Determinants of Housing Demand Across Income Groups in Pakistan

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TABLE OF CONTENTS

1. INTRODUCTION

Recent economic experiences in both developed and developing countries have seen an increasing role of housing markets in creating a stir in domestic economy. Housing markets have evolved from being consumption good by nature, to an instrument of investment with potential capital gains. Hence it is now popularly being characterized as one of the most important components of personal wealth that in turn has implications on household distribution of wealth, savings, personal portfolios and eventually seeps its way into the monetary transmission mechanism. Housing is also known to constitute a significant share of household expenditure and total wealth (Leung, 2004).[1] The growing importance of the housing sector and its development in the developed economies has had an effect of forcing policymakers and economists to factor in housing as a consequential component in studying economic fluctuations. An enormous amount of literature in housing studies has thus emerged which has attempted to draw theoretical foundations for the demand and supply of housing, elicit empirical analysis and evaluate government policies. Moreover, developments in the housing sector is now seen to be well informed by extensive and rigorous research which has matured on the axis of housing demand and supply and has also attempted to measure both its micro and macro implications.

Developing countries as a response to both their own experience and in their pursuit to follow developed economies have also begun to recognize housing as a consequential sector. However, they need to cover greater distances in propelling research in housing studies that would eventually support their domestic housing policies. Research on housing demand in developing countries has largely focused on the effects of income, prices and demographics of household. For example, empirical studies by Malpezzi and Mayo (1987) on Cairo, Ben Suef and Manila, Shefer (1990) on Indonesian household data, Arimah (1992) on Nigerian data, Tiwari and Parikh (1998) on India and Ballesteros (2001)'s study using Philippines data, determine and quantify the effect that household income, house prices and demographics have on the demand for housing. Empirical studies of this nature have sought to determine income and price elasticities that have an important implication for the formulation of housing policies. Another strand of literature on housing studies, seeks to determine the demand for various housing attributes like floor space, water supply, gas connection, distance to city centre and other amenities (e.g. Follain and

[1] Leung (2004) conducts the literature review by drawing majorly from studies based on US and UK data. Other studies covered in the review are on Taiwan, Amsterdam and Japan.

Jimenez, 1985 and Arimah, 1992). This is an aspect which has also received growing attention of policymakers since it reflects households' housing preferences.

While housing studies experienced a maturing status in the developed regions, and an emerging one in developing countries, its status in the case of Pakistan, is far from being emphatic, and its role in policy formulation has not been fully realized. The existing work on housing in Pakistan by Ghaus and Pasha (1990), Lodhi and Pasha (1991), Ahmed (1994) and Pasha and Butt (1996) represent the first few attempts at determining factors that affect housing demand. While these merit commendation, a lot is yet to be achieved.

The objective of this study is to prove empirically that, the effect of factors like wealth, income and house prices influence the ability to own a house differently for low, middle and high income groups. This variation of housing demand across income groups is determined for 14 major urban centres of Pakistan. Very few studies have ventured into determining housing demand across income groups (Shefer, 1990 and Tiwari and Parikh, 1998). No study based on income groups has been observed for Pakistan, and with a constant concern on the level of disparity in the country, it is tempting to question if these disparities also traverse into housing demand patterns. Motivations for extending conventional housing analysis from a national study to a study that is stratified by income groups, is not only drawn from the gap that currently exists in Pakistan's housing literature, but also from the fact that such an approach highlights the importance of formulating policies that ought to target these income groups separately.

Moreover, in this study, house price and income variation in the housing demand model is achieved by using three rounds of household surveys; a variation that cannot be achieved otherwise, with cross-sectional data. This methodology brings in the strengths of both time-series and cross-section data, rarely found elsewhere in housing demand studies. Following conventional housing studies, we determine house price by employing the Box-Cox hedonic price model. Unlike most studies on developing countries, we quantify the relationship between housing demand and its covariates, by using an econometric framework augmented by Heckman's two-step selection procedure that controls for selectivity bias between tenure choice and quantity of housing services demanded. Permanent and Transitory income is also estimated according to the Permanent Income Hypothesis. Another aspect not commonly found in studies from developing countries, including Pakistan, is determining the separate effect of permanent and more importantly transitory income on housing demand. Contrary to previous findings in

literature from developed and developing countries, we find that transitory income has a greater effect than permanent income in determining housing demand on national level as well as across low and middle income groups. Our results also suggest that households most vulnerable to exploitative housing supply behavior are those belonging to the low income group and that, those from the middle income are most responsive to changes in prices. Furthermore, we also show that the issue of affordability plays a significant role in housing demand for low income group and that cities too significantly display varying housing demand.

There have been successful attempts in the formulation of well intended housing policies, however only to remain unsuccessful in application. This is due to the disconnect between housing research and policies. For example, under the recently formulated National Housing Policy 2001 for Pakistan, the government aims to achieve resource mobilization, increase land availability for construction of houses, improve housing finance schemes and develop an incentive mechanism for home ownership. A successful implementation of such policies requires a deeper understanding of the magnitude of factors that affect housing demand and supply and how these factors vary across income groups.

2. THE HOUSING AND WELFARE NEXUS

Before we set out to achieve the purpose of this study, it perhaps proves relevant to highlight the importance of own housing and its consequential role in not only enhancing social welfare, but with the right policies, also compliment economic growth.

The Planning Commission of Pakistan in a recent attempt to formulate a long term strategic framework, the Vision 2030, envisages Pakistan to join the ranks of middle-income countries with GDP of USD 4,000 by the year 2030. One of the ways the government plans to achieve its goals is by increasing the share of industry from the current 18 to 30 percent of the economy by 2030. This level of growth will have a ripple affect not only on trade (both external and internal) but will require an expansion in services and infrastructure sector to support the increased level of economic activity, leading to a major structural transformation of the economy. These transformations will have obvious impacts on the level of urbanization in the form of growth in the skilled and enterprising middle class, which is expected to be around 130million and between the age of 15-35, by 2030. The Planning Commission expects the level of urbanization to increase from the current 34 percent to over 60 percent by 2030. This means that the current urban population of 55 million will be expected to more than double, to 120-130 million by 2030, with almost four-fifths of future increases in population in urban areas. Consequently, the Vision 2030 recognizes cities as the 'engines of growth' and their size and shape pose an imminent concern on economic efficiency and its expansive capabilities in realizing the goals of the government.

Similarly, in an earlier attempt to present a consolidated study on housing policies adopted in developing countries, The World Bank (2005) highlights works by Brueckner (1996) and Bertaud and Brueckner (2005) that stresses the importance of right and equitable housing in realizing welfare gains, efficiency and equity from urbanization which in turn is known to feed into the economic activity. Furthermore, the World Bank also argues that if countries aim to reap benefits from increased level of economic activity, the resulting urbanization should be correlated with rising per capita incomes. It refers to the work by Fay and Opal (2000) who contend that correlation between urbanization and rising per capita incomes in developed economies was found to be absent in some developing countries, especially those in the Sub-Saharan African countries during 1990s, creating a new type of housing demand in a much more urbanized, if poorer world. On the onset of growing levels of urbanization, how equity and efficiency is

achieved through appropriate housing is a matter of policy, an issue that merits debate and hence is discussed later in this study.

In the context of Pakistan, the existing level of wealth inequality is reflected in land ownership patterns as well. Those with wealth effectively drive up urban land prices and subsequently fuel speculative practices, encourage investors to hold real estate vacant as investment property until they want to sell it. This essentially has had the effect of locking out the urban poor who are faced with higher land prices, restricting land available for housing and causing price hikes for real estate in current use, to feeding the cycle of soaring prices.

In an attempt to measure the magnitude of housing shortage in Pakistan during the period 1960 and 1980 Ghaus and Pasha (1990) find that while population grew at 3%, the number of housing units increased by 2.1% only, leading to an increase in the overall size of housing deficit. In addition, the Medium Term Development Framework (MTDF) states that in 1998 the housing backlog was 4.3 million units which increased to 6 million units in 2004. This indicates that there is an annual incremental demand of 570,000 units. Against this demand, the supply is around 300,000 units leaving a gap of over 270,000 units annually.[2]

Therefore, both increasing house prices and shortage of housing units, low income households are faced with making choices between either housing consumption or paying for basic needs like food, clothing and health. An important implication of this is that the poor then tend to miss out on economic opportunities that emanate from increased activity and urbanization, such as capturing market value increases upon sale of house, or income gained from renting out a room or initiating small scale business /cottage industry. Even when households live in rented accommodation they are faced with substantial house rents; rent that has one of the highest weights in CPI. [3] It is commonly believed that when people have access to adequate housing, they are more likely to participate economically, socially and politically in their communities.

In addition to playing a crucial role in welfare enhancement of individual households, the MTDF has recognized Housing and Construction as priority sectors that pose substantial potential for

[2] National Housing Policy 2001, Government of Pakistan.

[3] Increases in house rent index have been reported to be second largest component of CPI (23.4 percent) after food (40.3 percent) (Pakistan Economic Survey 2006-07, Government of Pakistan)

employment generation for the poor segments of the society.[4] Within the housing and construction sector in Pakistan, nearly 40 industries are linked with construction activities, thus providing substantial additional employment opportunities by contributing through a higher multiplier effect with a host of beneficial forward and backward linkages in the economy. With employment elasticity reported at 0.60 and targeted growth rate ranging from 6.0% to 8.0% during the medium term, the Government of Pakistan stipulates that increasing housing supply can not only reduce the housing shortages, but also give a boost to the 40 allied industries linked with it.[5]

Having established the pervasive role the Housing sector has on welfare, stirring and sustaining economic activity, it is surprising that these gains are yet to be realized fully by developing countries, including Pakistan. The housing sector in Pakistan continues to face a number of problems which have only worsened over time. Some of the issue that continue to exacerbate include rising cost of land in urban areas lending a negative impact on the low and middle income groups, spurious growth of informal housing market (katchi abadis), lack of availability of mortgage finance at favorable terms to the poor, a lack of low cost housing schemes by the government and lastly, failure of housing specific projects. The answers to these concerns lie on a continuum of housing needs and effective housing policies.

[4] The MTDF has also identified agriculture, water development and SMEs as priority sectors in addition to housing and construction.
[5] Pakistan Economic Survey 2006-07, Government of Pakistan.

3. HOUSING POLICY ORIENTATION

Housing policies since its realization and inception have experienced varying degrees of transformations and have pendulumed between interventionist policies and purely market-based policies. Berry (1974) in his book catalogues the evolution of Housing policies in Britain since the 19th century and observes that focus on adequate housing during the 1800s merely fell in the purview of the sanitary conditions of the household. Back then, interference by the government was motivated by, and limited to the idea that bad housing conditions arose from bad sanitary conditions, rather the other way round. He further argues that even when housing was recognized in a spatial context by 1900s, policies that placed emphasis on large-scale building programs alone as a solution to the ever increasing housing shortages, only served to emerge as a weakness. Berry contends that the solution to the housing problem is much simpler if an adequate supply of houses of all kinds was in place and managed by the government and not left to private enterprise. He concludes that despite all the money and efforts, one of the greatest British failures has been in the Housing sector. Both Berry (1979) and Robinson (1979) further argue that the objectives behind a selected housing policy are largely determined by the prevailing political institution and therefore such studies should also come under the purview of political economy of housing. Stafford (1978) in his book on the Economics of Housing Policy passes the notion that;

> "…housing problems are largely the cumulative effect of the damaging and self-defeating policies of successive governments and this calls for a re-creation of housing markets based on consumer preferences rather than political predilection and bureaucratic control".
>
> (Preface)

While such debate on housing policies is seen to seep even into the twentieth century, the World Bank (2005) highlights that in the context of developing countries, emphasis on housing policies picked momentum during 1970s. The study presents a review based on various studies from the developing region[6] and discusses that housing policies during the 1980s took the form of projects by the governments in partnership with international institutes and agencies. Public policy orientation took preference over private production of housing as was the case even in most of the developed economies and researchers contended that policies excluding the private sector

[6] Studies reviewed by World Bank include countries like Argentina, Republic of Korea, India, Thailand, Malaysia, South Africa, Sub Saharan Africa, etc.

involvement, should not be pursued actively, instead it should be complimented. Furthermore, research in housing demand during 1990s unraveled an additional aspect into the study of housing; laying emphasis on the 'kinds' of housing units. This work now provided basis for understanding the standards and units that low-income families could afford, thus focusing on the kinds of housing units that could effectively be provided to the poor without subsidies.

