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Determinants of Housing Demand in Urban Areas of Pakistan: Evidence from the PSLM

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The study attempts to investigate the determinants of housing demand in urban areas of Pakistan. The empirical analysis is carried out using the Pakistan Social and Living Standard Measurement (PSLM) survey 2004-05 and 2010-11. The hedonic price model is used for the estimation of house prices. In order to control the selectivity bias between the tenure choice and the quantity of housing services demanded, Heckman's two-step selection procedure is used. The empirical analysis shows that housing price and income (temporary and permanent) play an important role in the determination of the housing units' demand. An increase in houses' prices causes decrease in demand for the housing units while the housing demand increases when the permanent income increases. On the face of change or increase in the transitory income, the demand for housing units remains static, since people do not desire to make long-term decisions based on volatile income. To manage rising housing demand, government should focus on developing effective and enforced price control mechanisms.

Keywords: Urban Housing Demand, PSLM, Pakistan

1. INTRODUCTION

Housing is a basic human need and millions of people struggle to have a roof over their heads. In the face of unprecedented urbanisation and population growth many cities have accrued huge housing shortages, especially in developing and emerging economies. Estimates show that in 2010 around 980 million urban households lacked decent housing, as will another 600 million between 2010 and 2030. One billion new homes will be required worldwide by 2025, costing an estimated amount of $650 billion per year [UN-Habitat (2016)]. Although hundreds of new housing colonies have been established, the problem of finding a suitable accommodation in big cities persists. In 2014, more than 30 percent of urban population resided in slums in developing countries. Since every household is not able to build a house for itself, there is always a demand for rental houses. Housing, therefore, as a basic need became a challenging outlay of rapid urbanisation in most of the developing countries [UN-Habitat (2016)].

Housing demand is simply a housing need, which is backed up by the ability and willingness to pay. It depends on the different forms of behaviour of individuals, that how various households spend their limited resources, to fulfil their needs of housing units as well as their need for goods and services. The need of urban housing is affected by a

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number of factors, such as: rural to urban migration, increasing population, low investment in housing development, low purchasing power of household, poor urban infrastructure and geography [Fontenla, Gonzalez, and Navarro (2009); Oktay, Karaaslan, Alkan, and Kemal Çelik (2014); Saiz (2010)].

Pakistan is a developing country that accommodates the world's sixth largest population. The housing situation has remained under pressure in Pakistan. Pakistan has been confronting housing issues in both qualitative and quantitative terms. Pakistan is faced with a severe shortage of housing, particularly for low and middle-income groups. Estimates disclosed that there is a shortage of about 7.5 million housing units [SBP (2013)]. The gap between supply and demand is increasing by more than 0.35 million. This issue is more critical in urban regions, where accessibility of sufficient residences at affordable rents is getting scarcer by the day. Population growth, rising urbanisation and economic development have created huge housing backlog, especially in big cities. This has not only increased the need for new housing units, but has also created a huge burden on the existing housing units. The existing work on housing in Pakistan by Pasha and Ghaus (1990), Lodhi and Pasha (1991), Ahmed (1994) and Pasha and Butt (1996), represents the first few attempts at determining factors that affect housing demand. Very few studies have ventured into determining the housing demand across income groups [Shefer (1990) and Tiwari and Parikh (1998)].

Given this background, the prime objective of this study is to analyse the housing demand in urban areas of Pakistan. This study attempts to determine empirically, how the factors such as wealth, income and house prices influence the ability to own a house differently for low, middle and high-income groups. This study compares the influence of socio-economic factors on the housing demand for two different time periods i.e. 2004-05 and 2010-11. In 2004-05, the housing market boomed while in 2010-11 the housing market was faced with recession.

This study makes a significant contribution to literature in various contexts. First, the study identifies all the possible factors, affecting the housing demand at national, provincial and income groups' levels. Second, this study compares the influence of socio-economic factors on housing demand for two different time periods i.e. 2004-05 and 2010-11. In 2004-05, the housing market was at its boom while in 2010-11 housing market was faced with recession. Both periods, therefore, have different implications for housing demand. This comparison helps in designing appropriate policies according to the contemporary state of the housing market. Different factors contribute differently towards housing demand on the face of two contrast economic cycles.

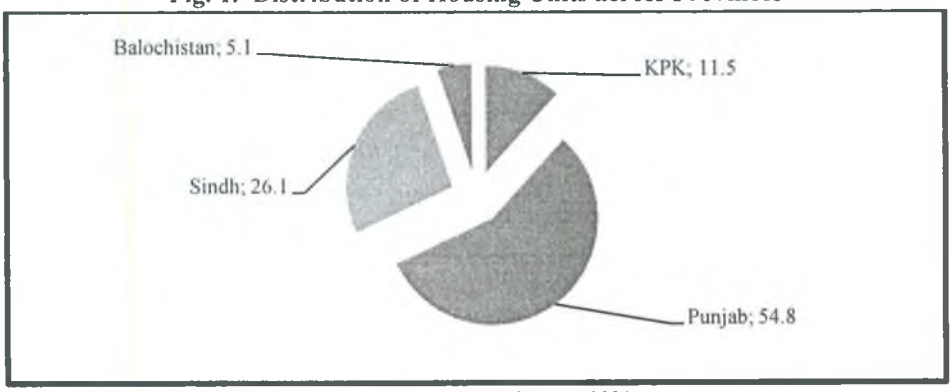
Following the conventional housing studies, this study determines a house price by employing the hedonic price model. Unlike most studies on developing countries, this study quantified the relationship between the housing demand and its covariates, by using an econometric framework, augmented by Heckman's two-step selection procedure that controls selectivity bias between the tenure choice and quantity of housing services demanded. Margins for probability of house ownership are calculated by using the Probit model. Permanent and Transitory income is also estimated according to the permanent income hypothesis. Another aspect, not commonly found in studies for developing countries, including Pakistan, is determining the separate effect of permanent and more importantly transitory income on housing demand. The log-linear model is estimated using the Ordinary Least Square (OLS) technique.

The rest of the paper is organised as follows: section 2 presents the state of housing in Pakistan with special focus on National Housing Policy; section 3 layouts the conceptual framework of the study, describes data and estimation methodology; section 4 explains the results and last section concludes the discussion with policy suggestions.

2. STATE OF HOUSING IN PAKISTAN

According to Population Census 1998, the stock of housing units was 19.2 million in 1998. Figure 1 represents the distribution of housing units across the provinces. Figure 1 indicates that in 1998, 55 percent housing units were in Punjab, 26 percent in Sindh, 11.5 percent in KPK and 5.1 percent in Balochistan. The stock of housing units was 12.5 million in 1981.

Fig. 1. Distribution of Housing Units across Provinces



Source: Authors' own calculation based on the "Population Census 1998".

The housing units, as a percentage of the total population remained almost the same across provinces. The housing units as a percentage of the total population have declined from 14.6 percent in 1981 to 12.5 percent in 1998 in KPK. The housing units as a percentage of the total population have declined from 15.9 percent in 1981 to 14.3 percent in 1998 in Punjab. On the other hand, the housing units as a percentage of the total population has increased from 14.6 percent in 1981 to 16.5 percent in 1998 in Sindh and from 13.6 percent in 1981 to 14.8 percent in 1998 in Balochistan. The increase in housing units was primarily observed in rural areas of Sindh and Balochistan during that period. But, on the other hand, decline has been recorded in urban areas of Sindh and Balochistan during this period (Table 1).

