	0.10008* (0.000)	0.09172* (0.000)
Annual income	0.34018* (0.000)	0.33844* (0.000)
No. of rooms	0.21001* (0.000)	0.22022* (0.000)
EDU1	0.00287 (0.938)	0.00478 (0.712)
EDU2	0.00494 (0.805)	0.00785 (0.320)

EDU3	0.00740 (0.753)	0.01048 (0.207)
EDU4	0.02641* (0.002)	0.04542* (0.005)
EDU5	0.03423* (0.000)	0.06014* (0.001)
EDU6	0.04003* (0.000)	0.06532* (0.000)
EMP1	0.05026* (0.001)	0.10026* (0.000)
EMP2	0.08045* (0.005)	0.15454* (0.000)
EMP3	0.06444* (0.000)	0.12026* (0.001)
EMP4	0.09634* (0.001)	0.18646* (0.000)
SCH_DIS_1	0.02728* (0.000)	0.03098* (0.001)
SCH_DIS_2	-0.03377 (0.835)	-0.04839 (0.920)
SCH_DIS_3	-0.07897 (0.927)	-0.05147 (0.958)
HOS_DIS_1	0.02315* (0.000)	0.02130* (0.003)
HOS_DIS_2	-0.01659 (0.324)	-0.03163 (0.835)
HOS_DIS_3	-0.03529 (0.411)	-0.05149 (0.997)
DKR_WTR_SR_DIS_0	0.04449 (0.107)	0.08057 (0.181)
DKR_WTR_SR_DIS_1	0.03646 (0.239)	0.06743 (0.260)
DKR_WTR_SR_DIS_2	-0.20009 (0.324)	-0.04644 (0.356)
SWRG	0.04006* (0.003)	0.03421* (0.000)
OCUP_ST_1	0.10120 (0.401)	0.07465 (0.492)
OCUP_ST_2	-0.29015 (0.302)	-0.05354 (0.311)
DWL_TYPE	0.00667 (0.829)	0.05642 (0.741)
PWR_S	0.11686* (0.000)	0.12045* (0.000)
GAS_S	0.09442* (0.009)	0.01008* (0.006)
WTR_DKR_SR_1	0.06060* (0.000)	0.07684* (0.000)
WTR_DKR_SR_2	0.08007*	0.05416*

	(0.002)	(0.007)
WTR_DKR_SR_3	0.02902	0.06034*
	(0.120)	(0.001)
WC_TYPE_1	0.07456	0.09039
	(0.199)	(0.122)
WC_TYPE_2	-0.13083	-0.16815
	(0.129)	(0.296)
Constant	10.68237	8.36862
	(0.000)	(0.000)
Observations	8,053	10,598
R-squared	0.6376	0.6386

Note: * values are significant at $p < 0.05$

In regression no.1 all variable that are included those are selected for study. Estimation results in the table 4.5 shows that for year 2005-2006 age positively and significantly affect housing unit prices. Estimation shows that 1year increase in age increases the housing price by 10%. Also, for year 2015-2016 age is significant and positively affecting by increasing the prices by 9.2%. Well these our results are like the results of the Ahmad et al. (2018). Annual incomes effect is also significant it for both years 2005-2006 and 2015-2016, for year 2005-2006 it increases the housing unit prices by 34%, and for 2015-2016 it increases the prices by 33.8%. These are like the results of Geng Niu (2014) he used income in his two model and in his results income turns out to be significant and positively affecting. No. of rooms also have positive and significant effect on housing unit prices with 1unit increase in no. of rooms for year 2005-2006 prices increases by 21%. And for the year 2015-2016 it increases the housing unit prices by 22%. Number of rooms has positive and significant effect on the housing prices, increase in the number of rooms increase the capacity of house which lead to raise the housing prices (Ahmad, 2007 and Krupka et al, 2009).