Another strand of policy review literature, as highlighted in the World Bank review, stressed the importance of security of tenure that had pervasive effects on policies focusing on housing finance, in particular. Additionally, the Bank points out that providing title will not always translate into spurring effective formal financial institutions and systems. This can happen when the titles have low values and cannot offer sufficient value as collateral. Moreover, even when formal financial systems do exist, majority of the households from the low income are unable to meet necessary condition for obtaining credit because they are mostly employed in the informal sector where presenting proof of income is often difficult, a feature quite common among low income households in developing countries. In the context of Pakistan, low income households in informal settlements are also faced with an additional dilemma of owning the structure (house) but not having title over the piece of land on which the structure stands. This obstructs them from obtaining credit at favorable terms. Finally, the review also highlighted the greater need of understanding the broader dimensions of land policy in formulating housing policies effectively, an issue extremely relevant to countries like Pakistan, India and Bangladesh where individual property rights are ill defined and titles are generally governed through joint ownership.

A recent attempt by the Government of Pakistan was to formulate a National Housing Policy in 2001. This policy was an outcome of a public and private partnership in which the advisory board consisted of all stakeholders. The policy paper highlights that the share of housing in the public sector development in Pakistan has remained scanty and continues to decline from 10.9% in the first Five Year Plan to 5.9% in the seventh Five Year Plan. However, it can perhaps be argued that the said decline in public spending does not necessarily pose as one of the causes of housing shortages. These figures should be seen in tandem with the contribution that the private sector has played; an aspect that Berry (1974) stress on. Furthermore, according to this policy paper, the major emphasis of the National Housing Policy is to mobilize resources, make more land available for house construction and develop an incentive mechanism for home ownership. The government of Pakistan aims to achieve resource mobilization through government initiation, mortgage, loans, refinance facility, microfinance schemes, induction of insurance, pensions and

provident funds. Provisions of incentives are contemplated to arise mainly through tax rationalization, reduction in property tax and registration. According to a 2006 report by the World Bank on Property Taxes in Punjab, the existing tax exemption schemes have been identified as being ineffective. For example, a rule granting tax exemption for all residential houses measuring up to 5 Marlas (125 sq yards) encompassed houses in poorer residential areas (say up to 50 sq yards floor space) as well as houses in affluent residential areas with up to 400 sq yards of floor space. An exemption of this kind has augmented the already generous treatment of residential units and has allowed further erosion of tax base by excluding high value properties. Furthermore, the Bank's report also highlights that the additional amendment to the model Punjab Local Government Ordinance 2001 gives municipality the authority to set their own tax rates. This, however, has received little application. This is because the local municipality neither has a clear motivation nor sufficient information on the tax capacity of their jurisdiction. Such pitfalls in well intended policies, in our view, require a deeper understanding and quantification of factors affecting the housing markets and the segmented characteristic it has.

4. LITERATURE REVIEW

4.1 ECONOMICS OF HOUSING : THEORETICAL FRAMEWORK

The literature on the theoretical framework in housing studies has been developed mainly in studies undertaken by the developed countries and hence serve as a plinth for empirical studies adopted by both developed and developing countries. Smith et al (1988) notes that the literature on housing markets has seen significant developments since the 1960s and recognized housing as a unique commodity that not only responds to market forces but has a number of special characteristics which require that the standard neoclassical model be modified. These characteristics include durability, spatial fixity, heterogeneity of housing and the extensive involvement of governments in housing and related input markets. In another instance Dusansky and Wilson (1993) construct a theoretical framework to highlight a dual role housing markets posses; the role of both a consumption and an investment good. It is precisely due to this dual characteristic that housing models at times have not exhibited traditional demand properties.[7] A discussion of these characteristics will serve as a useful pre-op to the theoretical framework constructed in tandem with literature on housing model.

Durability implies that the existing stock of house plays an important part in determining the amount of accommodation that will be required in the future, since housing is a long-lived good and tends to depreciate slowly. Therefore, a very small proportion of new housing is constructed each year.[8] Robinson (1979) and Smith et al. (1988) in an analysis of the characteristics of housing, point out that the complications that arise due to durability should be dealt with by distinguishing between 'housing stock' and the 'flow of housing services'. Housing stock is produced using land, labor and building materials, whereas, flow of housing services is produced using housing stock, labor and amenities like heat, light, water, sanitation and other essential services. Zabel (2004) writes that stock plus amenities can be considered to provide housing

[7] Neoclassical microeconomic theory emanates from the symmetry and negative semi-definiteness properties of Slutsky equations that lead to a downward sloping demand curve. Slutsky equation for owner-occupied housing is not the same as it appears in standard microeconomics theory (Dusansky and Wilson 1993).

[8] Ronbinson (1979) point out that approximately 2% new housing is constructed each year, whereas, Muth and Goodman (1989) proclaim net additions to be rarely more than 3 to 3.5% of the current stock.

stock. It is housing services that yields utility and are demanded by households (Smith et al. 1988).

This distinction forms the basis of the measures of rent and price. Robinson (1979) defines rent as payment made for the flow of housing services and price as the capital value associated with a particular unit of stock.[9] In a perfect market the price of a dwelling will be equal to the present discounted value of the future rent payment which it is expected to produce less its discounted operating costs.

The co-existence of the two afore-mentioned markets: housing stock and housing services, leads to separation of ownership and use, that is, an owner-occupied and a rental housing stock.[10] The implications that durability has had on this separation is to create a rental market that, on the supply side, continues to provide dwellings over a period of time, where as on the demand side renting caters to those who are unable to own. This high price of owned housing makes renting an important feature of the housing market and consequently, Smith et al. (1988) contend that the analysis of housing demand must consider the discrete choice of whether to own or rent housing as well as the continuous choice of what quantity of housing services to consume.

Housing markets have also been characterized as being heterogeneous. This implies that housing units that have the same price may differ in their size, age, design, access, to other locations, tax, involvement of local government, etc. Spatial fixity which refers to locational attributes of housing stock, also brings in heterogeneity in housing markets. Locational attributes involve aspects like, distance from city centre and site of employment, nature of land use in the neighborhood of the housing and the choice of local government. The inclusion of neighborhood choices[11] has recently gained considerable momentum as an additional aspect to the determinants of housing demand. Some of the studies including neighborhood choices are by Muth and Goodman (1989), Cheshire and Sheppard (1998), Ioannides and Zabel (2002) and Zabel (2004).

[9] Given how Smith et al. (1988) defined housing stock and services, it can perhaps be argued that since housing stock is a component of housing services, the rent (as defined by Robinson 1979) as a measure may in turn be a function of price/capital value.

[10] In an attempt to identify why both these markets co-exist, Smith et al. (1988) refer to common explanation given, that, due to lower transaction costs involved in changing say rented apartments compared to changing owned occupancy, young households (who tend to move with greater probability) prefer to rent rather than own. Other explanation given includes tax advantage of owner occupancy, mortgage market constraints.

[11] Literature includes neighborhood safety, racial composition, proximity to parks and the preference of individuals to live near others like themselves, as some of the features of neighborhood attributes (Muth and Goodman 1989 and Ioannides and Zabel 2002).

Smith et al. (1988) bring in to discussion two sets of popular literature that attempts to model heterogeneity. The first set postulates that households value goods for their characteristics which yields utility or are combined with other inputs including household time according to a production function to produce services that yield utility.[12] Another strand of literature presents a second approach that models housing as having a quantity and a quality dimension, an approach popularly used in work examining how owners of existing stock make decisions about maintenance.

On a similar note, Muth and Goodman (1989) describe housing as a bundle of characteristics, with different units differing in a variety of dimension- square feet of floor space, quality of construction etc.[13] They point out that housing therefore comes pre-bundled, as food would if one were to select from a variety of pre-assembled market baskets at the supermarket. It is due to this heterogeneity that the price of housing services is not observable calling for a special technique known as hedonic pricing method. Rosen (1974) defines hedonic prices as the implicit prices of attributes and are revealed to economic agents from observed prices of differentiated products and the specific amounts of characteristics associated with them.[14]

Another aspect that characterizes housing markets is the varying degree of local government involvement- involvement in the form of taxation, expenditure, capital market intervention, regulation and creation of public institutions (Smith et al. 1988). Cheshire and Sheppard (1998) in their study estimate demand structures, price and income elasticities for housing characteristics by taking into account not only physical attributes, but also neighborhood amenities, local public goods provision (reflected local government involvement) and land use planning policies.

Having discussed durability, heterogeneity, spatial fixity and government involvement as some of the key features that call for neoclassical demand theory to be modified, an additional and equally important feature has surfaced in the studies of housing market. The effects of a potential capital gain on housing demand has created a strand of both theoretical and empirical literature showing that an increase in house price, contrary to standard demand theory, leads to an increase in the demand for owner-occupied housing. Dusansky and Wilson (1993) and Dusansky and Koc

[12] Smith et al. (1988) refers to the work by Gary Becker (1966), Kelvin Lancaster (1966) and Muth (1966).
[13] Muth and Goodman (1989) highlight that the notion of bundle of characteristics was first applied empirically in the studies of automobile market.
[14] Detailed discussion on hedonic prices left for later sections.

(2007) carryout a study to determine the properties of housing demand function with the former drawing a theoretical framework followed by the later testing the theoretical framework using empirical analysis. Dusansky and Wilson (1993) in constructing a theoretical framework study the intertemporal demand for housing under uncertainty and find that Slutsky equation for housing demand does not yield the traditional predictions of a downward sloping own-demand curve. The authors believe that in order for housing to mimic traditional demand properties (downward sloping) it is necessary to impose additional structure on the model. Dusansky and Koc (2007) follow the theoretical model of owner-occupied housing demand that captures the dual characteristics and carry an empirical study that finds that an increase in house price increases the demand for owner-occupied housing services.[15]

It can be said that wider components of housing studies include, determining the quantity of housing services demanded, the decision of whether to own or rent (known as tenure choice), to account for capital gains effect and flow equilibrium of housing stock. Zabel (2004) argues that despite a vast amount of literature on housing demand the concept of housing remains to be clearly defined. He points out that the literature so far falls into four main categories[16]: (1) the demand for housing services, (2) the demand for individual housing attributes, (3) the demand for owner occupancy versus renting (tenure choice), and (4) the spatial allocation of households. Two consequential measures used in the above studies include estimating unobservables, like house price and permanent income.

The exercise of constructing a theoretical framework for housing studies would involve the use of the above discussion and will help demonstrate how the various elements come into play to give theoretical grounding to such studies. Therefore, the following section will focus on the development of a theoretical framework of hedonic house prices, permanent income and housing demand estimates based on popular convention in the studies of housing market.

4.1.1 Hedonic Pricing Method

Hedonic price function has popularly been used in the development of index numbers especially in the automobile studies. In the context of housing studies computation of hedonic indices was

[15] The authors undertake the econometric analysis using data for Florida, United States of America.
[16] These categories were first highlighted by Rothenberg et al. (1991).

advanced in the late 1960s and developed extensively during 1970s. Rosen (1974) is generally considered to provide the best theoretical framework for hedonic functions.

In a rigorous theoretical representation of the hedonic price function, Rosen (1974) recognizes that a product/commodity is described by n number of attributes or characteristics, $z = (z_1, z_{2,\ldots}, z_n)$. He puts forth the assumptions that there is a 'spectrum' of such products among which choice can be made, that second hand markets for these products do not exist, that is there is no possibility of resale of these used products and lastly that these products (a package of characteristics) cannot be untied.