Table 2 presents the "nature of tenure" at national level across the rural and urban areas. The nature of tenure was measured using three categories, including "owned house", "rented house" and "rent free house". The data uncovered that the owned dwellings have increased from 78.4 percent in 1981 to 81.2 percent in 1998. There was no significant change in the ratio of owned houses from 1998 to 2012-13. The statistics have established that around 86 percent dwellings are owner occupied (Table 2). Similar patterns have been observed across rural and urban areas of Pakistan. There was not a huge change across rural and urban areas in the ratio of owned houses from 1981 to 1998 (Table 2)

Table 1

Housing Units (Trend Analysis)

Region	All Areas		Rural		Urban	
	1981	1998	1981	1998	1981	1998
	Housing units (million)					
Pakistan	12.51	19.21	9.01	13.18	3.50	6.03
KPK	1.61	2.21	1.38	1.84	0.23	0.37
Punjab	7.53	10.54	5.57	7.34	1.96	3.20
Sindh	2.78	5.02	1.56	2.85	1.22	2.17
Balochistan	0.59	0.97	0.50	0.78	0.09	0.20
	Housing units as percent of total across the rural urban					
Pakistan	100.0	100.0	72.0	68.6	28.0	31.4
KPK	100.0	100.0	85.7	83.3	14.3	16.7
Punjab	100.0	100.0	74.0	69.6	26.0	30.4
Sindh	100.0	100.0	56.1	56.8	43.9	43.2
Balochistan	100.0	100.0	84.7	79.9	15.3	20.1
	Housing units as percent of total across the provinces					
Pakistan	100.0	100.0	100.0	100.0	100.0	100.0
KPK	12.9	11.5	15.3	14.0	6.6	6.1
Punjab	60.2	54.8	61.8	55.7	56.0	53.1
Sindh	22.2	26.1	17.3	21.6	34.9	36.0
Balochistan	4.7	5.1	5.5	5.9	2.6	3.2
	Persons per housing unit					
Pakistan	6.73	6.89	6.70	6.78	6.83	7.14
KPK	6.87	8.03	6.81	8.01	7.39	8.08
Punjab	6.28	6.98	6.16	6.89	6.63	7.19
Sindh	6.84	6.06	5.26	5.47	8.85	6.84
Balochistan	7.32	6.76	7.40	6.40	7.78	7.85

Source: Population Census (1981, 1998).

Table 2

Nature of Tenure (Percentages) by Rural/Urban Areas

	1981			1998			2004-05			2010-11		
Nature of Tenure	All Areas	Rural	Urban	All Areas	Rural	Urban	All Areas	Rural	Urban	All Areas	Rural	Urban
All Types	100	100	100	100	100	100	100	100	100	100	100	100
Owned	78.4	82.6	67.7	81.2	86.8	68.9	86.6	92.8	78.4	85.9	91.2	75.7
Rented	7.7	2.2	21.9	8.6	2.2	22.7	8.1	1.5	16.8	8.1	2.0	19.9
Rent Free	13.9	15.2	10.5	10.2	11.0	8.4	5.3	5.7	4.8	6.0	6.8	4.4

Source: Population Census (1981, 1998); PSLM (2004-05 and 2010-11).

Various indicators are used to examine the level of congestions within the housing unit. In this context we use persons per housing unit, person per room, single room housing units, two rooms housing units and three to four rooms housing units. Census of 1981 and 1998 established that in Pakistan persons per housing unit were 6.70 and 6.80 percent in 1981 and in 1998 respectively and the number of persons per room was 3.50

and 3.13. On the other hand, it was noticed that 51.54 and 38.11 percent people were living in one room, whereas 44.83 and 30.54 percent, 3.63 and 24.43percent, 6.70 and 6.92 percent people were living in two rooms, three to four rooms and five or more rooms respectively (Table 3 and Table 4).

Table 3

Congestion of Housing Units

Indicators	Pakistan	KPK	Punjab	Sindh	Balochistan
			1981		
Persons per Housing Unit	6.70	7.00	6.50	7.10	7.60
Persons per Room	3.50	3.60	3.30	4.00	4.20
Single Room Housing Units (%)	51.54	50.00	48.00	61.00	60.00
Two Rooms Housing Units (%)	44.83	4.00	48.00	36.00	36.00
3-4 Rooms Housing Units (%)	3.63	46.00	4.00	3.00	4.00
5 and more Rooms Housing Units (%)	6.70	7.00	6.50	7.10	7.60
			1998		
Persons per Housing Unit	6.80	8.00	6.90	6.00	6.70
Persons per Room	3.13	3.34	3.04	3.37	3.07
Single Room Housing Units (%)	38.11	27.71	31.97	56.93	42.77
Two Rooms Housing Units (%)	30.54	34.50	33.54	23.87	25.18
3-4 Rooms Housing Units (%)	24.43	29.11	27.12.	17.00	22.69
5 and more Rooms Housing Units (%)	6.92	8.67	7.36	3.56	9.36

Source: Population Census (1981 and 1998).

Table 4

Congestion of Housing Units

Indicators	Pakistan	KPK	Punjab	Sindh	Balochistan
			2004-05		
Persons per Housing Unit	6.75	7.71	6.55	6.71	6.88
Single Room Housing Units (%)	24.20	18.35	24.75	30.76	14.79
2-4 Rooms Housing Units (%)	68.71	69.90	68.69	65.00	75.78
5 and more Rooms Housing Units (%)	7.09	11.75	6.56	4.24	9.43
			2010-11		
Persons per Housing Unit	6.38	7.17	6.16	6.39	7.08
Single Room Housing Units (%)	24.83	19.03	26.09	25.67	20.89
2-4 Rooms Housing units (%)	69.33	72.62	67.49	70.94	75.02
5 and more Rooms Housing units (%)	5.84	8.32	6.43	3.39	4.09

Source: PSLM (2004-05 and 2010-11).

The gap between supply and demand for housing is persistently rising in Pakistan. The previous section clearly indicates that per annum housing demand is around 0.35 million. The unavailability of new housing unit increases the congestion and homeless people in the country. This calls for governmental intervention to provide decent accommodation to every household. Pakistan had no housing policy at national and even provincial level till 1992. First National Housing Policy was developed in 1992, which was revised in 1994. This policy proposed various innovative methods for increasing housing stock and improving the quality of existing housing units. The government, nevertheless, failed in implementing this policy. Later on, the government of Pakistan had formulated a National Housing Policy (NHP) in 2001.

The NHP 2001 covers all major issues related to housing market, such as land issues, housing finance, construction service sector, low cost rural housing, building material, infrastructure development, zoning regulations and institutional arrangements. The NHP 2001 highlights key challenges to housing sector and proposes some strategies to resolve those issues and challenges and spells out the aims with key objectives. Following are the key problems and issues that were highlighted in the NHP 2001:

(i) The housing related issues are mainly generated by huge population growth.
(ii) The per annum housing requirement is 0.57 million.
(iii) The unchecked growth of squatter settlements, *Katchi Abadis*, encroachment of state and vacant land is held responsible for housing shortages.
(iv) Scarcity of suitable land for housing, particularly in and around the urban centres.
(v) Affordability issues, especially for low-income group.
(vi) The housing stock is rapidly aging.
(vii) Shortage of affordable housing finance to be major obstacle in housing production.
(viii) Tremendous rise in price of housing material because of inflationary pressure.
(ix) Lack of the use of technology.

To overcome these issues and meet the future housing requirements, with low cost and high quality, the proposed NHP 2001 was intended to achieve the following aims and objectives:

(i) To propose an enabling strategy for capacity building and institutional arrangements.
(ii) Empowering all stakeholders, including public as well as private sector for housing market development.
(iii) To propose a strategy for easing housing finance and home improvement credits which are compatible with affordability, especially for low-income group.
(iv) Strategy to improve the housing conditions through development, capacity building and initiation of innovative ideas.
(v) Strategy to upgrade the existing cities with better planning through the improvement of infrastructure.
(vi) Encourage research and development activities to design low cost houses.
(vii) Provision of safeguard against malpractices and resource mobilisation.
(viii) Provision of incentives through tax rationalisation.
(ix) A countrywide program of developing small and medium size towns having growth potential.