From estimation it's found that education status is a factor that effect the prices of housing units significantly. EDU4 that is education level of MA/M.Sc/equivalent is significant for both

years 2005-2006 and 2015-2016, for the year 2005-2006 it increases the price of housing unit by 2.6%. And for the year 2015-2016 it increases the prices by 4.5%. EDU5 that is Professional degrees e.g. engineering, medical, and law is also significant for both selected years and effects positively. For 2005-2006 EDU5 increases prices by 3.4%, and for 2015-2016 it increases the prices by 6%. EDU6 that is M.Phil/Ph.D. is significant, and estimation shows that it increases the housing prices in 2005-2006 by 4% and for 2015-2016 it increases the prices by 6.5%. As this is because higher education level leads to the higher employment and this in turns lead to high income and that would affect the price because with increased income affordability will increase. While here our results are same as Baranoff (2016) said beside income education level also have positive and significant influence on the prices of housing units in his analysis for San Francisco he found that people with education level of graduation or more have positive influence on the housing prices they tend to raise the prices.

The prices are also significantly dependent on the employment status and its represented in our model by dummies EMP, but their impact is not large as EMP1 that is employer for year 2005-2006 increases the housing unit prices by 5%, and for year 2015-2016 it increases the prices by 10%. EMP2 that refer to self-employed for year 2005-2006 it increases the prices of housing unit by 8% and for year 2015-2016 the prices are affected 15.4%. EMP3 that refers to paid employee for year 2005-2006 it increases prices by 6.4% and for year 2015-2016 12%. EMP4 that refer to Own cultivation/contract cultivator/livestock that effects the housing prices for year 2005-2006 is 9.6%, and for year 2015-2016 it affects 18%. This due greater the investment greater is the profit so businessman re-invest his major part of profit in his business to further expand. While for self-employed people it is like a security or side business or additional permanent income by having more than one unit and then renting out housing units and for paid

employee it is necessity and they use it some as saving for future and put their savings in it therefore their share is less than self-employed and Own cultivation/contract cultivator/live stockers well in case of Own cultivation/contract cultivator/live stockers they see it as an investment. Alkan et al. (2014) in his study for Turkish province found that nature of employment has the positive and significant impact on the housing demand that in turns lead to raise the prices his results are pretty much like ours he said officers and workers that are paid employee see housing as a saving and future security for children and self-employed have housing demand due to sense of present security for them and their children in case of some economic shock to them they also see it as additional permanent income in form of renting out housing units.

From estimation results we came to know another factor that effect the housing unit prices significantly but minorly is distance from the school. SCH_DIS_1 in 2005-2006 that is school with in the range of the 2km is affecting the prices and increases the prices 2.7%. Well for same SCH_DIS_1 the distance is given in time that is 0-14min for year 2015-2016 and it affects the price by 3%..While the SCH_DIS_2 & SCH_DIS_3 that in 2005-2006 is schools at distance of more than 2km and in 2015-2016 school at more than 14min travel away are not significant, but they are showing negative affect on prices. This is because education is basic need and necessity of young kids and if the school is near the housing unit then it will be preferred due to ease of pick and drop of kids by financial and time saving both prospective. These results are resembling with results of Thomas J. Kane et al. (2006) they while studying the school quality, neighborhoods and houses prices relation discovered that houses in range of 500feet to the school boundaries do affect the housed value and capitalize in houses prices but houses beyond 500 feet are not very much affecting the prices.

Another factor that is significant is distance from hospital/health clinic. HOS_DIS_1 that in year 2005-2006 is hospital/health clinic within range of 2km is increasing the price by 2.3%, and for year 2015-2016 it is hospital/health clinic at travel of maximum 14min and it increases the prices by approximately 2%. While the HOS_DIS_2 & HOS_DIS_3 which represents hospital/health clinic at distance of more than 2km/0-14min are showing negative impact, but they are not significant. This is because health facility e.g. hospital or clinic near housing unit is preferable. As Irfan (2007) in his research on Rawalpindi used a variable of distance from hospital and in his estimation results he found that along with other amenities distance from hospitals play important role in determining the value of housing unit closer the housing unit is to hospitals value of unit increases.