Housing, like the product just described, is a package of a variety of dimensions such as square feet of floor space, quality of construction, neighborhood etc., and come in a package that is pre-bundled and cannot be untied.[17] Furthermore each product has a quoted market price and is also associated with a fixed value of the vector z, so that products market implicitly reveal a function $p(z) = p(z_1, z_{2\ldots}z_n)$ relating prices and characteristics. This represents the minimum price of any package of characteristics. The focal point of hedonic analysis is to determine $p(z)$. A simple exposition of the hedonic price model consists of

$$\max U(x, z_1, z_{2,\ldots,}z_n)$$

$$\text{s.t. } y = x + p(z)$$

Where U is the utility function that is assumed to be strictly concave, z_is measure the amount of the ith characteristic of a dwelling unit and x is all other goods consumed. Maximization of utility subject to the nonlinear budget constraint requires choosing x and $(z_1, z_{2\ldots}z_n)$ to satisfy the budget and the first order conditions

$$\partial p/\partial z_1 = p_i = U_{zi}/U_x \qquad i = 1\ldots\text{n}$$

The expenditure a consumer is willing to pay for alternative values of $(z_1, z_{2,\ldots,}z_n)$ at a given utility index and income is represented by $\theta(z; u, y)$. Value or bid function $\theta(z_1, z_{2,\ldots}z_{n;}\, u, y)$ is defined according to;

[17] A most common analogy is found in the automobile studies that define it as being a combination/bundle of various characteristics like engine, transmission and sound-system, air conditioning, mileage etc (Muth and Goodman 1989)

$U\,(y - \theta, z_1, z_{2,\ldots,}z_n) = u$

Differentiating the above gives

$\theta_{zi} = U_{zi} / U_x > 0$

θ_{zi} is the marginal rate of substitution between z_i and 'money' or the implicit marginal valuation the consumer places on z_i at a given utility index and income and reflects the reservation demand price for an additional unit of z_i, which is decreasing in z_i . [18]

If a consumer is willing to pay $\theta\,(z;\, u,\, y)$ and is faced with a minimum price of any package of $p(z)$ then the optimum quantities will be z^* and u^* where $\theta\,(z^*;\, u^*,\, y)$ and $p(z)$ are tangent. This relationship is shown by Rosen (1974) as in figure 1

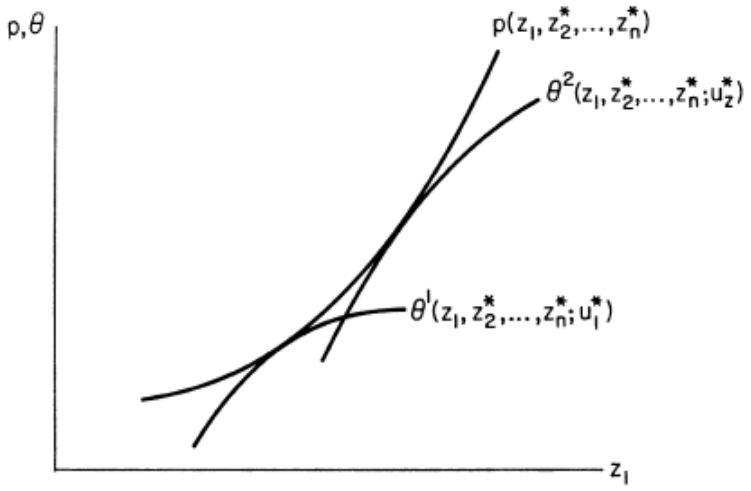

Figure 1

In the context of a supplier, the unit cost that a producer is willing to incur is reflected in what is known as the offer function, expressed as follows;

$\Phi\,(z_1,\ldots, z_n\,;\, \pi,\, \beta)$

Where π denotes profit and β denotes factor price and serves as a shift parameter.

[18] Where $\theta_{zi\,zi} < 0$

Each producer maximizes profit $\pi = Mp(z) - C(M, z_1, \ldots, z_n)$[19] by optimally choosing M (number of units produced) and z, where unit revenue on design z is given by the implicit price function for characteristics, $p(z)$. Given this producer equilibrium is characterized by tangency between a profit- characteristics indifference surface and the market characteristics- implicit price surface. That is;

$$p(z^*) = \phi(z_1^*, \ldots, z_n^*; \pi^*, \beta)$$

Rosen (1974) describes this relationship as in figure 2.

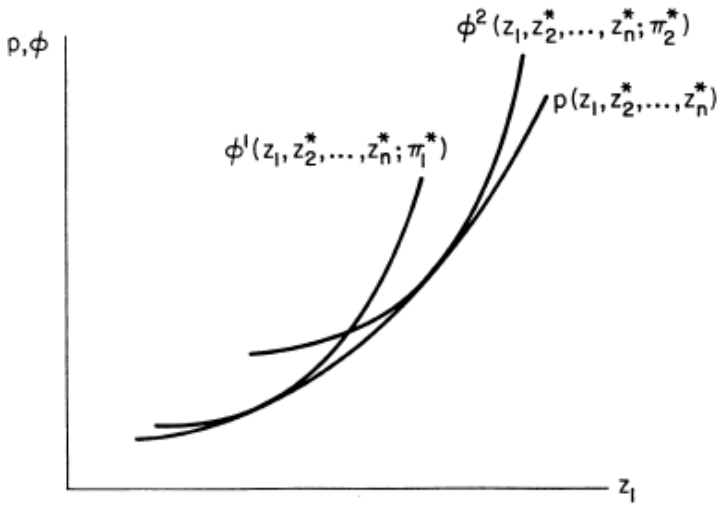

Figure 2

Superimposing figure 2 onto figure 1 represents equilibrium for suppliers and demanders. Rosen (1974) with the aid of Figure 3 shows that $p(z_i)$ represents the joint envelope of suppliers' marginal offer function (Φ_{zi}) and demanders' marginal value/bid function (θ_{zi}); where $\theta_{zi}(z)$ represents compensated demand prices and are inverses of the set of ordinary compensated demand functions for $z_i s$. The locus of intersecting marginal offers and values at z_i is $p_i(z)$, the hedonic price schedule for component z_i.[20]

[19] Where $C(M, z; \beta)$ is the total cost.

[20] Rosen (1974) and Muth and Goodman (1989) explain dp/dz_i = pi as a locus of intersecting marginal 'offers' and marginal 'bids', that is, the hedonic price schedule for the attribute z_i.

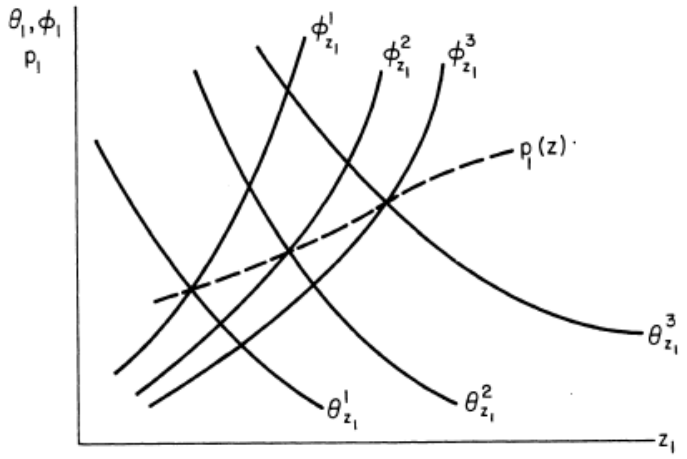

Figure 3

Having outlined the popular convention adopted to estimate unobservable house prices, the literature branches out yet again on the kinds of functional forms used in order to run hedonic regression.

Hedonic housing price model applications typically utilize classical regression analysis in which housing unit's sales prices are regressed on measures of their attributes. Bowen et al. (2001) in their paper refer to housing comprising of three widely considered, basic categories. The first category includes structural *(S)* characteristics (e.g. floor space, age of building, etc), the second includes surrounding or neighborhood characteristics *(E)* and the third includes locational characteristics *(L)* such as distance from the central business district, proximity to transportation amenities, etc. Therefore the specification of the hedonic price function accordingly expresses the market prices of housing units as

$P = f(S, E, L)$.

The econometric regression model typically used to empirically estimate these attribute prices is

$$P = \beta_1 + \beta_S \mathrm{X}_S + \beta_e \mathrm{X}_e + \beta_L \mathrm{X}_L + u$$

Where P represents observed cross sectional sales prices of the housing units on the market; X_s is a vector of structure attributes; X_e is a vector that represents the salient features of their immediately surrounding environment; X_L is a vector of variables reflecting their locational

attributes[21] and μ is the stochastic disturbance term from classical regression theory. This disturbance term represents all those factors that affect the sale price but are not taken into account explicitly, e.g., sampling error, unavailable data or randomness in human behavior. The values of β_1, β_s and β_L estimate the corresponding implicit marginal prices.

Another form used for hedonic specification is the Box-Cox estimation of the following form;

$$P^{\lambda} = \frac{\left(P^{\lambda} - 1\right)}{\lambda} = \alpha_{\upsilon} + \mathrm{X}'_{\upsilon}\beta_{\upsilon} + D\gamma_{\upsilon} + \varepsilon_{\upsilon}$$

where $$P^{\lambda} = \frac{\left(P^{\lambda} - 1\right)}{\lambda} \qquad \text{for } \lambda \neq 0$$

$$= \log P \qquad \text{for } \lambda = 0$$

In this specification parameter λ is the specific form of the function and is determined by the maximization of a non linear likelihood function and involves the transformation of only the left hand side variable.[22] The regression coefficients can then be interpreted as the implicit marginal prices of the attributes (Bowen et al. 2001). This specification of the Box-Cox transformation has popularly been employed by Quigley (1982)[23], Goodman (1988), Bown et al. (2001) and Dusansky and Koc (2007) to name a few.

As much as the use of hedonic pricing models is consequential to housing studies, it nevertheless comes without its own set of problems. Muth and Goodman (1989) point towards the stability of coefficients as posing a problem commonly associated with hedonic studies. Then there is the issue of multicollinearity. For example, plot size is said to be correlated with living area/space

[21] Fletcher et al. (2000) points out that as widely recognized is the importance of locational aspect, researchers have often been restricted due to limited data availability and have instead used postcodes, school districts and neighborhood groupings.

[22] Bowen et al. (2001) points out that if both the right hand and left hand side variables are transformed, e.g., as follows;

$$P^{\lambda(1)} = \alpha_{\upsilon} + X'^{\lambda(k)}{}_{\upsilon}\beta_{\upsilon} + D\gamma_{\upsilon} + \varepsilon_{\upsilon};$$

The resulting regression coefficients that are marginal effect of a unit change in the transformed attribute on the transformed price will result in lack of interpretability. This is why Box-Cox models where either the dependent variables are transformed or natural logarithms are used, are more common.

[23] Following Rosen (1974)'s extensive study on the theoretical framework of the hedonic prices, Quigley (1982) employed Box-Cox in addition to a linear form, semi-log, log-log and inverse semi-log functional forms for hedonic regression. He found Box-Cox reporting the highest R^2 of 49% compared to other models that reported around 34%.

which in turn is correlated with the number of rooms. This affects the efficiency of the estimators.[24] The third concern that researchers face is the problem of 'spatial autocorrelation'. Muth and Goodman (1989), Bowen et al. (2001) and Cominos et al. (2006) have all highlighted this issue. In recent studies, Stevenson (2004) re-examine the issue of heteroscedaticity in hedonic house price models and emphasize on the age of the property as one of the primary causes of heteroscedasticity.[25] He attempts to correct for it by using both the GLS approach and then the general EGLS correction. Fletcher et al. (2000) finds that both age and the external area of the property are known to cause heteroscedasticity. He corrects for it by using estimated generalized least square method.