3. CONCEPTUAL FRAMEWORK, DATA AND ESTIMATION METHODOLOGY

3.1. Conceptual Framework

To put the above discussion in a framework, we followed the work of Goodman (1998), Zabal (2004) and Fontenla and Gonzalez (2009). These studies have used the utility maximisation approach as a framework to understand the housing demand dynamics. Let individual i's utility function in market j depends on two goods: (i) non-

housing composite consumption, denoted by C_{ij} and (ii) the amount of housing units, denoted by q_{ij}. We also assume that households have the same utility function but differ in their socio-demographic characteristics. These socio-demographic characteristics are denoted by z_i. The vector z includes variables such as age of the head of the household, gender and education, social status and migration. The utility function of the household can be written as follows:

$$U_{ij} = U(C_{ij} \quad q_{ij} \quad z_i) \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

Assuming a static setting, the objective of an individual is to maximise the utility, given the budget constraints. An individual chooses how to allocate his/her income to non-housing composite consumption (C_{ij}) and the housing services (q_{ij}). The budget constraint of an individual can be defined as follows:

$$C_{ij} = p_i q_{ij} = m_{ij} \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

Where m is the household's income, p is the price of housing services and the price of non-housing consumption is normalised to one. We allow housing prices to be different across markets.

The household's utility maximisation problem is defined as follows:

$$\begin{aligned} &\text{Max}_{C_{ij}, q_{ij}} U(C_{ij} \quad q_{ij} \quad z_i) \\ &\qquad st \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3) \\ &C_{ij} + p_j q_{ij} = m_{ij} \end{aligned}$$

Solving the budget constraint for C_{ij} and substituting into the utility function gives the indirect utility function. The budget constraint can be written as follows:

$$C_{ij} = m_{ij} - p_i q_{ij} \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (4)$$

Now substituting Equation 4 in the utility function, we get the following indirect utility function

$$V_{ij} = \text{Max}_{qij}\, U(m_{ij} - p_i q_{ij}, \quad q_{ij}, \quad z_i) \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (5)$$

Solving Equation (5) yields the (implicit) housing demand equation

$$p = \frac{\frac{\partial V}{\partial q_i}}{\frac{\partial V}{\partial m_i}} \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (6)$$

Providing a specific form for the utility function (1), will give rise to an explicit housing demand equation. While many utility functions result in non-linear demand equations, typically a log-linear housing demand equation is specified

$$\ln q_{ij} = \beta_0 + \beta_1 \ln p + \beta_2 \ln z_i \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (7)$$

This equation can be assumed to be an approximation to the underlying (non-linear) housing demand equation. We analysed the housing demand in Pakistan with the use of this model. Estimating the implicit parameters of Equation (7) is the main purpose. We usually observe the value of the housing unit rather than the quantity. Thus, q_{ij} has to be estimated in order to obtain Equation (7). An important feature of the housing market

is that the physical and surrounding characteristics of the housing units are important, yet they vary widely across the housing units.

Define H_n as the vector that represents housing characteristics for housing unit n. Similarly, β_j is defined as the parameter vector, which is allowed to vary across markets, for each of the housing unit characteristics in H_n. Thus the value v of a housing unit n in market j, consumed by household i, is given by the following expression:

$$V_{nj}^{i} = V(H_n; \beta_j) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (8)$$

If the characteristics H_n and the value $v_{n,j}^{i}$ of each housing unit are known, then it is possible to estimate β_j, using a hedonic price model. In addition, defining H_n^* as the standard unit we can compute the price index p_j as follows:

$$\bar{p}_j = \frac{V(H_n^*;\beta_j)}{V(H_n^*;\beta_1)} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (9)$$

The value of the housing unit n in market j, consumed by the household i can be expressed as $v_{n,j}^{i} = q_{ij}.p_j$. The quantity, therefore, of housing is obtained as follows:

$$q_{ij} = \frac{v_{nj}^{i}}{p_j} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (10)$$

Once we know the q_{ij}, we can estimate the Equation 7.

3.2. Data

To estimate the demand for housing, data of various social and economic indicators is taken from Pakistan Social and Living Standards Measurement Survey (PSLM) and Household Integrated Economic Survey (HIES), conducted by Pakistan Bureau of Statistics (PBS). In this study, PSLM survey data for the year 2004-05 and 2010-11 is taken.

We are using a set of population based social indicators for 16341 households from PSLM/HIES national level data. The data on household information covers education, health, employment and income as well as ownership of assets, household details, immunisation, married women, facilities and services. Additionally, it offers data on household consumption expenditures (including consumption on durable items owned/sold), transfer received and paid out and buildings and land owned. Population of all the four provinces is considered as the universal sample. Under the framework of PSLM/HIES each city/town was sub divided into enumeration blocks. Urban areas were divided into 26698 blocks and rural areas comprised of 50588 blocks. Each urban block was categorised on the basis of income groups. The selection of Primary Sample Units (PSU) and Secondary Sample Units (SSUs) data from urban and rural areas of each province has been discussed in Table 5.

Table 5 indicates that the entire sample of households has been drawn from 1045 Primary Sample Units (PSUs) in 2004-05, out of which 486 are urban and 559 are rural and 1180 Primary Sample Units (PSUs) in 2010-11, out of which 564 are urban and 616 are rural. The total sample is 14777 in 2004-05 and 16341 in 2010-11. This sample size has been considered sufficient to produce estimates of key variables at national and provincial levels [Pakistan (2012)].

Table 5

Profile of the Sample of PSLM Survey (2004-05 and 2010-11)

Province/Area	Sample PSUs			Sample SSUs		
	Urban	Rural	Total	Urban	Rural	Total
		2010-11				
Punjab	256	256	512	2935	4019	6954
Sindh	152	144	296	1802	2296	4098
Khyber Pakhtunkhwa	88	120	208	1041	1913	2954
Balochistan	68	96	164	811	1524	2335
Total	564	616	1180	6589	9752	16341
		2004-05				
Punjab	210	226	436	2511	3607	6118
Sindh	125	125	250	1497	1980	3477
Khyber Pakhtunkhwa	91	118	209	1088	1878	2966
Balochistan	60	90	150	713	1434	2147
Total	486	559	1045	5809	8899	14708

Source: PSLM/HIES (2004-05 and 2010-11).

3.3. Estimation Methodology

In this study, we seek to determine the factors that impact the demand for housing and its services across income groups. Additionally, welfare impact across income groups is also determined for 2004-05 and 2010-11, that will clarify whether the housing units owned by the income-based groups are better off or worse off. For the purpose of analysis, this model includes $m = 1 \ldots M$ urban areas. In each urban area there are $i = 1 \ldots I_m$ individual household heads and $j = 1 \ldots J_m$ housing units. The analysis, therefore, considers each city as a separate entity across income groups.

3.3.1. *Housing Demand Model*

The model explained in previous section indicates that various socio-economic variables explain the housing demand. These factors include different physical and community attributes, such as number of rooms, dummy variable for owner occupied or rented unit as well as the availability of housing services, including pipe-water, motors, hand pumps or others. The community attributes include whether a housing unit is located in a city, number of earners and educated members in the household. Moreover, attributes related to head of the household are age, gender, education, marital status, employment status and occupation. In this study, we consider the household head as a special case. Thus demand for housing can be represented as a function of personal characteristic of the household head, background of the household and price of housing. The functional form of housing demand highlighted in Equation 7 at maximum utility level is given below:

$$q(z) = f(X_1, Y, C, p_j(z)) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (11)$$

For each housing characteristic "z_{ij}" the $q(z)$ presents the quantity of individual housing unit, which is to be estimated. X_1 refers to the household characteristics such as family size, income group it belongs to and the number of earners. Income of household is represented by Y which is the sum of permanent income and transitory income.