The effect of distance from the source of drinking water are not significant but they project a trend for both the year 2005-2006 and 2015-2016 inside source and distance less than 0.5km/0-14min are positive and dummies with distance above than 0.5/0-14min are showing negative sing. But the availability of sewerage facility affects the prices of housing unit significantly in both 2005-2006 and 2015-2016 and it increases the price for year 2005-2006 by 4%, and for the year 2015-2016 it affects the prices by 3.4%. Ihuah et al. (2014) showed that through his work in his paper that drainage system/ sewerage is among top 4 feature that play main role in determining the value of housing unit, and his work presence of drainage system/ sewerage is inducing positive and significant effect on value of housing unit. This is due to the physical need of human. While the occupancy status represented by dummies OCUP_ST is also insignificant but OCUP_ST_1 positive for both year 2005-2006 & 2015-2016 and OCUP_ST_2 shows negative sing. Dwelling type whether independent or not represented by DWL_TYPE is not significant for both selected years.

Availability of electricity and gas facilities turns out to be significant and affecting positively in estimation on housing unit prices. PWR_S that represent availability of electricity for 2005-2006 year affects the housing unit price by 11.6% and for 2015-2016 its affect is 12%. Ajibola et al. (2013) in his work said Electricity is 2nd most important facility for the determining the value of the housing unit. GAS_S that shows the availability of gas is causing of 9.4% effect on the prices for 2005-2006. And for 2015-2016 GAS_S is inducing 10% effect on housing unit prices.

One more factor that effect the price of housing unit is the source of drinking water that are represented by the dummies WTR_DKR_SR. The dummy WTR_DKR_SR_1 that is the piped water supply availability in both years 2005-2006 and 2015-2016 is significant and it increases the prices by 6% in estimates of 2005-2006. And for 2015-2016 it is influencing price 7.6%. WTR_DKR_SR_2 that shows the availability of hand pump/motorized/tube well/ open or closed well in both selected years. For 2005-2006 it is influencing the housing prices by 8%. For the year 2015-2016 it is influencing 5.4%. Well a thing different here is that WTR_DKR_SR_3 is significant for 2015-2016 because there it shows the sources mineral water/water tanker/filtration water and it is inducing the effect of 6% in housing unit price. These results are very much consistent with the results of Choumert et al. (2014) as they in their research in rwanda found that access to piped water and internal source of drinking water increases the values of housing units positively up to 20%. This is because they are internal sources of water that are available inside the housing unit and save time of travel and expenditure to fetch water beside this water from below earth is clean and fresh, so it affects positively on the prices of housing unit. And the supply of clean mineral water at home is good for health and time saving.

4.2. Regression No. 2

Table 4.2. Hedonic Price Regression No. 2 of 2005-06 & 2015-2016 (dependent variable is log prices of houses)

Variables	2005-2006	2015-2016
Age	0.12060* (0.000)	0.11329* (0.000)
Annual income	0.37082* (0.000)	0.36710* (0.000)
No. of rooms	0.23124* (0.000)	0.24016* (0.000)
EDU1	0.00431 (0.965)	0.44348 (0.721)
EDU2	0.00622 (0.236)	0.12558 (0.317)
EDU3	0.00943 (0.119)	0.22637 (0.865)
EDU4	0.04349* (0.000)	0.06517* (0.002)
EDU5	0.05728* (0.000)	0.07064* (0.001)
EDU6	0.06028* (0.001)	0.08543* (0.000)
EMP1	0.07001* (0.000)	0.09296* (0.000)
EMP2	0.10052* (0.007)	0.12065* (0.000)
EMP3	0.09031* (0.009)	0.11839* (0.001)
EMP4	0.12027* (0.000)	0.14093* (0.001)
SWRG	0.06243* (0.000)	0.05554* (0.000)
OCUP_ST_1	0.10259 (0.408)	0.07005 (0.561)
OCUP_ST_2	-0.29072 (0.304)	-0.06123 (0.328)
DWL_TYPE	0.00524 (0.866)	0.05778 (0.145)
PWR_S	0.13160* (0.009)	0.15079* (0.003)
GAS_S	0.11015* (0.000)	0.13209* (0.000)
WTR_DKR_SR_1	0.08080* (0.000)	0.10001* (0.000)
WTR_DKR_SR_2	0.10348* (0.000)	0.07649* (0.000)