4.1.2 Permanent Income Hypothesis

Studies in demand for housing are largely motivated by the desire to estimate the effect of changes in income on housing demand. There is a general consensus among researchers on the use of long-term, or permanent, income in any equation used to estimate housing demand and many have concluded that the relation of housing expenditure to permanent income is more stable than that to current income (Goodman 1986 and Muth and Goodman 1989). Leeuw (1971) in reviewing literature on cross section evidence, focused on the response of housing demand to changes in income and attempted to explain why studies differed in their income elasticity estimates of housing- the range of income elasticity observed in earlier literatures was reported to be in the range of 0.4 to 2.1, a range considered wide enough to cause difficulty in drawing quantitative conclusions. In addition to identifying other causes, Leeuw (1971) points out that income elasticities also differed between studies due to the differences in the concept of income. The use of current income as opposed to permanent income causes the income elasticity to be biased downwards (Mayo 1981).

This concern with the use of an appropriate measure of income merits the inclusion of the 'Permanent Income Hypothesis' as an essential component to the study on housing demand. According to the Permanent Income Hypothesis (PIH) established by Milton Freidman,

[24] Muth and Goodman (1989) in their discussion on reducing multicollinearity in hedonic model point out towards alternative methods involving data reduction like factor analysis or an estimation process known as ridge regressions. However, these too have received tantamount criticism.

[25] This Stevenson (2004) explains is due to the fact that as properties age renovations become more likely but it is the difficulty in obtaining the exact timing of these renovations that makes it tedious to take formal account of the impact of age.

individuals make choices based on long-term income expectations and not current income. In other words consumption is a function of real wealth

Consumption = *f*(real wealth)

Where real wealth does not constitute of current disposable income and the PIH theory suggests that consumers try to smooth out consumption based on their estimates of permanent income. Permanent income is defined as the return a consumer unit expects to receive from human and non human sources (Attfield, 1976). In quoting Freidman's hypothesis, Attfield (1976) and DeJuan and Seater (2007) outline the PIH model as follows;

$$y_i = y_i^p + y_i^T \quad (1)$$

$$c_i = c_i^P + c_i^T \quad (2)$$

$$c_i^P = k_1 y_i^p \quad (3)$$

The first equation implies that measured income (y_i) contains a permanent (y_i^p) and a transitory income (y_i^T) component. Here transitory income refers to income that is unexpected or a windfall gain. The second equation implies that measured consumption (c_i) consists of a permanent (c_i^P) and a transitory component (c_i^T). The third equation refers to permanent consumption as proportion of permanent income, with k_1 representing the marginal propensity to consume out of permanent income. For these identities to hold, the PIH assumes that both transitory income and transitory consumption sum to zero across all individuals, i.e.,

$$\sum_i Y_{it}^T = \sum_i C_{it}^T = 0$$

and that the transitory components of income and consumption are uncorrelated with one another and with their corresponding permanent components[26]

[26] This assumption made by Friedman has received considerable attention in literature and has been termed 'excessively strong'. Authors like Attfield (1976) DeJuan and Seater (2007) contend that there infact may be correlation between the transitory income and transitory consumption. Attfield (1976) in an attempt to see the interrelationship between transitory components tests the following equation

$$c_i^T = k_2 y_i^T + u_{it}$$

According to Attfield (1976) if $k_2 = 0$ then strict PIH holds but if $k_2 \neq 0$ then transitory components are infact correlated.

cov (y_i^T, y_i^p) = cov (c_i^T,c_i^p)= cov (y_i^T, c_i^T)= *0.*

The PIH theory contends that only changes in permanent income cause changes in consumption. The equation determining permanent income thus takes on the following form[27]

$$y_i^P = \beta' w_i + u_{2i}$$

Where vector w_i consists of factors that determine human and non-human wealth. Human wealth/ capital is explained in literature as consisting popularly of years of schooling, occupation, age, family size, gender, marital status, region (urban or rural) and the like (Attfield 1976, Miles 1997 and DeJuan and Seater 2007). Non-human wealth is defined as comprising of property, bonds, stock, etc.

Education/schooling, occupation, age, region etc, are all observable characteristics of an individual and a household, and therefore seem closely related to permanent income and unlikely to be related to transitory income.[28] In an attempt to measure human capital, Miles (1997) assumes that conditional on the observable characteristics, the log of household income is a quadratic function of age[29] and according to Attfield (1976) using AGE and AGE² reflects the time path of permanent income over the individual's lifetime. Family size proves useful in capturing human wealth as number of children are considered a security in old age; a belief quite significant in countries like Pakistan.

Another consequential aspect of permanent income estimation is what constitutes the dependent variable, the observable income (y_i^p). Attfield (1996) defines it as measured income of the *i*th consumer unit. Miles (1997) specifies it as post-tax labor income of household *i* in period *t* including income from paid employment, self employment and receipts of benefits. Wang (1995) estimates permanent income using weighted least square and runs two functions with two dependent variables; first dependent variable comprises of the total household income and second variable consists of only wages and bonuses. Using the same set of independent variables, Wang (1995) concludes that equation based on wages and bonuses alone underestimates permanent

[27] This form is assumed by Friedman (Attfield 1976).
[28] Dejuan and Seater (2007) however contend that observable characters such as occupation and region may be correlated with transitory income in a given year, a problem that can be mitigated if data for several years in used. Region they explain may be correlated due to natural disaster or unusual weather.
[29] Miles (1997) uses the form $\log(Y_{it}) = Z_i + \alpha_1(age_i) + \alpha_2(age_i)^2 + e_{it}$ to estimate permanent income.

income of the self-employed and therefore considers the former dependent variable, more representative.

Consequently, fitted values of household income ($\hat{y}_i$) are obtained with the residuals being the unexpected or the transitory income

$\hat{y}_i = \hat{\beta} w_i + \hat{u}_i$ and therefore,

$y_i - \hat{y}_i = \hat{u}_i$

That is the deviation of current income from its expected value will be equal to transitory income. However, Miles (1997) points out that decomposing $\hat{u}_i$ will consist of a systematic component (w_i) and a random element e_i

$\hat{u}_i = w_i + e_i$

such that w_i by definition will be that part of the deviation of current income from expected that are only known to household itself and not known to econometricians. This according to Miles (1997) and Goodman (2001) can not be untangled when using a cross section data.

Another approach to estimate permanent income, as used by Dusansky and Koc (2007) and Goodman (1988) is to run a hedonic regression using a Box-Cox form. Permanent income is estimated using the following equation

$$\mathrm{Y}_p^{(\xi)} = \frac{\mathrm{Y}_p^{(\xi)} - 1}{\xi} = \alpha_p + \mathrm{X}'_p \beta'_p + D\gamma_p + \varepsilon_p$$

where Y_p equals the observed income of the household, X_p includes personal characteristics determining permanent income, D a vector of regional dummies and ξ is the Box-Cox non linear transformation parameter.

In reviewing research, albeit scarce, on Pakistan's housing market, works by Pasha and Butt (1996) and Lodhi and Pasha (1991) take total household consumption expenditure as a proxy for

permanent income. Pasha and Butt (1996) contend that using various approaches of estimating permanent income in a developing country like Pakistan may not prove very helpful because actual spending patterns serve as more accurate measures of permanent income (as its easier for households to recall and provide information about). Ahmed (1994) on the other hand uses the human capital theory and estimates in linear form permanent income using employment period, skill dummy, education, age and age² as independent variables.

4.1.3 Housing demand

Having highlighted the importance of income and price elasticities in the study of housing demand, the decision involving the use of an appropriate functional form to reflect housing demand has largely been motivated by the desire to obtain representative income and price elasticity. In a study, following Leeuw (1971)'s attempt, Mayo (1981) pointed out that income elasticity of housing demand may also differ based on the kind of functional form used, with the following log linear form of demand equation most commonly adopted;

$$lnH = a + blny + clnP_{н}$$

where H is housing; y, income; $P_{н}$, the relative price of housing with a, b and c being the parameters. Mayo (1981) also indicated that the use of micro and aggregate data may also cause variations in the estimates of income elasticity and in terms of varying price elasticities pointed out that the estimates are sensitive to both the way in which prices are defined and to the model specification.

Mayo (1981) further investigates functional forms that can be related explicitly to known utility functions. For example a linear-demand function of the form

$$R = A + By + Cp_{н}$$

where R is housing expenditures or rents; y income and $p_{н}$ is the relative price of housing. Such a demand function may be derived from the Stone-Geary or the displaced Cobb-Douglas utility

function[30] and when maximized subject to a budget constraint gives the following form of demand equation;

$$H = \theta_н + \beta/p_н\,(y - p_н\,\theta_н - \theta_z)$$

where $R = p_н H$.

Mayo (1981) points out two reasons why a Stone-Geary demand (expenditure) function is desirable. First, if *R* is regressed on income and relative price of housing, all parameters of the Stone-Geary function are identified, and second that it allows both price and income elasticties to vary with price and income (as opposed to a log-linear form).[31] Zabel (2004) in refuting Mayo's claim points out the possibility of allowing price and income elasticities to vary with income in the log-linear model by interacting income with itself and price.[32] Our study allows this variation by using three rounds of household surveys and therefore has the strengths of both the time-series and cross-section data. There is a mix of evidence in support and against the use of linear demand functions as opposed to log-linear estimations, thus leading to inconclusive choice between the two functional forms.

An additional set of literature has attempted to determine household demand for housing services by employing a model of housing demand that considers the joint determination of tenure choice and the quantity of housing services demanded. [33] Goodman (1988) employs this methodology and explains that housing demand H (Q), is the sum of the probability of owning multiplied by the amount of housing demanded by owners plus the comparable probabilities (percentages) for renter.

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[30] Given a utility function;

$$U = (H - \theta_H)^{\beta}(Z - \theta_z)^{1-\beta}$$

where H is housing; Z, other goods and $\theta_н$, θ_z and β parameters (Mayo 1981).

[31] A drawback of the Stone-Geary demand function is that price and income elasticities monotonically approach unity with changes in price and income (Mayo 1981)

[32] In Zabel (2004)'s study, the following two variables were included in the log-linear model to allow for variation;
Log (price) Log (permanent income) &*
Log (permanent income)^2

[33] Housing services units refers to the number of standardized units which is determined by dividing self-reported owner house value by price of a standardized unit (hedonic house price) (Muth and Goodman 1989, Dusnasky and Koc 2007 etc), a methodology covered in greater detail in subsequent sections.

That is

$$H(Q) = f(Q_0 + (1-f)Q_r$$

where Q_o and Q_r denote housing demand by owners and housing demand by renters, respectively. Dusansky and Koc (2007) work on similar lines and use the Heckman selection model to determine tenure choice and housing demand jointly. In studies involving Pakistani housing markets, this methodology has been adopted by Ahmed (1994). Lodhi and Pasha (1991) follow Mayo (1981) and employ a liner demand specification whereas Pasha and Butt (1996) use a single equation OLS to estimate demand for varying housing attributes.

4.2 NATURE OF PREVIOUS HOUSING STUDIES

Having discussed how the theoretical framework for housing studies developed and its adoption in various studies covering both developed and developing country studies, this section will highlight the scope and nature of previous studies.

In the context of developed countries, for the most part, studies have focused on determining the effect that income, price and demographics have on housing demand and tenure choice by using both cross-sectional and panel data sets. Such studies include Mayo (1981), Quigley (1982), Goodman and Kawai (1984), Henderson and Ioannides (1985), Goodman (1988) and Dusansky and Koc (2007) to name a few. Goodman (1990) in his paper focuses on the importance of including demographics like age, occupation, marital status, education etc. on housing demand. Ioannides and Zabel (2002) and Zabel (2003) follow the strand of literature that shows interaction of neighborhood into demand function and show that neighborhood considerably affects housing choices. Moreover, Goodman (2002) uses a panel data set to estimate housing demand for 'stayers'.