Characteristics of the head of the household is represented by C, including education of the household head, age of the household head, occupation, marital status and gender. Finally, $p_j(z)$ denotes the price of the individual household which is not available for household data. A proxy, therefore, is used to capture the price of the house estimated, using hedonic price model. In order to estimate the demand for housing, we first need to calculate the quantity of housing unit (q (z)), house price ($p_j(z)$), permanent income (Y_P) and transitory income (Y_T). Thus the demand for housing is determined as

$$Y_i = x_i'\beta + e_i \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (12)$$

In Equation (12), Y_i represents the housing quantity and $x_i'$is a vector with dimensions 1 x M, representing all exogenous variables included in the model. β is a vector of parameters with M x 1 dimensions. The following Ordinary Least Square (OLS) regression equation specifications used for housing demand in log-linear form is given as:

$$q(z) = \beta_0 + \beta_1 lnY_P + \beta_2 lnY_T + \beta_3 \ln\left(p_j(z)\right) + \beta_4 lnA_{R/Y} + \beta_5 lnA + \beta_6 lnE_r + \beta_7 lnE_d + \beta_8 lnF_s + \delta_1 ln(male) + \delta_2 lnM + \delta_3 lnY_M + \delta_4 lnY_H + \sum_{m=1}^{14} \delta_m Ct + e_i \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (13)$$

Where, β is the coefficient of exogenous variables and δ is the coefficient used for dummies. The interpretation of the variables is as: $q(z)$ is the quantity of housing unit (defined in equation 10), Y_P is the permanent income of the household, Y_T represents the transitory income, $p_j(z)$ is the price of housing unit, $A_{R/Y}$ is the affordability of the individual household head, A is the age of the household head, E_r represents the number of earners in a household, E_d is the education of the household head, F_s is the family size (children and adults), *male* is the dummy, representing the gender of the household head (=1 if male; = 0 if female), M is the marital status (=1 if married; =0 otherwise), Y_M is the dummy for middle-income group (=1 if middle-income group; = 0 otherwise), Y_H is the dummy for high-income group (=1 if high-income group; = 0 otherwise), Ct represents the dummy for the 14 urban cities of Pakistan selected in this study and e_i is the error term. Moreover, all the variables used are in its log form for reducing changes including extreme values in parametric estimation. Additionally, it also reduces the heteroscedasticity in data.

3.3.2. *Housing Quality*

In order to estimate the housing demand, dependent variable i.e. quality of housing units is first calculated following Dusansky and Koc (2007).

$$Standardized\ Housing\ unit\ \left(q(z)\right) = \frac{(owner-occupied\ housing\ value\ )}{house\ price\ per\ unit\ p_j} \quad \ldots \quad (14)$$

The market value of the house is used as a proxy to measure the owner-occupied housing value, which refers to the price of the house acceptable if he wishes to sell his property. The housing price per unit represents the hedonic price $p_j(z)$. Some studies also used rent (rent equivalent) instead of owner-occupied housing value for the calculation of housing units [Hernández and García (2006); Garabato and Sarasola (2011)]. The demanded quantity of housing calculated in Equation (14) is used to calculate the factors that affect housing demand.

3.3.3. *Permanent and Transitory Income*

There are many views regarding the modelling of the unobservable variables, such as permanent income and transitory income. Friedman (1957) states that the consumption is the function of permanent income, but his point of view was criticised as the consumption decision of the household are forward-looking. It was looked at as a poor determinant to measure the permanent income. Though, permanent income cannot be measured directly, it is estimated using physical and human resources, such as education, property and experience, which contribute in generating income. Singh, *et al.* (1986) states that the determinants of permanent income are the household characteristics, physical assets, education, community and environmental attributes. It was, nonetheless, argued that the physical assets are a weak determinant of permanent income, as physical assets may underline a different level of permanent income in different countries. Because of the environmental and economic factors, the price of physical assets is distorted and it represents different proportion of ownerships, thus the level of permanent income. Many different approaches are discussed in literature to measure permanent income, Townsend, *et al.* (1985). Some used qualitative approach while others used rapid rural appraisal (RRA) approach [Takasaki, *et al.* (2000)]. Shefer (1990), Ahmed (1994) and Ballesteros (2001) used the expenditures on consumption as a proxy to measure permanent income.

There are some studies, nevertheless, that used a set of different individual characteristics such as education, age, skills, wages, bonus, pension, on job training capital gain, inheritance and savings [Goodman and Kawai (1984); Ahmed (1994); Wang (1995); Goodman (2002)]. Thus, following Goodman and Kawai (1984) and Goodman (2002), we expressed permanent income as a function of human and non-human wealth:

$$Y_P = f(H, N) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (15)$$

Where, H is the human wealth and N represents the non-human wealth. The human wealth demands the expected future income such as bonus and increments (annual increase in income on constant rate) and the current income, which depends on the individual household characteristics such as age, education, gender, marital status, occupation, employment status, number of earners in a household and family size. Non-human wealth accounts for the income received from other resources, such as remittances and income from commercial or non- agricultural property.

Thus, the permanent income measure represents the potential lifetime earnings and by regressing the real observed total income on the independent variables, provides the permanent income as fitted value of the regression and transitory income as residual. Observed total income is indicated as the sum of permanent and transitory income is highlighted in Equation (16) as:

$$Y = Y_P(H, N) + Y_T \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (16)$$

Linear regression model is represented as:

$$Y = \beta_0 + \beta_1 lnA + \beta_2 lnE_r + \beta_3 lnE_d + \beta_4 lnF_s + \beta_5 lnR_m + \delta_1 ln(male) + \delta_2 lnM + \delta_3 lnE_P + \delta_4 O_C + \delta_5 lnY_M + \delta_6 lnY_H + \sum_{m=1}^{14} \delta_m Ct + e_i \quad \ldots \quad (17)$$

Where, β is the coefficient of exogenous variables and δ is the coefficient used for dummies. Y represents the observed total income, A is the age of the household head, E_r represents the number of earners in a household, E_d is the education of the household head, F_s is the family size (children and adults), R_m is the remittances, *male* is the dummy representing the gender of the household head (=1 if male; = 0 if female), M is the marital status (=1 if married; = 0 otherwise), E_P is the dummy for employment status (=1 if employed; = 0 otherwise), O_C represents the occupancy: whether the housing unit is owner occupied, rented, subsidised rent or rent free, Y_M is the dummy for middle-income group (=1 if middle-income group; = 0 otherwise), Y_H is the dummy for high-income group (=1 if high-income group; = 0 otherwise), Ct represents the dummy for the cities and e_i is the error term. Thus the predicted income is the required permanent income (Y_P) and the residual is saved as transitory income (Y_T).

Various income measures can be estimated using different sets of explanatory variables, but the best fitted regression model for which the standard error is minimum, is chosen for the analysis.

3.3.4. *House Price*

Since house prices are not available in the data set of PSLM, it is estimated using the hedonic price model. The price of the house is determined by the internal characteristics as well as the external factors. There are other underlying issues that cause difficulties towards calculating the price of unobserved variables. Firstly, price of the property is not the same in each period; the house price varies because of the supply and demand factors that determine the price. Thus, the price is not same for two consecutive periods. Secondly, such as many other products, properties of house traded in market are not identical. The price changes, therefore, because of the characteristics of property (number of rooms, appearance, source of water, availability of gas, electricity, telephone, means of sewage), location attributes (close to market area, office, school, hospital, neighbourhood and others) and environmental attributes (urban, rural, industrial area, air or water pollution) [Herath and Maier (2010)]. Thus, these attributes cannot be ignored while calculating the house price.