	(0.003)	(0.001)
WTR_DKR_SR_3	0.29414	0.08490*
	(0.204)	(0.005)
WC_TYPE_1	0.05811	0.05924
	(0.502)	(0.129)
WC_TYPE_2	-0.16116	-0.16467
	(0.630)	(0.306)
Constant	10.41448	8.53090
	(0.000)	(0.000)
Observations	8,053	10,598
R-Squared	0.6284	0.6381

Note: * values are significant at $p < 0.05$

In regression no.2 the distances are excluded from the model. This is done to separate out effects of other variables on prices. Here age is significant for both years selected for studies. For 2005-2006 the age has 12% influence on the prices, and in case of 2015-2016 it has 11.3% influence on prices. Income is also another determinant of prices. Annual income is significant, and it is influencing the prices of housing unit 37% for year 2005-2006, and 36.7% for year 2015-2016. No. of rooms have significant and positive effect on prices of housing unit and they have approximately 23% influence on prices for year 2005-2006 and 2015-2016 they have 24% influence on prices.

Education level influences prices and its significant and it's being represented here by dummies. EDU4 that is MA/M.Sc is influencing the price by 4.3% for year 2005-2006, and it has 6.5% on prices for year 2015-2016. EDU5 that is professional degrees e.g. medical engineering & law has 5.7% influence on prices observed for year 2005-2006, and it has 7% influence on prices observed in 2015-2016. EDU6 that is M.Phil/Ph.D. has 6% influence on prices for year 2005-2006, and for year 2015-2016 it has 8.5% influence on prices.

Employment effects the housing unit prices and they have significant influence on prices. Dummies EMP represent employment here. EMP1 that is employer is influencing price by 7%

for year 2005-2006 and it has influence of 9.2% on prices for year 2015-2016. EMP2 that is self employed has the influence of 10% for year 2005-2006 and it influences 12% on price for year 2015-2016. EMP3 that is paid employee has 9% influence on prices of housing unit in year 2005-2006 shown by estimation and it has the influence of 11.8% on prices for the year 2015-2016 shown in table 4.6. EMP4 that is Own cultivation / contract cultivator / livestock shows that in table 4.2 that it has 12% influence on prices, and it has 14% influence on prices of housing units shown by table 4.6. The sewerage is influencing the prices by 6% for year 2005-2006 and 5.5% for 2015-2016 as shows the table 4.6.

Availability of electricity is influencing the prices and it is represented by PWR_S and have effect of 13% for the year 2005-2006 and 15% for the year 2015-2016 shown in table 4.6. While the availability of gas has also influence on prices and it has effect of 11% for year 2005-2006 and it has approximately 13% influence on prices of housing unit. One factor that effect the price of housing unit significantly shown by the table 4.6 is the source of drinking water that are represented by the dummies WTR_DKR_SR. The dummy WTR_DKR_SR_1 that is the piped water supply availability in both years 2005-2006 and 2015-2016 is significant and it increases the prices by 8% in estimates of 2005-2006. And for 2015-2016 it is influencing price 10% shown in table 4.6. WTR_DKR_SR_2 that shows the availability of hand pump/motorized/tube well / open or closed well in both selected years. For 2005-2006 it is influencing the housing prices by 10.3%. For the year 2015-2016 it is influencing 7.6%. Well a thing different here is that WTR_DKR_SR_3 is significant for 2015-2016 because there it shows the sources mineral water / water tanker / filtration water and it is inducing the effect of 8.4% in housing unit price. This is because they are internal sources of water that are available inside the housing unit and save time of travel and expenditure to fetch water beside this water from below earth is clean and

fresh so it affects positively on the prices of housing unit. And the supply of clean mineral water at home is good for health and time saving.