Recent work in the developed countries have included studies like that of Quercia and Wachter (2002) who test the impact of affordable lending efforts on homeownership rates and find that while affordable lending rates increase homeownership, the effect of these rates is felt differently across various groups like young households, blacks and central city residents. Turner (2003) tests if house-price risks affect housing decisions and finds that households are less likely to own

during episodes of relatively high, anticipated house-price volatility. In another study by Thalman (2003), using data on Switzerland, studies, who among the poor are in need of general income assistance and who needs specific housing aid. The author constructs alternative affordability indicators that help determine more specific housing policies for the low income. In an another interesting paper by Ermisch and Pevalin (2004), using the British Household Panel Survey 1991-2001, the author sets out to determine the effects of early child bearing on housing demand and finds that births early in adulthood substantially reduce housing demand later in life. Sinai and Waldfogel (2005) conduct a policy analysis in which they test if subsidized housing programs helps in raising the quantity of owner-occupied housing and find that tenant based housing programs better target subsidized housing units to households who in fact need it, compared to project-based programs. All these studies only reflect a plethora of similar literature that has branched out of conventional housing studies and are now actively seeking to evaluate various housing policies.

In the context of developing countries, the nature of housing research is still at a very nascent stage and is still encircling the importance of focusing income, price and demographic effects on housing demand. Studies include those by Malpezzi and Mayo (1987), Shefer (1990), Arimah (1992), Tiwari and Parikh (1998) and Ballesteros (2001). Additionally, studies like Follain and Jimenez (1985) estimate demand for housing characteristics and find that household willingness to pay for living space increases with income but at a less than proportionate rate, willingness to pay for living space falls with an increase in household size and that willingness to pay for various other attributes, is responsive to income. A recent policy paper by Buckley and Kalarickal (2005) for the World Bank Research Observer gives an interesting and thorough analysis on effective housing policies adopted in developing countries and stresses on the need for policies to be in line with relevant research.

The work on housing research is even more limited in the context of Pakistan. Although, the importance of housing has been part of government policies since a considerable time, these policies have been disconnected with any research. Ghaus and Pasha (1990) have attempted to measure the magnitude of housing shortage in Pakistan. Lodhi and Pasha (1991) conduct their own survey in Karachi to determine housing demand in informal and formal housing markets. Ahmed (1994) estimates a joint model of tenure choice and demand for housing in Karachi. In another study by Pasha and Butt (1996), the authors attempt to determine demand for various housing characteristics.

5. METHODOLOGY

This study seeks to determine the factors that affect demand for housing services and extends into investigating if this demand for housing services varies across income groups. This chapter sets out to first present the econometric model used to estimate determinants of housing demand. This will be followed by an estimation of permanent income, transitory income, house price and housing units; parameters not directly observable from the data. Lastly, a discussion on Heckman's two step selection model adopted to control for selectivity bias, will be presented.

Demand for housing services is a function of household background, household head's personal characteristics and price of housing. That is

$$Q = f(B, C, P)$$

Q is the quantity of housing services, which needs to be either estimated or use a proxy to represent it. *B* refers to household background including household's permanent income, transitory income, family size, number of earners in the household and income group to which the household belongs. Since the data does not provide a measure of permanent and transitory income explicitly, these will need to be estimated using the Permanent Income Hypothesis (PIH) theory discussed earlier. *C* in the above expression denotes household head's characteristics including, head's age, head's education, gender, marital status and occupation. Lastly *P* which refers to the 'price' of housing unit is another variable not commonly observed in household level data sets and therefore a proxy capturing house price also needs to be estimated in addition to housing quantity and permanent income.[34] Once these have been estimated, a demand equation of the following form is used to determine demand for housing services;

$$y_i = x_i'\beta + e_i \qquad (5.a)$$

Where y_i is the quantity of housing services (standardized housing units) and x_i' is a 1xM vector of exogenous variables including permanent income, transitory income, house price, rent-to-income ratio (proxy for affordability), head's age, gender, marital status, head's education,

[34] The methodology adopted to estimate housing quantity, permanent income and house price will be described in greater detail in subsequent section.

number of earners in the household, family size (adults and children) and dummy variables for income groups (low, middle and high) and city (14 urban centres). β is an Mx1 vector of parameters. The OLS demand equation we employ (5.b) takes the following log-linear form;

$$LnH = \beta_0 + \beta_1(Permanent\_income) + \beta_2(Transitory\_income) + \beta_3 \ln(House\_price) + \beta_4(\text{Re}nt\_income\_ratio) + \beta_5(Age) + \beta_6(Earners) + \beta_7(Education) + \beta_8(Family\_size) + \delta_1(Year0102) + \delta_2(Year0405) + \delta_3(Middle\_income) + \delta_4(High\_income) + \delta_5(Male) + \delta_6(Married) + \sum_{20}^{7}\delta_j(City) + e_i \quad (5.b)$$

Where δ parameters refer to dummy variable coefficients including dummy variables for 14 urban centers in Pakistan. We choose a log model because one of its desirable properties is that it reduces heteroscedasticity and reduces the influence of extreme values on parameter estimates. Given the above demand equation, permanent and transitory income, house price, and quantity of housing services (*H*) are not observable and hence need to be determined. *H*, the standardized housing units are estimated as follows;

$$\text{Standardized housing units} = \frac{\text{Observed owner-occupied house value}}{\text{House price per unit}} \quad (5.c)$$

The standardized housing unit is used as the dependent variable for the housing demand equation. Here the observed owner-occupied house value refers to the market value of the property that the owner expects to receive if he sells his property and is reported in the data. However, housing units are only determinable after house price is estimated. Dependent variable for the demand equation has popularly used housing expenditure as a proxy, i.e., rent which is a product of housing units and price. However, we follow Dusansky and Koc (2007) and estimate standardized housing units as described in equation 5.c.

5.1 PERMANENT AND TRANSITORY INCOME

Permanent income is defined as the return a consumer unit expects to receive from human and non human sources, thus representing potential life time earnings. In order to estimate permanent and transitory income, we follow Goodman & Kawai (1984), Ahmed (1994), Wang (1995) and Goodman (2002) and use a linear regression approach of the following form;

$$y = \alpha + X_1'\beta_1 + ' X_2\beta_2 + D\gamma + \varepsilon \quad (5.c)$$

Where *y* is the real observed total income of the household computed using an aggregate of wage income[35] of the household and income from other sources (remittances). X_1' refers to year dummy variables and X_2' accounts for both human and non-human capital. Human capital includes personal characteristics like head's age, head's education, family-size, number of earners in the household, gender, marital status, occupation and employment status. Non-human capital is accounted for by remittances received and dummy variables for ownership of commercial and/ or non-agricultural property. Finally, the *D* captures city dummies. Therefore, this approach to measure permanent income represents potential life time earnings and by regressing real observed total income on the independent variables identified provides permanent income as fitted value of the regression and transitory income as residuals. This method of estimating permanent income is extensively used in housing studies from both developed and developing countries. However, there exists another strand of literature, especially those on developing countries, which have used consumption expenditure as proxies for permanent income. These include studies by Ahmed (1994), Ballesteros (2001) and Shefer (1990) to name a few. Dusansky and Koc (2007) use the Box-Cox specification to estimate permanent income.

5.2 HOUSE PRICES

Since house prices are also not observed in the data set, these are computed using the hedonic method popularly adopted in housing studies. Households have reported their estimate of how much they expect their property to sell for in the market if it were put up for sale and has been reported in the data as owner-occupied house value. Owner-occupied house value is considered to be equal to the per unit price times the number of housing units consumed, and is assumed to be a function of structural characteristics and locational attributes. Since per unit price and housing units are not observed, both these variables will need to be extracted from the owner-occupied house value. Following Goodman and Kawai (1984), Goodman (1988), Cheshire and Sheppard (1998) and Dusansky and Koc (2007), house price per unit can be estimated using the Hedonic approach with a Box-Cox specification as follows;

[35] Wage income includes bonuses and pension. All monetary values have been deflated using yearly CPIs.

$$P^{\lambda} = \frac{(P^{\lambda} - 1)}{\lambda} = \alpha + \mathrm{X}'_{\upsilon}\beta_{\upsilon} + \mathrm{X}'_{s}\beta_{s} + D\gamma + \varepsilon \qquad (5.d)$$

Where P is the observed owner-occupied house value and λ is the Box-Cox non-linear transformation parameter. X_{υ}' refers to year dummies and D is a vector of city dummies. X_s' includes structural features like number of rooms, source of water, means of sewage, house tax (real values) and dummy variables for the presence of amenities like electricity, gas and telephone connection[36]. After using the Box-Cox specification to run the hedonic function, fitted/ predicted values generated represent price of a standardized unit of housing services. Dusansky and Koc (2007) describe the fitted values as representing the estimated price for the same home in different districts (cities), thus allowing price comparisons that hold quantity constant.

5.3 HOUSING DEMAND

It is important to note at this juncture that the dependent variable (standardized housing units) is not always observable for the entire sample. It is only observable if the household is a home-owner (and not a renter), that is, the tenure choice, say, z=1 if household is an owner and zero otherwise. Under these circumstances, running an OLS regression will cause selectivity bias and as a result the β estimates will be biased and inconsistent. To quantify the relationship between housing demand and its covariates, we use an econometric framework augmented by Heckman's two-step selection procedure to control for selectivity bias between tenure choice and quantity of housing services demanded. Therefore, following Greene (2003) and Wooldridge (2006), the Heckman two-step selection model[37] is used by estimating the following tenure choice equation, using probit analysis, before running the above demand equation;

$$z_i^{*} = w_i'\gamma + u_i$$

[36] The choice of structural features includes variables that were consistently available/covered by all three surveys, albeit, the PSLM survey for 2004-05 covers structural attributes in greater detail.

[37] The Heckman selection model offers both the two-step and a Maximum Likelihood (ML) estimation. However, for the purpose of this study, we use the two-step estimation since ML estimations of the parameters can be time consuming with a large dataset. Furthermore, the two-step model is generally considered to be more stable in cases where the data are problematic. Additionally it also allows for estimates of ρ (rho-the correlation between the error terms of the regression and the selection model) to be less than -1 and greater than 1 (STATA manual).

Where z_i^* (a latent variable) in our study refers to those observations for which households own their house (i.e. z_i =1 if z_i^* > 0 and $z_i = 0$ otherwise). γ is a Kx1 vector of parameters and w_i' is a 1xK row vector of observations on K exogenous variables (same variables as the independent variables used in the demand equation above)[38]. The problem of selectivity arises when the error terms of both the equations (e_i & u_i) are correlated. This selectivity bias is eliminated using the Heckman procedure and has been employed by Goodman (1988), Ahmed (1994) and Dusansky and Koc (2007).

Very few housing studies in developing countries have employed the Heckman sample selection procedure. Tiwari and Parikh (1998) use a ridge regression to determine demand. Shefer (1990), Follain and Jimenez (1985) and Ballesteros (2001) use a log-linear form whereas, Arimah (1992) and Pasha and Butt (1996) use a double-log form. For the purpose of our study, we use the Heckman two-step selection model and run an OLS demand equation of the log linear form (equation 5.b).

[38] When using the Heckman selection sample to correct for selectivity bias, the independent variables used in the OLS demand equation should be a strict subset of the independent variables used in the probit (tenure choice) equation.

6. DATA

We take a sample of 8386 urban households from the Pakistan Integrated Household Survey (PIHS) 1998-99, 2001-02 and Pakistan Social and Living Standards Measurement (PSLM) survey 2004-05.[39] The universe of these surveys consists of all urban and rural areas of all four provinces excluding military restricted and protected areas of NWFP.[40]

The total urban sample constitutes about 37% of the entire sample for the years 1998-99 & 2001-02 and 39% for the year 2004-05. The rest constitutes rural areas. Of the proportion that is urban, only 51.62% (1998-99), 50.1% (2001-02) and 47.39% (2004-05) have been considered as 'major' urban areas and therefore have been focused on, only, for the purpose of this study. Major urban areas defined here; include Karachi, Lahore, Islamabad, Peshawar, Quetta, Hyderabad, Faisalabad, Bhawalpur, Sialkot, Sukkur, Gujranwala, Sargodha, Multan and Rawalpindi.[41] All of these urban areas have been further divided into smaller areas known as Enumeration Blocks or Primary Sampling Units (PSUs). Each of these PSUs comprises of 200 to 250 households and each has been categorized into low, middle and high income groups. The selection of only 14 urban areas/cities is motivated by the fact that the housing market in the urban cities of Pakistan are purported to display greater and differing dynamics across income groups; low, middle and high.