The household survey data provides information about the expected value of the house/property, if it is put up for sale and is reported as the owner-occupied housing value. Owner-occupied housing value represents the product of housing price per unit and standardised housing unit. The value of the housing price is extracted from the owner-occupied housing value using hedonic regression. Following Goodman and Kawai (1984) and Goodman (2002), house price per unit can be calculated using hedonic price model, which is a more sophisticated form of mix adjustment. The hedonic regression, in terms of set of features that contributes to the value of house is as follows:

$$\begin{aligned} lnP = {} & \alpha + \beta_1 lnH_S + \beta_2 lnT_H + \gamma_1 lnW_P + \gamma_2 lnW_{HP} + \gamma_3 lnW_M + \gamma_4 lnG_{AS} + \\ & \gamma_5 lnTS + \gamma_6 lnTPT + \gamma_7 lnTPS + \gamma_8 lnTMS + \gamma_9 lnTHS + \gamma_{10} lnTHP + \\ & \delta_3 lnY_M + \delta_4 lnY_H + \sum_{m=1}^{14} \delta_m lnCt + e \qquad \ldots \qquad \ldots \qquad \ldots \quad (18) \end{aligned}$$

Where, P is the owner-occupied housing value, number of rooms is used as a proxy to measure the house size and is represented by H_S, T_H is the house tax, W_P is the dummy for piped water (= 1 if piped water; = 0 otherwise), W_{HP} is the dummy for water from hand pump

(= 1 if water from hand pump; = 0 otherwise), W_M represents the dummy for water availability from motor (= 1 if water from motor; = 0 otherwise), G_{AS} is the dummy for availability of gas (= 1 if gas is available; = 0 otherwise), *TS* denotes the time (in minutes) required to reach a grocery shop, *TPT* represents the time (in minutes) required to reach a public transport, *TPS* characterises the time (in minutes) required to reach a primary school, *TMS* represents the time (in minutes) required to reach a middle school, *THS* represents the time (in minutes) required to reach a high school, *THP* symbolises the time (in minutes) required to reach a hospital, Y_M is the dummy for middle-income group (=1 if middle-income group; = 0 otherwise), Y_H is the dummy for high-income group (=1 if high-income group; = 0 otherwise), *Ct* represents the dummy for the 14 urban cities and e is the error term. β is the coefficient of exogenous variables and δ is the coefficient used for dummies. Taking logs of the variables are considered to ensure that the prices are non-negative. This regression model used values of the above mentioned features to predict the price of housing unit during a particular period. The fitted values generated from the hedonic regression are the required prices per house for the standardised housing units. Dusansky and Koc (2007) are of the view that prices generated from the hedonic method represent the prices of the same sized house across cities. Hedonic price modelling is commonly used in real estate for sales comparison. Thus, allow the comparison between prices of constant quality housing across cities over a particular time period.

3.3.5. *Imputed Rent*

For the calculation of standardised unit of housing, we also need to estimate affordability. In literature, affordability is defined as the ratio of rent to total income [Tiwari and Parikh (1998)]. Housing expense is commonly measured through rent. Malpezzi and Mayo (1985) considered rent as the product of unit price and quantity consumed, depending on the housing services. It varies for individual household, depending on the shelter, type of construction, dwelling and neighbourhood. The conventional hedonic regression model can also be used to measure imputed rent. The hedonic equation for house rent is specified as:

$$R = f(R_T, W_T, G_{AS}, T_F, W) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (19)$$

The house rent is measured against the set of characteristics of the housing unit, which are specified as follows: R_T is the type of roof, it may be made of rcc/rbc, wood/bamboo, steel/cement or other; G_{AS} represent the dummy for availability of gas, $T_F$represents the toilet facility (outdoor, flush, pit/latrine or others), W represents the water availability (piped, hand pump, motor or other) and W_T refers to type of walls i.e. brick, cement, stone, wood, bamboo or mud. After the hedonic regress, fitted value of the imputed rent is generated for the sample of housing units [Malpezzi (2003)]. Imputed rent is used only for owner-occupied housing unit for which only market value of housing is available.

Following Greene (2003) and Wooldridge (2006), we applied Heckman's two-step model [Heckman (1979)] of sample selection. In order to select sample, two equations are used, first is the equation that determines the outcome variable. Second equation only uses selected samples and mechanisms determining the selection process. The dependent variable, standardised housing unit, is only observed for those household heads that are the owners of their houses and are not observed for

those rented units. Regressing an OLS model on the standardised housing unit will cause sensitivity bias. Thus, the model will estimate biased and incontinent value of β. In order to deal with the problem of non-random selection and to control the sensitivity bias between household quantity of service demand and tenure, the Heckman two-step selection model was applied.

For data generation, the Heckman model applies the moments of incidentally reduced by variant normal distribution. The basic Heckman model equation is specified as:

$$z_i^* = w_i\gamma + u_i \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (20)$$

$$z_i = \begin{cases} 1, & if\ z_i^* > 0 \\ 0, & if\ z_i^* \leq 0 \end{cases}$$

The basic demand equation is

$$y_i = \begin{cases} x_i\beta + \varepsilon_i, & if\ z_i^* > 0 \\ - & if\ z_i^* \leq 0 \end{cases} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (21)$$

z_i^* refer to those households who own their houses and is 0 for rented households. w_i is the 1xk row vector for the selected exogenous variables used in Heckman model and in the demand equation. γ is the parameter to be estimated with kx1 dimensions. As a special case, if the error terms of both equations are correlated then the problem of selectivity arises and additional assumptions are imposed:

$$u_i \sim N(0,1)$$
$$\varepsilon_i \sim N(0,\sigma^2)$$
$$corr(u_i, \varepsilon_i) = \rho \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (22)$$

Here we assume normal distribution with mean zero and correlationρ. Following Goodman (1988), Ahmad (1994) and Dusansky and Koc (2007) the selectivity biasness was removed through Heckman process.

4. RESULTS AND DISCUSSION

4.1. Housing Demand Analysis

The housing demand was estimated using 2-step Heckman model, whose results are presented below in Tables 6 to 8. The housing demand during 2004-05 indicates that the coefficients of permanent income are insignificant, whereas during 2010-11 the permanent income elasticity of 0.04, negatively yet significantly affected the housing demand. Whereas, the transitory income elasticity 0.033 (2004-05) and 0.039(2010-11) was found to be positive and significant. It was found to be relatively smaller as compared to the income elasticity range i.e. 0.6 to 0.8 found in literature for developing countries [Mayo (1981)]. The results are in line with the findings of Malpezzi and Mayo (1987), Lodhi and Pasha (1991) and Garabato and Sarasola (2011) and they indicate that additional factors are needed to improve the housing demand. The results in Table 5.1, nonetheless, present a static relationship between transitory income and housing demand.

The difference in the results of income elasticity may have stemmed from different income measures [Mayo (1981)]. Ahmad (1994) used the permanent income, predicted from the income regression. Shefer (1990) and Ballesteros (2001) used monthly

Table 6

Tenure Choice Regression 2004-05 (Income Group Wise)

	Low-income		Middle-income		High-income	
Variables	Coefficient	Margin effect	Coefficient	Margin effect	Coefficient	Margin effect
Permanent Income	13.030	3.246	8.211	2.405	6.450	1.659
	(1.01)***	(0.30)***	(0.53)***	(0.17)***	(0.77)***	(0.22)***
Transitory Income	–0.150	–0.037	–0.244	–0.071	–0.241	–0.062
	(0.18)	(0.05)	(0.10)**	(0.03)**	(0.14)*	(0.04)*
House Price	0.823	0.205	0.962	0.282	1.571	0.404
	(0.33)**	(0.08)**	(0.19)***	(0.05)***	(0.27)***	(0.06)***
Affordability	5.162	1.286	4.087	1.197	2.162	0.556
	(1.53)***	(0.39)***	(1.10)***	(0.32)***	(1.55)	(0.40)
Age	–0.089	–0.022	–0.048	–0.014	–0.034	–0.009
	(0.01)***	(0.00)***	(0.01)***	(0.00)***	(0.01)***	(0.00)***
Number of Earners	–1.180	–0.294	–0.708	–0.207	–0.569	–0.146
	(0.11)***	(0.03)***	(0.06)***	(0.02)***	(0.11)***	(0.03)***
Head's Education	–5.826	–0.893	–3.709	–0.541	–2.993	–0.243
	(0.46)***	(0.03)***	(0.26)***	(0.03)***	(0.46)***	(0.03)***
Household Size	–0.436	–0.109	–0.271	–0.079	–0.293	–0.075
	(0.04)***	(0.01)***	(0.03)***	(0.01)***	(0.05)***	(0.01)***
Gender	1.340	0.468	0.730	0.257	0.832	0.273
	(0.39)***	(0.15)***	(0.22)***	(0.09)***	(0.37)**	(0.14)*
Marital Status	–1.113	–0.168	–0.064	–0.018	–0.702	–0.137
	(0.33)***	(0.03)***	(0.16)	(0.05)	(0.36)**	(0.05)***
Intercept	–152.635		–106.222		–99.540	
	(11.49)***		(6.16)***		(9.58)***	
City Dummies	Yes	Yes	Yes	Yes		
No. of Observations	784	784	1,402	1,402	485	485

Note: *** p<0.01, ** p<0.05, * p<0.1, Figures in parenthesis are robust standard errors.