4.3. Regression No. 3

Table 4.3. Hedonic Price Regression No. 3 of 2005-06 & 2015-2016 (dependent variable is log prices of houses)

Variables	2005-2006	2015-2016
Age	0.31694* (0.001)	0.31065* (0.000)
No. of rooms	0.33483* (0.000)	0.34047* (0.000)
SCH_DIS_1	0.05098* (0.000)	0.06263* (0.005)
SCH_DIS_2	-0.14787 (0.371)	-0.00287 (0.950)
SCH_DIS_3	-0.18807 (0.419)	-0.00027 (0.967)
HOS_DIS_1	0.04368* (0.000)	0.05450* (0.006)
HOS_DIS_2	-0.09028 (0.171)	-0.00430 (0.803)
HOS_DIS_3	-0.33651 (0.198)	-0.01021 (0.836)
DKR_WTR_SR_DIS_0	0.10056 (0.220)	0.25358 (0.204)
DKR_WTR_SR_DIS_1	0.14221 (0.103)	0.25399 (0.166)
DKR_WTR_SR_DIS_2	-0.14327 (0.506)	-0.30468 (0.544)
SWRG	0.07035* (0.000)	0.08679* (0.000)
OCUP_ST_1	0.27108 (0.315)	0.14414 (0.257)
OCUP_ST_2	-0.39939 (0.624)	-0.13203 (0.532)
DWL_TYPE	0.02470 (0.380)	0.01831 (0.378)
PWR_S	0.13887* (0.003)	0.15269* (0.000)
GAS_S	0.11058* (0.001)	0.12305* (0.000)
WTR_DKR_SR_1	0.09678* (0.000)	0.09317* (0.000)

WTR_DKR_SR_2	0.09499*	0.08747
	(0.003)	(0.001)
WTR_DKR_SR_3	0.10861	0.08016*
	(0.799)	(0.003)
WC_TYPE_1	0.14639	0.12657*
	(0.233)	(0.220)
WC_TYPE_2	-0.08176	-0.16066
	(0.372)	(0.349)
Constant	12.04396	11.76566
	(0.000)	(0.000)
Observations	8,053	10,598
R-squared	0.5622	0.5589

Note: * values are significant at $p < 0.05$

In regression no.3 we have dropped the income, education level and employment status to see the effect of age and housing characteristics on the prices. According to Table 4.7 here age has influence on prices and for year 2005-2006 it influences the price 31.6% and for the year 2015-2016 it has influence of 31% on the prices. Another factor influences significantly on prices is no. of room and for the year 2005-2006 it has 33.4% effect on prices. While for year 2015-2016 it has 34% effect on prices.

Distance from school represented here by dummies named SCH_DIS and table 4.7 tells us that out of all school dummies only SCH_DIS_1 that shows availability of schooling/school within range of 2km for 2005-2006 and travel time up to 14min in 2015-2016 data is significant. SCH_DIS_1 has the effect of 5% on prices for year 2005-2006 and approximately 6% influence on price for the year 2015-2016.

Hospital/health clinic distance is also represented by dummies HOS_DIS and table 4.7 shows out them only HOS_DIS_1 is significant and it represent presence of hospital/health clinic within range of 2km for 2005-2006 and hospital/health at travel time up to 14min maximum in 2015-2016 data. HOS_DIS_1 has 4.3% effect on prices of housing unit, and it effect 5.4% on prices of housing unit for year 2015-2016.

It can be seen in table 4.7 that Sewerage availability is affecting the price as for the year 2005-2006 SWRG has influence of 7% on prices of housing unit, and for year 2015-2016 it has influence of approximately 8% on prices. The table 4.3 also shows us that availability of electricity and Gas that is represented by dummy PWR_S & GAS_S is significant. PWR_S has 13.8% influence on prices in estimation of year 2005-2006 and 15.2% effect on prices estimated for 2015-2016. And GAS_S has approximately 11% influence on price estimated for 2005-2006 and approximately 12% influence on prices in estimated of 2015-2016.