The three data sets are structured in a way that report information on employment, income and education of the household head. On a household level, the data also provides information on housing, monthly and yearly expenditures on durables and non-durable, assets (both financial and non financial) and liabilities.

Prior to conducting econometric analysis using Stata SE 8(2), the data cleaning exercise involved destring-ing variables[42], treatment of missing values, generating dummy variables (e.g. year, cities etc) and finally naming/ labeling variables. 25 observations were dropped since the households did not report any information in the required areas. An additional 13 observations for

[39] Data was provided by the Centre for Management and Economic Research (CMER) at the Lahore University of Management Sciences, which was originally obtained from the Federal Bureau of Statistics of Pakistan.
[40] Source: Federal Bureau of Statistics of Pakistan.
[41] Sukkur and Bhalwalpur were not recognized as survey districts until after the 1998-99 survey.
[42] Most often many (or all) of the variables are defined as strings, i.e., character. The variables may contain numeric values, but if they are defined as type string, there are very few things that can be done to analyze the data, e.g. compute means or run regression. Therefore it is essential to 'destring' variables.

which no income (neither earned nor income from other sources) was reported, were also dropped.

Treatment of missing values by far merits a detailed explanation as variables of importance were not free of missing values. These included variables such as house value reported by owners, total household income, employment status and occupation of the household head. Both the 'primary occupation' and the 'employment status' variables reported approximately 20% missing values. After a careful analysis of the missing values in these particular variables, it was observed that about 51% of the missing values were attributable to household heads who were past the retirement age of 60 and had simultaneously not reported any wage income. These were also observations for which the 'employment status' too was missing, therefore, strongly suggesting that this group of the sample was either retired or simply unemployed. It was decided against dropping these observations and instead a new category in both occupations and employment status was created by the name of 'retired/not working'. All missing values were included in this category.

House value reported by owners, another important variable, reported approximately 32% missing values.[43] Of these 82% were attributable to households who were living in a rented accommodation. Only 18% of the missing values constituted of households living in owned accommodation. For the data already reported, mean values were computed for each PSU and each income group. That is, within one PSU missing values on house value were assigned mean values based on which income group that observation belonged to. Furthermore, a small number of observations were seen to report unrealistic house values (e.g. Rs.250, Rs.490). It was suspected that data for these few observations were entered scaled to 100,000. Therefore were corrected for by multiplying these values by 100,000. Lastly, city, gender, marital status and owner occupancy dummies were created.

Description of these variables is given in Table 1. Standardized housing unit is used as the dependent variable in the demand regression. After estimation house price, housing units are extracted from the relationship shown in equation 5.c. An increase (decrease) in demand for

[43] This variable is household's estimate of how much their residential property would sell for if they were to sell it.

housing units would therefore indicate an increase (decrease) in the *number* of these housing units being demanded.[44]

Since the surveys only report observed income (in Rupees), both Permanent and Transitory income are estimated. Permanent income is estimated by regression real observed total income on human (age, gender, education, etc) and non-human capital variables (income from other sources). Transitory income, which represents unexpected or windfall gain/loss, is estimated as a residual to the regression used for permanent income. Similarly, house price per unit, which represents hedonic indices, is also constructed. Categorization of income groups, as discussed earlier, represent enumeration blocks or Primary Sampling Units as identified by the Federal Bureau of Statistics.

Rental units too have been estimated the same way as standardized housing units has been constructed. Observed real rents paid by households or the expected rental values are considered to be a product of rental price per unit and rental units. Where both rental price per unit and the rental units are not observable, rental house price per unit is estimated by a hedonic transformation of the observed real rent using Box-Cox, and regressing it on structural attributes, locational attributes and also on cost of amenities like gas, electricity, etc. Consequently, the rental housing units is extracted now that we have both per unit price and the observed real rents.

The proxy for affordability, rent to income ratio, is estimated using observed real rent and real income from all sources. Other variables like head's age, gender, marital status, number of earners, family size, head's education (number of years) and city have been obtained from the three rounds of household surveys.

[44] For example, a negative coefficient on an explanatory variable will indicate that, with every unit increase (decrease) in the explanatory variable, the number of housing units demanded will decrease (increase) by that unit.

Table 1

Definition of explanatory variables used in regression equation

Variables	Description
Standardized housing units	Dependent variable
Permanent Income	Potential life time earnings
Transitory Income	Unexpected/ windfall gain
House Price	Owner occupied housing price per 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)
Rental Units	Rental housing units
Rent to Income Ratio	Rent to Income Ratio used as a proxy for affordability
Head's Age	Head's age in years
Male	=1 if head is a male
Married	=1 if head is currently married
Number of Earners	No of earners in a household
Family Size	Household size (adult plus children)
Head's Education	Education of head (years)
Rawalpindi	=1 if Rawalpindi
Sargodha	=1 if Sargodha
Faisalabad	=1 if Faisalabad
Gujranwala	=1 if Gujranwala
Sialkot	=1 if Sialkot
Lahore	=1 if Lahore
Multan	=1 if Multan
Islamabad	=1 if Islamabad
Bhawalpur	=1 if Bhawalpur
Sukkur	=1 if Sukkur
Hyderabad	=1 if Hyderabad
Peshawar	=1 if Peshawar
Quetta	=1 if Quetta
Karachi	=1 if Karachi
Year 1998-99	=1 if Survey year 1998-99
Year 2001-02	=1 if Survey year 2001-02
Year 2004-05	=1 if Survey year 2004-05

Table 2

Means of explanatory variables

Variable	National	Low Income	Middle Income	High Income
Standardized Housing Units	1.77	1.28	1.46	3.44
	(2.90)	(2.65)	(1.49)	(4.98)
Permanent income (Rupees)	141,888	114,814	138,107	196,694
	(89,588)	(73,186)	(81,461)	(109,851)
Transitory income (Rupees)	-0.000035	-19,988	-12,860	68,824
	(124,158)	(68,067)	(94,875)	(212,702)
House price (Rupees per unit)	517,364	347,059	493,319	862,843
	(756,007)	(265,177)	(547,623)	(1,409,655)
Rented housing quantity	1.23	0.96	1.18	1.85
	(0.98)	(0.52)	(0.82)	(1.54)
Rent to Income Ratio	0.20	0.17	0.21	0.24
	(0.23)	(0.14)	(0.25)	(0.27)
Head's age (in years)	46.29	44.60	46.28	49.08
	(13.19)	(13.14)	(13.08)	(13.15)
Male	0.93	0.94	0.93	0.91
	(0.26)	(0.23)	(0.26)	(0.29)
Martial status (Married)	0.96	0.96	0.96	0.97
	(0.20)	(0.20)	(0.20)	(0.18)
Family size	6.60	6.97	6.59	6.04
	(3.23)	(3.37)	(3.17)	(3.05)
No: of earners in the family	1.69	1.80	1.67	1.55
	(1.11)	(1.12)	(1.11)	(1.05)
Head's years of education (in years)	6.29	4.49	6.35	9.05
	(5.25)	(4.66)	(5.09)	(5.36)
Year 1998-99	0.34	0.34	0.34	0.32
	(0.47)	(0.47)	(0.47)	(0.47)
Year 2001-02	0.33	0.33	0.34	0.33
	(0.47)	(0.47)	(0.47)	(0.47)
Year 2004-05	0.33	0.33	0.32	0.35
	(0.47)	(0.47)	(0.47)	(0.47)
Proportion of owner occupied houses	0.71	0.70	0.70	0.74
	(0.45)	(0.46)	(0.46)	(0.44)
Low income group	0.30			
Middle income group	0.52			
High income group	0.18			
Total observations	8368	2505	4327	1536

Figures in parenthesis denote standard deviations

Table 2 presents summary statistics of all the variables. Standardized housing units for owners are on average 1.77 units, for national level. Across income groups, the average housing units for a low income household is 1.28 units (lower than national average), which increases for middle income to an average of 1.49 units. High income households report 3.44 units of housing on an average. Permanent income is reported to be Rs. 141,888, on average. It can also be observed that permanent income is almost 71% and transitory income is over 400% higher in high income compared to low income group. House price on an average has been around Rs 517,000 and the highest average house price per unit is observed among high income households.

The average rental housing units of 1.23 units show that owner occupied housing units (1.77) are greater than housing units rented on a national level and also across income groups. The proxy for affordability, rent to income ratio shows that affordability is low on a national level but even lower for low income households. Moreover, affordability also seems to be increasing as income levels (from low to high income group) increase.

Among the demographic characteristics, the average age of the head of a household is seen to be 46 years. 93% of our data consists of male household heads with a 96% of the sample married. Family size/ household size which is defined as children plus adults living in the household, is reported to have 6.6 members on average per household. This number is in line with figures observed in developing countries like Pakistan. In addition, it can be observed that family size is greatest in low income households and reduces as income group ascends. Average number of earners in a household is 1.69 with a decline if the household moved from a low income group towards high income group. The head's years of education is quite reflective of each income group characteristics that is an individual from the low- income group has less education compared to an individual from middle or high income group.

Of the total 8368 observations, all three years consist of an equal sample size (approximately 33% each of the total sample). Owner occupied housing constitutes of 71% of the entire sample implying that within the urban sample, over 70% of households own their own house while the remaining 30% comprise of those who rent instead. Owner occupancy is slightly higher for high income group (74%) compared to low and middle income groups. Moreover, low-income group constitutes 30%, middle income 52% and high income 18% of the sample.

The summary statistics in Table 2 extend useful trends in housing in Pakistan over the year 1998-99 to 2004-05 and across income groups. It can be inferred that households belonging to low income groups are characterized as having larger families, more number of earners in the family, lesser education, hence lower permanent incomes and interestingly negative income shocks (captured by transitory income) compared to high income groups. It is perhaps due to all these factors that low income households can afford lesser owned housing units and even lesser rental units. Middle income group is also characterized with experiencing negative income shocks only 36% less than low income households. Given that both the low and middle income groups constitute 82% of our sample and are also receiving negative income shocks, the importance of determining factors that affect housing decisions for each of these income groups becomes even more pressing in the context of Pakistan.

Table 3 shows city wise sample distribution with Karachi and Lahore constituting 30% and 14% respectively.

Table 3

City-wise sample distribution

City	National	Low Income	Middle Income	High Income
Rawalpindi	418 (5)	100 (4)	173 (4)	108 (7)
Sargodha	335 (4)	125 (5)	130 (3)	92 (6)
Faisalabad	586 (7)	150 (6)	303 (7)	107 (7)
Gujranwala	334 (4)	125 (5)	173 (4)	61 (4)
Sialkot	251 (3)	75 (3)	86 (2)	77 (5)
Lahore	1172 (14)	300 (12)	649 (15)	153 (10)
Multan	418 (5)	125 (5)	216 (5)	92 (6)
Islamabad	502 (6)	125 (5)	216 (5)	138 (9)
Bhawalpur	167 (2)	50 (2)	15(1)	46 (3)
Sukkur	167 (2)	50 (2)	86 (2)	30 (2)
Hyderabad	585 (7)	150 (6)	260 (6)	138 (9)
Peshawar	669 (8)	225 (9)	346 (8)	138 (9)
Quetta	502 (6)	150 (6)	303 (7)	15 (1)
Karachi	2510 (30)	2594 (31)	1341 (31)	338 (22)
Total observations	8368	2505	4327	1536

Figures in parenthesis denote percentage

7. EMPIRICAL FINDINGS

7.1 TENURE CHOICE REGRESSION

Table 4 shows the result for the tenure choice regression. Of the two components of income, an increase in permanent income by an additional Rs 100,000, increased the probability of ownership by 5.6%, whereas for transitory income, probability decreased by 0.7%. However, the coefficient on transitory income is insignificant. This observation is in line with Ahmed (1994)'s results, where the permanent income increased the probability of ownership by 0.1%, while the coefficient on transitory income is reported to be negative and insignificant. This observation is quite plausible as transaction costs involved in purchasing with the intention of owner occupancy, is very high.