Table 7

Tenure Choice Regression 2010-2011 (Income Group Wise)

	Low-income		Middle-income		High-income	
Variables	Coefficient	Margin Effect	Coefficient	Margin Effect	Coefficient	Margin Effect
Permanent Income	1.264	0.405	1.391	0.465	3.546	1.142
	(0.47)***	(0.15)***	(0.41)***	(0.14)***	(0.71)***	(0.24)***
Transitory Income	–0.396	–0.127	–0.176	–0.059	–0.206	–0.066
	(0.13)***	(0.04)***	(0.09)**	(0.03)**	(0.12)*	(0.04)*
House Price	1.781	0.570	1.175	0.393	2.113	0.681
	(0.25)***	(0.08)***	(0.17)***	(0.06)***	(0.24)***	(0.07)***
Affordability	0.638	0.204	1.435	0.480	0.730	0.235
	(0.32)**	(0.10)**	(0.28)***	(0.09)***	(0.21)***	(0.07)***
Age	–0.001	–0.000	0.003	0.001	–0.008	–0.002
	(0.01)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)
Number of Earners	–0.196	–0.063	–0.253	–0.085	–0.475	–0.153
	(0.07)***	(0.02)***	(0.05)***	(0.02)***	(0.10)***	(0.03)***
Head's Education	–0.717	–0.213	–0.888	–0.251	–2.362	–0.340
	(0.24)***	(0.07)***	(0.21)***	(0.05)***	(0.41)***	(0.03)***
Household Size	–0.079	–0.025	–0.016	–0.005	–0.137	–0.044
	(0.03)**	(0.01)**	(0.03)	(0.01)	(0.05)***	(0.02)***
Gender	0.784	0.290	0.474	0.174	0.361	0.126
	(0.26)***	(0.10)***	(0.19)**	(0.07)**	(0.30)	(0.11)
Marital Status	–0.632	–0.166	–0.337	–0.103	–0.415	–0.118
	(0.22)***	(0.05)***	(0.15)**	(0.04)**	(0.27)	(0.07)*
Intercept	–38.854		–33.092		–74.003	
	(5.81)***		(4.85)***		(9.19)***	
City Dummies	Yes	Yes	Yes	Yes	Yes	Yes
No. of Observations	944	944	1,484	1,484	624	624

Note: *** p<0.01, ** p<0.05, * p<0.1, Figures in parenthesis are robust standard errors.

Table 8

Housing Demand at National Level (Dependent Variable Housing Units)

Variable	2004–05	2010-11
Permanent Income	0.0190	–0.0430
	(0.0200)	(0.01)***
Transitory Income	0.0330	0.0390
	(0.00)***	(0.00)***
House Price	–0.0270	–0.0420
	(0.00)***	(0.01)***
Affordability	0.1850	0.0080
	(0.02)***	(0.00)***
Age	0.0000	0.0010
	0.0000	(0.00)***
Number of Earners	–0.0010	0.0020
	0.0000	(0.00)***
Head's Education	0.0080	0.0450
	(0.0100)	(0.01)***
Household Size	–0.0010	0.0030
	0.0000	(0.00)***
Gender	–0.0070	–0.0070
	(0.0100)	(0.01)
Marital Status	0.0000	0.0060
	0.0000	(0.00)***
Middle-income Group	0.0030	0.0240
	(0.0100)	(0.01)***
High-income Group	0.0110	0.0840
	(0.0200)	(0.02)***
Lambda	–0.0020	–0.0180
	0.0000	(0.01)*
Intercept	0.9820	2.0370
	(0.23)***	(0.23)***
City Dummies	Yes	Yes
Number of Observations	2752	3,040
R-squared	0.107	0.119

Note: *** p<0.01, ** p<0.05, * p<0.1, Figures in parenthesis are robust standard errors.

household expenditures as an indicator for permanent income. Arimah (1992) and Tiwari and Parikh (1998) used total annual income as a proxy for permanent income. Moreover, because of the difference in the data sample the results uncovered the variations.

The fitted house price was statistically significant and it highlighted a negative relationship between house price and demand for both data sets. It indicated that with an increase in house price, keeping other factors constant, the overall demand in housing

market will decrease. The reported price elasticity ranges 0.027and 0.042 for 2004-05 and 2010-11, respectively. Results suggest that the demand for house price was inelastic. The range of price elasticity observed in literature was from –0.1 to –0.9. The less elastic demand, nonetheless, could be caused by limited supply of houses in markets. Consequently, the household head was bound to pay the asking price of housing. Results imply a downward sloping demand for housing service with no gain in housing demand market.

Rent to income ratio, used as proxy for affordability, derived positive and significant results for the housing demand. With an increase in affordability, which may have been triggered by the increase in income or decrease in rent, the house demand had increased by 18.5 percent and 0.8 percent in 2004-05 and 2010-11, respectively. It implies that household head was willing to buy a housing unit in order to avoid the large housing expense.

All the demographic factors are found to be insignificant for 2004-05, whereas except gender all the demographic factors are statistically significant for 2010-11. Household head's age implies that the need for housing increases with the increase in age. With an additional year in the age of household head, increases the housing demand by 0.1 percent, nonetheless, after a certain age, as the children move out, the demand for housing decreases (2010-11). It also implies that with an increase in house demand because of age, there appears a change in the taste of the individual [Goodman (1988); Fontenla, *et al.* (2009)].

The coefficients for number of earners in a household were also positive and significant. The value of earners coefficient indicates that with an addition of one earning member, the housing demand increased by 0.2 percent (2010-11). Similar results were also reported by studies in Pakistan, such as Pasha and Ghaus (1990) and Nazli and Malik (2003). It shows that a single earner (household head) cannot save enough because of high consumption expenses, therefore, with an increase in number of earning members, the saving level increases, which ultimately increases the demand for housing.

Highly significant results are reported about the effect of education on housing demand. With an additional year in education, the housing demand increased by 4.5 percent, which discovered that the income of the household was in control. Such household could demand a new housing unit with a change in its taste (2010-11). Additionally, with an increase of one member in family, the demand for housing increased, as the number of rooms was already assigned to the existing members of the household. Thus, with an additional member, 0.3 percent increase was recorded. For a household that belonged to middle-income group, the demand increase was recorded as 2.4 percent and for a high-income group, an increase of 8.4 percent in demand was reported (2010-11), as shown in Table (5.3). Mixed results were reported in the previous literature regarding the effect of demographic factors on housing demand.

The LAMBDA coefficient indicates that the choice for housing was made by considering the housing units consumption. The LAMBDA coefficient was positive and significant for only 2010-11. In case of Pakistan, this study established that a major increase in housing demand was caused by the education factor.

4.2. Housing Demand Analysis at Disaggregated Level

This study estimated the housing demand, based on income groups for owned housing and is reported in Table (9). The permanent income elasticity was found positive and significant for low-income group and high-income group, whereas the elasticity for middle-income group was found inelastic (2004-05). The elasticity of 0.06 (low-income group) and 0.07 (high-income group) reported were higher than the results at the national level but it still indicated that the housing demand was inelastic. During 2010-2011, permanent income elasticity (0.04) was negatively significant only for middle-income group. Transitory income represents a positive and significant effect on the housing demand across all income levels and for both data sets. With the increase in income level, the housing demand became less elastic, as high-income group represented an elasticity of 0.02.