Table 4.7 shows that source of drinking water that are represented by the dummies WTR_DKR_SR. The dummy WTR_DKR_SR_1 that is the piped water supply availability in both years 2005-2006 and 2015-2016 is significant and it induces the prices by 9.6% in estimates of 2005-2006. And for 2015-2016 it is inducing 9.3% effect on price shown in table 4.3. WTR_DKR_SR_2 that shows the availability of hand pump/motorized/tube well/ open or closed well in both selected years. For 2005-2006 it is influencing the housing prices by 9.4%. For the year 2015-2016 it is influencing 8.7% on prices. Well a thing different here same as in 2 models we estimated before is that WTR_DKR_SR_3 is significant for 2015-2016 because there it shows the sources mineral water/water tanker/filtration water and it is inducing 8% on the housing unit price.

4.4. Regression No. 4

Table 4.4. Hedonic Price Regression No. 4 of 2005-06 & 2015-2016 (dependent variable is log prices of houses)

Variables	2005-2006	2015-2016
No. of rooms	0.45051* (0.000)	0.48722* (0.000)
SCH_DIS_1	0.14241*	0.16371*

	(0.000)	(0.000)
SCH_DIS_2	-0.15140	-0.00615
	(0.331)	(0.893)
SCH_DIS_3	-0.19679	-0.00042
	(0.423)	(0.907)
HOS_DIS_1	0.12707*	0.12039*
	(0.000)	(0.003)
HOS_DIS_2	-0.09400	-0.00539
	(0.155)	(0.767)
HOS_DIS_3	-0.33967	-0.01017
	(0.563)	(0.837)
DKR_WTR_SR_DIS_0	0.10820	0.23476
	(0.501)	(0.611)
DKR_WTR_SR_DIS_1	0.14847	0.24173
	(0.713)	(0.805)
DKR_WTR_SR_DIS_2	-0.12487	-0.29152
	(0.963)	(0.995)
SWRG	0.08137*	0.09970*
	(0.000)	(0.000)
OCUP_ST_1	0.27635	0.16352
	(0.342)	(0.574)
OCUP_ST_2	-0.40594	-0.15241
	(0.434)	(0.687)
DWL_TYPE	-0.02286	0.02697
	(0.486)	(0.196)
PWR_S	0.14016*	0.16169*
	(0.004)	(0.000)
GAS_S	0.12025*	0.13455*
	(0.000)	(0.000)
WTR_DKR_SR_1	0.10722*	0.10634*
	(0.002)	(0.004)
WTR_DKR_SR_2	0.10366*	0.09425*
	(0.000)	(0.000)
WTR_DKR_SR_3	0.32222	0.09642*
	(0.451)	(0.000)
WC_TYPE_1	0.14167	0.13701
	(0.290)	(0.131)
WC_TYPE_2	-0.08757	-0.20177
	(0.339)	(0.241)
Constant	12.40967	12.81737
	(0.000)	(0.000)
Observation	8,053	10,598
R-Squared	0.5614	0.5519

Note: * values are significant at $p < 0.05$

In regression no.4 we have included only housing characteristics so that we can observe the influence alone housing characteristics cause on the prices of housing units. No. of rooms that is

significant causes 45% influence on prices for year 2005-2006, and it causes 48.7% influence on the prices in the estimates of year 2015-2016 shown in table 4.8. Distance from schools is represented by SCH_DIS dummies and out these SCH_DIS_1 that is school in range of 2km for 2005-2006 and school in distance 14min travel for 2015-2016 are significant shown by table 4.8. SCH_DIS_1 causes 14.2% effect on prices in estimation of 2005-2006 year, and it causes 16.3% change in the prices for 2015-2016. Dummies are used for Hospital/Health clinic distance and one of them is significant and positively affecting prices and dummies representing it are named HOS_DIS. HOS_DIS_1 is influencing 12.7% for year 2005-2006, and 12% for 2015-2016 estimation respectively shown in table 4.8. Availability of sewerage is significant in table 4.8 and it is influencing 8.1% on prices in year 2005-2006 estimates, and 9.9% for year 2015-2016. Availability of the electricity also turns out to be significant in table 4.8 that is represented by the PWR_S that has 14% influence on prices for the year 2005-2006, and 16% effect on the prices. While the availability of gas represented by GAS_S is influencing the prices by 12% for year 2005-2006 and 13% for year 2015-2016 respectively.