The marginal effect of an increase in house price has an increasing effect on the probability of owning versus renting. This implies that with an increase in house prices the probability of owning increases, an observation that can perhaps best be explained by the greater proportion of owners in the sample. Interestingly, probability of owning decreases by 5% and 12% for middle-income and high-income groups, respectively. It would prove difficult to explain, without an extended study, as to why an increase in house price is increasing the probability of ownership and how household heads belonging to high income group face a lower probability of ownership, relative to low income household.

The probability of ownership increased by 0.4% with every additional year's increase in head's age; result in line with what Goodman (1988), Goodman (1990), Ahmed (1994) and Dusansky and Koc (2007) have observed. An additional member in the family (an increase in family size), increased the probability of ownership by 1.3%, a relationship which is also observed by Ahmed (1994) and Dusansky and Koc (2007). Each additional earner and year of education seems to reduce the probability of ownership by 5% and 0.8%, respectively.

Results show that the probability of owning a house during 2001-02 was not much different, but decreased by 9% (marginal effects) during 2004-05, relative to 1998-99. Most, with the exception Lahore and Quetta, offer higher probabilities of ownership relative Karachi. Islamabad, Rawalpindi and Peshawar have lesser probabilities of ownership, with 45%, 8% and 4%, respectively, less than Karachi.

Table 4

Tenure choice regression

Variables	National Coefficient (Standard Error)	Marginal Effect
Permanent Income	0.170 (0.043) *	0.056 *
Transitory Income	-0.022 (0.015)	-0.007
Log of House Price	0.496 (0.040) *	0.163 *
Middle-income Group	-0.149 (0.037) *	-0.049 *
High-income Group	-0.338 (0.057) *	-0.117 *
Log of Rental Units	0.012 (0.031)	0.004
Rent to Income Ratio	0.216 (0.110)	0.071
Head's Age	0.011 (0.001) *	0.004 *
Male	-0.059 (0.064)	-0.019
Married	-0.0007 (0.065)	-0.000
Family Size	0.039 (0.006) *	0.013 *
Number of Earners	-0.144 (0.017) *	-0.047 *
Head's Education	-0.025 (0.005) *	-0.008 *
Rawalpindi	-0.231 (0.072) *	-0.080 *
Sargodha	0.644 (0.091) *	0.168 *
Faisalabad	0.902 (0.081) *	0.215 *
Gujranwala	0.736 (0.095) *	0.184 *
Sialkot	0.904 (0.121) *	0.207 *
Lahore	0.060 (0.049)	0.019
Multan	0.634 (0.080) *	0.167 *
Islamabad	-1.208 (0.072) *	-0.453 *
Bhawalpur	0.645 (0.135) *	0.165 *
Sukkur	0.712 (0.131) *	0.177 *
Hyderabad	0.587 (0.072) *	0.158 *
Peshawar	-0.127 (0.059) *	-0.043 *
Quetta	0.044 (0.069)	0.014
Year 2001-02	-0.014 (0.039)	-0.005
Year 2004-05	-0.270 (0.041) *	-0.091*
Constant	-6.251 (0.430) *	
Lambda	-1.541 (0.243) *	
Rho	-1.000	
Sigma	1.541	

Figures in parenthesis are robust standard errors

* denotes coefficients that are statistically significant at 5% level.

7.2 HOUSING DEMAND REGRESSION

Results in table 5 show that both the components of current income, that is, permanent and transitory, are positive and statistically significant. With every Rs. 100,000[45] increase in permanent income, demand is reported to rise by 10%, whereas, a similar increase in transitory income has the effect of increasing demand by 20%. This implies that an unexpected/windfall gain has a greater effect on increasing demand then does permanent income. Ahmad (1994), like many others, finds permanent income to be affecting demand positively and significantly, where as the effect of transitory income, the author observes, is significant and negative. The author further claims that these results are contrary to previous work (developed countries) which report a significant effect of transitory income and a coefficient generally about one-third of the coefficient of permanent income.[46] However, our study observes the opposite, that is, the coefficient on transitory income is twice the coefficient of permanent income.

The estimated income elasticity in our study is 0.14 (using permanent income), implying that housing is a normal good and faces a highly inelastic demand. Comparing our income elasticity with those estimated in previous studies, as shown in Table 6, it can be observed that our estimate is generally lower than those observed in other studies. In the literature reviewed on developing countries, income elasticity ranges from 0.1 to 1.2 and for developed countries it ranges from 0.12 to 0.87. In both cases our estimate of 0.14, lies at the lower end of the ranges.

In the context of developing countries, Malpezzi and Mayo (1987) and Lodhi and Pasha (1991), report income elasticity closer to our estimate. Malpezzi and Mayo (1987)'s study on Ben Suef (Egypt) observed an income elasticity of 0.1, whereas, Lodhi and Pasha (1991) reported an income elasticity of 0.12; only for informal areas of Karachi. Studies by Shefer (1990), Lodhi and Pasha (1991) and Ballesteros (2001) estimate elasticities greater than unity (Table 6). Income elasticity estimates less than unity and greater than our estimate of 0.14 have been reported in studies by Malpezzi and Mayo (1987) on Cairo and Manila, Arimah (1992), Ahmad (1994) and Tiwari and Parikh (1998).

[45] The figures estimated for permanent and transitory income have been divided by 100,000 for ease of exposition and interpretation.
[46] Goodman (1988) finds the coefficient of permanent income to be twice that of transitory income.

Table 5

Housing demand regression for own housing

	National	
Variables	Coefficient	(Standard Error)
Permanent Income	0.101	(0.026) *
Transitory Income	0.199	(0.111) *
Log of House Price	-0.798	(0.056) *
Middle-income Group	0.269	(0.033) *
High-income Group	0.780	(0.054) *
Rent to Income Ratio	-0.097	(0.059)
Head's Age	-0.0028	(0.002)
Male	-0.0094	(0.049)
Married	-0.082	(0.074)
Number of Earners	0.051	(0.019) *
Family Size	-0.033	(0.006) *
Head's Education	0.034	(0.004) *
Rawalpindi	0.173	(0.070) *
Sargodha	-0.678	(0.093) *
Faisalabad	-0.662	(0.098) *
Gujranwala	-0.409	(0.092) *
Sialkot	-0.903	(0.114) *
Lahore	0.020	(0.042)
Multan	-0.562	(0.087) *
Islamabad	1.043	(0.162) *
Bhawalpur	-0.426	(0.114) *
Sukkur	-0.643	(0.120) *
Hyderabad	-0.508	(0.079) *
Peshawar	0.027	(0.054)
Quetta	0.013	(0.060)
Year 2001-02	0.076	(0.031) *
Year 2004-05	0.207	(0.042) *
Constant	10.715	(0.871) *
Total observations	8368	
No: of owner-occupied	5926	

Figures in parenthesis are robust standard errors
* denotes coefficients that are statistically significant at 5% level.

The differing estimates highlighted so far can perhaps best be explained by the use of different income measures (Mayo 1981). While Ahmad (1994) uses predicted permanent income (similar to this study), Tiwari and Parikh (1998) and Arimah (1992) have used current annual income as a proxy to permanent income. Shefer (1990), Lodhi and Pasha (1991) and Ballesteros (2001) have used total household expenditure, where as Malpezzi and Mayo (1987) have used predicted consumption instead. Shefer (1990) who has used total household expenditure as a proxy for permanent income, mentions but does not report income elasticities obtained by using current income, and points out that elasticity estimated using current income (instead of household expenditure) is generally less than unity. This claim is fortified by elasticity estimates of 0.65 (median income elasticity) and 0.75 by Arimah (1992) and Tiwari and Parikh (1998), respectively. Furthermore, Malpezzi and Mayo (1987) also observe income elasticity estimates to be less than unity while using current income. Ahmad (1994) who predicts permanent income like we do, estimates an elasticity of 0.6; an estimate much higher than 0.14. It can be argued that despite similar methodology, differences may be caused by the fact the Ahmad (1994)'s area of study is focused on one city, Karachi. Therefore, it may be suggested that these conflicting observations may not be taken seriously as the area under observation and its related information, is different. Nevertheless, the comparison does extend some useful insights.

In the context of estimates from studies focusing on developed countries (Table 6), income elasticities generally range from 0.12 to 0.87. Mayo (1981) highlights that both income and price elasticities have tended to vary considerably owing to either differing levels of aggregation, varying measures of income or separate model specifications. Researchers from the developed region have popularly used both permanent and current income and have conducted a comparative analysis by estimating respective income elasticities. Permanent income has popularly been estimated using current income which is then regressed on demographic and regional dummy variables. These include works by Goodman and Kawai (1984), Goodman (1988), Goodman (2002) and Zabel (2004), to name a few. The ones that are closest to our income elasticity estimates are Goodman (1988) with elasticity of 0.173 and Ionnides and Zabel (2002) with elasticity of 0.1207. Moreover, as Mayo (1981) points out, and as can also be observed in Goodman (1988), permanent income elasticity estimates are generally larger than current income elasticity estimates.[47] Contrary to estimates observed in developing country,

[47] Goodman and Kawai (1984) show that the use of permanent income increases income elasticity from 0.353 to 0.567 for all owners. Similarly Zabel (2004) shows that permanent income elasticity of 0.394 is larger than 0.15 (based on current income) for the year 1993 and is 0.362 (permanent income elasticity) versus 0.166 (current income) for the year 2001.

income elasticity estimates (both using current and permanent income) are generally below unity. Therefore, in comparison to other studies, our study reports lower income elasticity.

The coefficient on house price is as expected, negative and statistically significant. The results report an estimated price elasticity of -0.798, suggesting that demand for housing is elastic and that the ability to own more units of housing is sensitive to changes in prices. Unlike income elasticity, price elasticity observed in our study is close to estimates reported in most studies.

In the literature reviewed here (Table 6), a range of -0.36 to almost -0.87 for developing countries and -0.1 to -0.9 for developed countries, has been observed. In a study by Pasha and Butt (1996) the price elasticities for various housing attributes were reported to fall in the range -0.57 to -0.98. However, studies focusing on Pakistan e.g., Lodhi and Pasha (1991) and Ahmed (1994) do not report an estimate for price elasticity. Overall, our estimate for price elasticity is in line with estimates generally observed in the literature. This implies a downward sloping demand for housing services and shows no signs of capital gains effect of housing demand.

Positive and highly significant coefficients on the dummy variables of middle and high income present an interesting aspect. The presence of a household in the middle income group increases demand for housing services by 27% relative to low income group. Similarly, the coefficient on high income group suggests that demand increases by 78% relative to the low income group; an effect almost 3 times the middle income group. What presents this as an interesting aspect to the study is perhaps the fact that income groups seem to be playing an independent role regardless of the presence of income (permanent and transitory). Thus, this tends to fail the convenient presumption that income levels would capture the true effect of income on housing demand across income groups.

We follow Lodhi and Pasha (1991) and Tiwari and Parikh (1998) and use rent to income ratio as proxy for affordability. The negative coefficient of -0.097 is statistically insignificant and shows that an increase in the ratio which is either as a result of an increase in rent or a decrease in income, reduces affordability and therefore reduces demand for housing units. This variables is however statistically insignificant. Lodhi and Pasha (1991) discuss this ratio and point out that for owners, as income increases, the ratio falls sharply as a result of inelastic income elasticity of demand.