Increase in house price negatively affect the housing demand for all income groups. These results are highly significant for low-income groups and the credibility decreases as we move from low-income group to high-income group for both data sets. An increase of 36 percent was observed in housing demand with the increase in affordability in low-income group (2004-05). As we moved from low to high-income group, affordability ratio decreased because of high-income and fixed rent cost and, therefore, housing demand was less affected by the affordability (2004-05, 2010-11). Moreover, during 2010-11 attribute of affordability was insignificant for housing demand.

The coefficient of age of the household head was found to be insignificant during 2004-05, across all income groups. The age factor caused housing demand to change slightly by 0.1 percent for income groups (2010-11). As seen in the results at the national level, age, number or earners, household size (family members), education, gender and marital status are statistically insignificant during 2004-05, except the household size related to high-income group, which negatively and significantly causes house demand to decrease by 0.5 percent.

Increase in the earning members of a household, positively affected the house demand by 0.1 percent (low-income group) and 0.4 percent (middle-income group), nevertheless, for a high-income group, the housing demand decreases by 0.2 percent (2010-11). For middle-income group, the increase in housing demand because of an additional year of education was reported as 5.1 per cent higher as compared to other groups. No significant impact of education, nonetheless, for high-income group was found on the housing demand. For most of the time families living in low-income groups and middle-income groups view housing as an indicator for Social, Economic and Personal Security.

A logical increase in house demand was recorded with the increase in family size for all income groups. Household head, being male, negatively affect the housing demand in low-income group, whereas its effect was statistically insignificant for other income levels. For a married household, the house demand increased by 1.5 percent for a low-income group, while results are insignificant for middle and high-income groups. The results demonstrated a change in the attributes of housing demand across income groups over the year. The housing attributes for low-income groups highlighted that demand was more sensitive to the change. Therefore, high proportion of income was spent on the improvement and consolidation of housing units in low-income group.

Table 9

Housing Demand by Income Group (Dependent Variable Housing Unit)

	2004-05			2010-2011		
Variables	Low-income	Middle-income	High-income	Low-income	Middle-income	High-income
Permanent Income	0.0600	0.0240	0.0780	(0.0240)	–0.049	–0.009
	(0.04)*	(0.0300)	(0.04)*	(0.0200)	(0.02)***	(0.04)
Transitory Income	0.0360	0.0270	0.0280	0.0320	0.042	0.02
	(0.01)***	(0.00)***	(0.01)***	(0.00)***	(0.00)***	(0.00)***
House Price	–0.0450	–0.0270	–0.0100	–0.0410	–0.054	–0.019
	(0.01)***	(0.01)***	(0.0100)	(0.01)***	(0.01)***	(0.01)*
Affordability	0.3620	0.1510	0.2410	0.0040	0.004	0.01
	(0.04)***	(0.04)***	(0.06)***	(0.00)***	(0.00)***	(0.01)
Age	0.0000	0.0000	0.0000	0.0010	0.000	0.001
	(0.000)	(0.000)	(0.000)	(0.00)***	(0.00)***	(0.00)***
Number of Earners	–0.0060	–0.0030	0.0010	0.0010	0.004	–0.002
	(0.000)	(0.000)	(0.000)	(0.00)***	(0.00)***	(0.00)***
Head's Education	(0.0090)	0.0050	(0.0200)	0.0310	0.051	0.028
	(0.0200)	(0.0100)	(0.0200)	(0.01)***	(0.01)***	(0.02)
Household Size	–0.0010	0.0000	–0.0050	0.0010	0.002	0.002
	0.0000	0.0000	(0.00)**	(0.00)***	(0.00)**	(0.00)***
Gender	(0.0110)	0.0070	(0.0110)	–0.0210	–0.002	–0.012
	(0.0100)	(0.0100)	(0.0100)	(0.01)**	(0.01)	(0.01)
Marital Status	(0.0040)	(0.0020)	(0.0080)	0.0150	0.002	0.011
	(0.0100)	(0.0100)	(0.0100)	(0.01)*	(0.01)	(0.01)
Lambda	0.0050	(0.0040)	0.0310	(0.0250)	–0.045	0.028
	(0.0100)	(0.0100)	(0.01)**	(0.01)*	(0.01)***	(0.01)**
Intercept	0.6310	0.9640	0.0240	1.8210	2.333	1.307
	(0.4100)	(0.32)***	(0.5800)	(0.32)***	(0.25)***	(0.57)**
City	yes	Yes	yes	yes	Yes	Yes
No. of Observations	784	1402	485	944.0000	1,484	612
R-squared	0.2390	0.0980	0.2640	0.2030	0.16	0.297

Note: *** p<0.01, ** p<0.05, * p<0.1, Figures in parenthesis are robust standard errors.

In an attempt to explain the differences of regional housing demand, this study used the log-linear regression model for a province-wise analysis of houses in urban Pakistan. The results are presented in Table (10). The empirical results suggest that household income was the significant factor, causing housing demand to vary among province. The permanent income elasticity of 0.03 (2004-05) and 0.04 (2010-11) was highly significant and positive for Sindh. Similarly, positive statistically significant and permanent income elasticity was also reported for Punjab (2004-05) and Balochistan (2010-11) on housing demand. Whereas, in case of KPK (2004-05) and Balochistan (2004-05), the housing demand was negatively related to change in permanent income, but the results are insignificant for Balochistan only (2004-05). The results indicate that the demand for housing was inelastic for all provinces.

Transitory income elasticity is positive and statistically significant for four provinces, for both data sets, except for KPK (2010-11). Moreover, the coefficient of transitory income presented inelastic demand for housing across all regions. House price negatively and significantly cause the demand for housing to decrease for all regions except for KPK (2004-05) and Balochistan (2004-05). The result implies that the housing demand was inelastic and relatively small for all regions. The housing price was elastic for Balochistan (2010-11) and was reported to be 0.8. It indicates that the sectorial and

regional difference should also be considered using aggregate parameters, while estimating housing demands. These differences are not reflected in the housing demand at national level.

Interesting results were reported regarding the affordability of a household head across regions. Results indicated that households in Punjab, Sindh and Balochistan depend on affordability (rent to income ratio) for housing demand but, for KPK results were found insignificant. With an increase in affordability ratio, the housing demand increased by 15 percent and 4 percent for Punjab; 19 percent and 0.4 percent for Sindh and 12 percent and 14 percent for Balochistan for both data sets, respectively. It indicates that individuals depend less on affordability for housing demand. A decrease, therefore, in housing demand was observed over the period for Punjab and Sindh. The dependence on income, nevertheless, for house demand increased over the period for Balochistan.

As discussed in the previous literature, the demographic factors uncovered mixed results. With an increase in age, a significant change in demand was recorded to the extent of Punjab (2010-11) and Balochistan (2004-05). An increase in number of earners negatively and significantly caused the decrease in demand by 0.9 percent for Sindh (2010-2011) and insignificant for all the other regions. With an increase in education, the demand for housing increased by 0.9 percent and 0.1 percent in Punjab; 1.1 percent in Sindh (2010-11) and 5.8 percent for Balochistan (2004-05). Household size negatively affected the demand by 0.3 percent for Sindh (2010-11) and its impact was insignificant for other regions. Similarly, gender and marital status were found irrelevant as a result of regional demand analysis.