Table 4.8 shows that source of drinking water that are represented by the dummies WTR_DKR_SR. The dummy WTR_DKR_SR_1 that is the piped water supply availability in both years 2005-2006 and 2015-2016 is significant and it induces the prices by 10.6% in estimates of 2005-2006. And for 2015-2016 it is inducing 10.7% effect on price shown in table 4.8. WTR_DKR_SR_2 that shows the availability of hand pump/motorized/tube well/ open or closed well in both selected years. For 2005-2006 it is influencing the housing prices by 10.3%. For the year 2015-2016 it is influencing 9.4% on prices. Well a thing different here same as in 2 models we estimated before is that WTR_DKR_SR_3 is significant for 2015-2016 because there

it shows the sources mineral water/water tanker/filtration water and it is inducing 9.6% on the housing unit price.

4.5 Conclusion

The results explained above postulates that the income, number of rooms and age has more significant effect on house price than the other variables. However, the other variables like education, employment status, locational factor and amenities also significantly affect the house price. Well one thing to be noticed is that the impact of amenities and locational factors is increased in the results of 2015-2016, because demand for amenities increases and this has significant impact on the Housing Price.

Chapter 5

Conclusion

5.1. Conclusion

The scope of our study is to measure the effects of income and demographic characteristics on the prices of houses in Big cities of Punjab. We aimed to measure effects that influence prices in addition to income. As income is not the only factor in determining the prices because there are many needs of human these needs associated with different factors affect the prices among there are some are factors associated with the physical needs i.e. health care, electricity, gas water, drainage and latrine type others are social like education, employment. We aim to measure these demographic effects. On international level there is a lot of work done on the influence of demographic factors on value of housing units but in case Pakistan there is not enough work done on housing demand. But there is a deficit on price side and measuring such demographic characteristics. By measuring the effects of income and demographic factors on prices we can determine the exact effect of each of these on prices that would help us in development of the cities and facilities required by people. We obtained our data from PSLM/HIES as HIES is the survey that is conducted under PSLM and it gives statistics on housing prices and personal income. For statistical analysis we applied hedonic price model and technique we used for estimation is OLS regression. We used different variables some are in continuous and some are represented by dummy to see detail effect. The variables those turned out to be significant among them most influencing variable on price is income, after that number of rooms and then other variables like age, employment status and education level are significant and positively influencing prices. Out of other characteristics of the housing units' close range distance from

school and hospitals are significant and positively affecting prices as is an advantage to have schools at close range it saves time, finance and fatigue for both children and parents and having hospitals close to house is mean of ease in case of any health emergency situation you can easily reach hospital and have treatment. While another category of variable that turns out to be significant and have positive influence on prices is sewerage facility as smell and hygiene is involved in the case that is reason it is showing positive effect availability of electricity and is significant as now a days it is one of the necessities of human life and at last drinking water source is significant and positively effecting prices. As it is important for us to survive and dirty water is injurious to health and causes different diseases. Well its observed when we drop out some variables in 2nd ,3rd and 4th models' other variables affect increases. In conclusion we came to know that income is the major determinant of prices of housing units but not only determinant but alongside income other variables such as age, education level, employment status, distance from school and hospital, availability of sewerage electricity & gas more over drinking water source are the factors that influence the prices of housing units significantly.

5.2. Policy Recommendation

- I.** Education is vital for social survival and in our country many children are out of school and those who are enrolled many of them cover long distances to reach school, so government should build schools near high populated areas.
- II.** The provincial government provides medical facilities in different localities of the cities by providing small scale hospitals and health care centers.
- III.** As clean drinking water is basic physical need for human life and now a day's water pollution is causing many diseases like cholera and hepatitis so government should

provide filtration plants in every locality and maintain them properly for supply of clean drinking water to citizens.

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