Table 10

Housing Demand: A Provincial Comparison (Dependent Variable Housing Unit)

	Punjab		Sindh		KPK		Balochistan	
Variables	2004-05	2010-11	2004-05	2010-11	2004-05	2010-11	2004-05	2010-11
Permanent Income	0.014	0.000	0.038	0.044	-0.047	0.023	-0.035	0.074
	(0.01)*	(0.01)	(0.01)***	(0.01)***	(0.02)**	(0.02)	(0.03)	(0.03)**
Transitory Income	0.025	0.031	0.045	0.047	0.017	0.008	0.033	0.063
	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.01)**	(0.01)	(0.01)***	(0.01)***
House Price	-0.021	-0.017	-0.017	-0.011	0.002	-0.030	-0.014	-0.087
	(0.00)***	(0.00)***	(0.01)***	(0.00)**	(0.01)	(0.01)**	(0.02)	(0.01)***
Affordability	0.152	0.044	0.199	0.004	0.071	-0.005	0.124	0.144
	(0.03)***	(0.01)***	(0.05)***	(0.00)*	(0.10)	(0.01)	(0.07)*	(0.04)***
Age	0.000	0.000	-0.000	0.000	0.000	0.000	0.001	0.000
	(0.00)	(0.00)*	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)**	(0.00)
No. of Earners	0.000	-0.000	-0.002	-0.009	-0.001	-0.005	0.003	-0.008
	(0.00)	(0.00)	(0.00)	(0.00)***	(0.00)	(0.00)	(0.01)	(0.01)
Head's Education	0.009	0.014	0.004	0.011	0.023	-0.008	0.058	0.017
	(0.00)*	(0.00)***	(0.01)	(0.01)*	(0.01)	(0.01)	(0.01)***	(0.02)
Household Size	-0.000	0.001	-0.001	-0.003	0.001	0.001	-0.001	-0.001
	(0.00)	(0.00)	(0.00)	(0.00)***	(0.00)	(0.00)	(0.00)	(0.00)
Gender	-0.009	0.001	-0.003	-0.005	-0.011	0.022	0.034	0.061
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.03)	(0.05)
Marital Status	0.003	-0.001	-0.004	0.001	0.016	-0.019	-0.016	-0.016
	(0.01)	(0.00)	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)
Intercept	0.988	1.200	0.614	0.636	1.451	1.127	1.394	1.218
	(0.05)***	(0.05)***	(0.07)***	(0.07)***	(0.15)***	(0.18)***	(0.21)***	(0.27)***
No. of Observations	1,385	1,542	971	1,089	234	231	162	178
R-squared	0.066	0.106	0.144	0.247	0.126	0.078	0.263	0.391

Note: *** p<0.01, ** p<0.05, * p<0.1 level of significance and standard errors are highlighted in parentheses.

5. CONCLUSION AND POLICY IMPLICATIONS

The study has attempted to investigate the determinants of housing demand in urban areas of Pakistan. The empirical analysis is carried out using Pakistan Social and Living Standard Measurement (PSLM) survey 2004-05 and 2010-11. The hedonic price model is used for the estimation of house prices. In order to control the selectivity bias between the tenure choice and the quantity of housing services demanded, Heckman's two-step selection procedure is used.

The empirical analysis shows that housing price and income (temporary and permanent) play an important role in the determination of the housing units' demand. An increase in houses' prices causes decrease in demand for the housing units, while the housing demand increases when the permanent income increases. It was found that the transitory income has positive effect on the housing demand among all three groups, but its impact was relatively stronger in case of middle-income. Escalation of price was negatively related to demand, as the housing demand decreases with the increase in the prices of housing units. The affordability has the same effect on low and middle-income groups, but for high-income group it was positive, yet reflects a lesser value in terms of its coefficient. The demand for housing at national level has positively impacted permanent income, as people with more permanent income caused an increase in demand for houses. The scenario changed in 2010-11 when people with more permanent income had a negative impact on the demand for housing.

To manage rising housing demand, following policy implications emerged from the empirical analysis:

(a) Analysis indicates that housing price has a negative impact on housing demand. This finding suggests that government should focus on developing effective and enforced price control mechanism. This will help to control housing market hence reduce burden on city development.

(b) The economic development is one of the major determinants of housing demand, as measured by income. Empirical analysis reveals that rising income has a significant impact on new housing markets. To meet the future demands with rising income, it is suggested that government in collaboration with the private sector should develop new low cost housing societies to cater future needs. Along with the economic development, increasing urbanisation and population growth put pressure on the housing sector. Government of Pakistan should devise national housing policy on priority basis to address future housing demand in the light of Vision 2025. This framework should address not only future demands but also quality issues of housing sector, especially in mega cities.

(c) Affordability is another important policy dimension of the housing sector. The positive association between affordability and housing demand implies that household prefers to purchase new housing unit to manage housing expenses. A well functional rental market may help to reduce housing pressure with innovative housing units. The government should regulate rent market to manage rising demands.

In essence, government should design and implement new housing policy to cater future need. The policy should consider future development, house prices and affordability dimensions in its design. The policy should also look into the institutional arrangement of

this sector to manage rental market and development of new societies, especially in mega cities. The on-going census 2017 will provide a golden opportunity to assess the demand and supply conditions of housing market, in finalising the new housing policy. The Benazir Income Support Programme (BISP) has also collected data on housing condition across Pakistan, using National Socio-Economic Registry (NSER). This data can also be used to understand the current housing situation in Pakistan. A detailed study may be conducted using NSER and PSLM 2014-15 datasets to review and suggest policy framework, keeping in view development, housing price and affordability dimensions.

Appendix

Appendix Table 1

List of Explanatory Variables

Variables	Description
Standardised housing unit	Dependent variable
Permanent Income	Monthly income, remittances or wealth effect
Transitory Income	Unexpected income, bonus
Remittances	Total remittance was the sum of domestic and foreign remittance
Market Value of House	Price of owner occupied housing unit
Low-income Group	Low income group (as identified under PSU)
Middle-income Group	Middle income group (as identified under PSU)
High-income Group	High income group (as identified under PSU)
Affordability	Affordability was defined as Rent to Income Ratio
Household Head's Age	Age of household head in year
Household Head's Education	Education of household head in year
Gender	= 1 if Male; = 0 if female
Marital Status	= 1 if married; = 0 otherwise
Occupation	Post currently working on
Employment Status	= 1 if employed; = 0 otherwise
Industry	Industry in which households head was working
Number of Earners	Number of earners in a house hold
Family Size	Number of members in a house hold
Household size	Number of Rooms
Owner Occupied House	= 1 if owner occupied, = 1 otherwise
Housing Expenditure (rent)	Rent in rupees
Imputed rent	imputed rent was used for the missing values of house rent
Type of roof	It refers to the material used in roof
Type of walls	It refers to the material used in making walls
Water Facility	water availability in house, piped, motor water or other
City	urban cities are chosen for analysis

Source: Author's own work.

Appendix Table 2

Means of Variables (2004-05)

Variables	National	Low-income	Middle-income	High-income
Standardised housing unit	1.00	1.00	1.00	1.00
Permanent Income	11.92	11.56	11.88	12.58
Transitory Income	0.00	0.00	0.00	0.00
Remittances	11026	5089	8808	26069
Market Value of House	1386344	661429	922390	3735204
Affordability	0.85	0.83	0.85	0.87
Household Head's Age	46.24	44.71	45.93	49.43
Household Head's Education	9.84	8.65	9.60	11.63
Gender	0.93	0.95	0.94	0.90
Marital Status	0.89	0.91	0.89	0.87
Number of Earners	1.72	1.84	1.68	1.63
Household size	6.49	6.89	6.48	5.91
Owner Occupied House	0.71	0.69	0.70	0.74
Observation	2752	820	1402	430

Source: Author's own Calculations.

Appendix Table 3

Means of Variables (2010-11)

Variables	National	Low-income	Middle-income	High-income
Standardised Housing Unit	1.00	1.00	1.00	1.00
Permanent Income	12.37	12.08	12.32	12.93
Transitory Income	0.00	0.00	0.00	0.00
Remittances	15712	8320	15381	27683
Market Value of House	2637309	1112030	2033660	6454766
Affordability	0.29	0.27	0.28	0.33
Household Head's Age	47.18	46.04	46.89	49.58
Household Head's Education	10.63	8.72	10.39	13.15
Gender	0.93	0.93	0.93	0.92
Marital Status	0.89	0.89	0.88	0.89
Number of Earners	1.70	1.78	1.73	1.51
Household Size	6.14	6.36	6.14	5.83
Owner Occupied House	0.68	0.70	0.68	0.66
Observation	3053	944	1485	624

Source: Author's own Calculations.

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