Of the demographic variables, number of earners, family size and years of education (head's) are statistically significant. The coefficient on number of earners imply that with every additional earner to the total earners in the family, holding all other things constant, demand for housing units increases by 5%. Also with every additional year spent in education, demand increased by 3.4 %. This is in line with results reported by Lodhi and Pasha (1991), Arimah (1992), Ahmed (1994), Zabel (2004) and Dusansky and Koc (2007). In case of every one person addition to a household, demand for housing is seemingly decreased by 3.3%. Similar effect of family size/household size on housing demand is also observed in Shefer (1990), Lodhi and Pasha (1991)[48] and Tiwari and Parikh (1998). However, studies including Ahmed (1994) and Zabel (2004) report positive and significant coefficients on household size. Demographics like head's age, gender and marital status have no statistically significant bearing on housing demand in our study. Review of earlier studies presents a mixed picture on effects of demographics on housing demand and generally varies across countries. However, the importance of including these variables has been stressed quite frequently in literature. Goodman (1988) points out that in 13 out of 20 studies, age has a significant and a positive effect on demand. Similarly gender (male), married, household size and education have had a positive and significant impact on housing demand.

When housing demand is compared across urban areas/cities, it is seen that of all the 14 cities, Lahore, Peshawar and Quetta do not report any differences in housing demand, relative to Karachi. This comes forth as an interesting observation and suggests that housing markets in provincial capitals face similar pressure on the demand side. Additionally, if the city is Islamabad, housing demand is reported to increase by 104% relative to Karachi, suggesting differing dynamics in the housing market, especially when compared to Karachi, the most populated city in the country[49]. All the other cities, except Rawalpindi, and Islamabad, report statistically significant lesser demand for housing units relative to Karachi; results in line with expectations.

[48] Pasha and Lodi (1991) also observe positive and significant effect of household size on demand in their study which breaks household size into children and adults. They find that in the model where they use current income, household size is positive and significant for adults in planned areas and also for both children and adults in informal settlements. However, as a result of using permanent income, an increase in the number of children and adults has a positive and significant effect on demand in informal settlements.

[49] According to the Population Census Organization of Pakistan, the population figures for the 1998 census were 9.3 million and 0.53 million for Karachi and Islamabad, respectively. Furthermore, the population density per sq. km (1998 census) is reported to be 889 per sq.km for Islamabad and 19756, 2267, 14304, 33014 and 433per sq.km for Karachi East, West, South, Central and Malir districts, respectively.

Over the years, housing demand increased by 7.6% during 2001-02 and then by almost 21% during 2004-05, relative to 1998-99; the coefficient on both year dummy being statistically significant at 5% level.

Table 6

Price and income elasticities in previous studies

Authors	Year	Country/Region	Price Elasticity	Income Elasticity
Our study	2007	Pakistan	-0.823	0.142
Developing countries				
		Cairo (Egypt)	-0.86	0.49
Malpezzi and Mayo	1987	Ben Suef (Egypt)	-1.02	0.1
		Manila (Philippines)	-0.36	1.04
Shefer	1990	Indonesia	N.A	1.169
Lodhi & Pasha	1991	Karachi (Pakistan)	N.A	Planned areas : 1.2 Informal areas : 0.12
Arimah	1992	Ibada (Nigeria)	-0.400	0.65
Ahmad	1994	Karachi (Pakistan)	N.A	0.6
Tiwari & Parikh	1998	India	-0.844	0.92
Ballesteros	2001	Philippines	Poor : -0.42 Non-poor : -0.45	Poor : 1.03 Non-poor : 1.014
Developed countries				
Mayo *	1981	N.A	-0.52 to -0.89	0.21 to 0.87
Quigley	1982	Santa Ana (El Salvador)	-0.6 to -0.7	0.5 to 0.7
Goodman & Kawai	1984	U.S	N.A	0.571
Henderson & Ioannides	1985	U.S	-0.800	0.35 to 0.45
Goodman	1988	U.S	-0.499	0.173
Goodman	1990	U.S	-0.515 to -0.561	0.249 to 0.269
Goodman	2002	U.S	-0.31 & -0.44[a]	0.616
Ioannides & Zabel	2002	U.S	-0.3019	0.1207
Zabel	2004	U.S	-0.091 & -.052[b]	0.35 & 0.45[b]

* Mayo (1981) conducted a literature review on previous studies.
a. for the years 1985 and 1989 respectively
b. for the year 1993 and 2001

To reiterate, housing demand analysis on a national level suggests that, while both permanent and transitory income play a positive and a highly significant role, transitory income has a greater effect on increasing demand than permanent income, an observation contrary to previous studies. Income elasticities estimated here are very low while price elasticity is negative and close to one, implying a downward sloping demand curve and an elastic demand. An increase in the number of

earners and years of education increases demand, while an increase in family size is decreasing demand for housing services; results very plausible in the context of a country like Pakistan. Moreover, it is also observable that demand has increased over the years, placing more pressure on urban infrastructure. Across the 14 urban centres included in this study, all except Lahore, Quetta and Peshawar have experienced a less increase in demand relative to Karachi. The positive and significant coefficient on Islamabad not only implies that housing demand is much greater in the capital relative to Karachi, but also catapults the much believed notion of the housing market in that city, calling for a separate study that focuses only on the dynamics of housing market in the capital. Lastly and perhaps more importantly, the results observed with the inclusion of income groups in both demand regression and tenure choice equation, reveals a very important aspect to the study in question and thus becomes the motivation for extending the study into an income group-wise analysis of the housing market in Pakistan.

7.3 HOUSING DEMAND ACROSS INCOME GROUPS

7.3.1 Tenure Choice Model Across Income Groups

Table 7 and 8 show results of the two-step Heckman procedure applied to low, middle and high income groups. Every Rs 100,000 increase in Permanent income for the middle income group, is observed to increase chances of ownership significantly by almost 8%. An additional increase in transitory income of Rs. 100,000 for low income group, is observed to reduce the probability of ownership by 6%. Permanent income does not affect ownership in neither the middle nor the high income group.

Increases in house price (log of house price) has positive and statistically significant coefficients implying that an increase in the log of house price increase the probability of ownership across all income groups. However, the greatest probability of ownership is seen in high income group of 21% , with 16% for middle income and 15% chances of ownership in the low income group. The coefficient of log of rental housing quantity is insignificant across all income groups.

Among the demographic variables, an increase in head's age by one additional year seems to be increasing the probability of ownership for middle and high income groups by 2.3% and 0.6 %.

These results are plausible as with age savings tend to increase thus increasing the likelihood of ownership. Being a male household head and married has no significant role in effecting probabilities of ownership with the exception of high income group where both the variables are negative and statistically significant. A male head and married head in high income household experience a decrease in probability by -12 % and -11% respectively. It can be argued that these are infact representative results as a single male from a high income group may not be able to own a house assuming that he is still young and living with one of the parents. As for married household it can be argued that they are at an earlier part of life cycle where consumption is higher than savings/wealth.

An increase in family size of one additional member, seem to be increasing the probability of ownership by 2% and 1% for the low and middle income groups, respectively. On the other hand an increase in the number or earners in a household seem to be reducing the probability of ownership by 5%, 6% and 2% for low, middle and high income groups, respectively.

Interestingly, the role of increased education is to reduce probability of ownership by 1 % for both low and middle income group. This observation can be explained by the fact that educated members from the low and middle income groups tend to be on the move depending on their jobs and the frequency with which they switch jobs, thus face reduced probabilities of owning a house. The coefficient on education for high income group is statistically insignificant.

Among the city dummies, cities like Sargodha, Faisalabad, Gujranwala, Sialkot, Multan, Sukkur and Hyderabad experience higher probabilities of ownership relative to Karachi. Islamabad has a much less likelihood of ownership relative to Karachi implying that probability of owning a house in Islamabad is very low when compared to Karachi; 48%, 53% and 35% less likely to own for low, middle and high income group, respectively. Similarly, Rawalpindi too has lesser chances of ownership for low (12% less probability) and middle income (9% less probability), relative to Karachi. Peshawar has a reduced probability of ownership among the high income group. Lahore shows an increased probability only among the low income group, relative to Karachi.

The tenure choice regression results show that the probability of owning was 7% during 2001-02, which decreased by 8% during 2004-05 (relative to 1998-99) for the low income households. For the middle income group, probability of ownership decreased by 5% and then by 12% during

2001-02 and 2004-05, respectively, relative to 1998-99. The high income households did not experience any difference in ownership probabilities during 1998-99 and 2001-02 however, they too experienced a decline in probability by 9% during 2004-05. Looking at a holistic level, probabilities of house ownership has in general decreased over time and across all income groups, with the greatest loss of probability experienced by the middle income group (12%).

Table 7

Tenure choice regression

Variables	National		Low-Income		Middle-Income		High-Income	
	Coefficient (Standard Error)	Marginal Effects	Coefficient (Standard Error)	Marginal Effects	Coefficient (Standard Error)	Marginal Effects	Coefficient (Standard Error)	Marginal Effects
Permanent Income	0.170 (0.043) *	0.056 *	0.226 (0.144)	0.075	0.230 (0.053) *	0.076 *	-0.025 (0.054)	-0.007
Transitory Income	-0.022 (0.015)	-0.007	-0.178 (0.055) *	-0.059 *	-0.036 (0.027)	-0.012	-0.004 (0.023)	-0.001
Log of House Price	0.496 (0.040) *	0.163 *	0.453 (0.079) *	0.149 *	0.494 (0.057) *	0.163 *	0.713 (0.084) *	0.211 *
Middle-income Group	-0.149 (0.037) *	-0.049 *						
High-income Group	-0.338 (0.057) *	-0.117 *						
Log of Rental Units	0.012 (0.031)	0.004	-0.021 (0.070)	0.007	0.066 (0.042)	0.022	0.012 (0.061)	0.004
Rent to Income Ratio	0.216 (0.110)	0.071	0.283 (0.283)	0.093	0.219 (0.118)	0.073	0.204 (0.229)	0.061
Head's Age	0.011 (0.001) *	0.004 *	0.006 (0.003)	0.002	0.009 (0.002) *	0.003 *	0.019 (0.003) *	0.006 *
Male	-0.059 (0.064)	-0.019	0.225 (0.123)	0.078	-0.071 (0.088)	-0.023	-0.462 (0.152) *	-0.117 *
Married	-0.0007 (0.065)	-0.000	-0.017 (0.156)	-0.006	0.137 (0.106)	0.047	-0.467 (0.219) *	-0.114 *
Family Size	0.039 (0.006) *	0.013 *	0.054 (0.013) *	0.018 *	0.039 (0.009) *	0.013 *	0.024 (0.016)	0.007
Number of Earners	-0.144 (0.017) *	-0.047 *	-0.157 (0.034) *	-0.052 *	-0.171 (0.024) *	-0.057 *	-0.082 (0.040) *	-0.024 *
Head's Education	-0.025 (0.005) *	-0.008 *	-0.043 (0.011) *	-0.014 *	-0.031 (0.006) *	-0.010 *	0.003 (0.009)	0.001
Rawalpindi	-0.231 (0.072) *	-0.080 *	-0.324 (0.143) *	-0.115 *	-0.262 (0.103) *	-0.092 *	-0.056 (0.156)	-0.017
Sargodha	0.644 (0.091) *	0.168 *	0.771 (0.162) *	0.192 *	0.831 (0.152) *	0.200 *	0.508 (0.192) *	0.124 *
Faisalabad	0.902 (0.081) *	0.215 *	0.748 (0.153) *	0.190 *	0.971 (0.108) *	0.229 *	1.170 (0.233) *	0.214 *
Gujranwala	0.736 (0.095) *	0.184 *	0.731 (0.151) *	0.186 *	0.678 (0.134) *	0.176 *	1.302 (0.383) *	0.214 *
Sialkot	0.904 (0.121) *	0.207 *	0.928 (0.200) *	0.213 *	1.032 (0.212) *	0.224 *	0.939 (0.248) *	0.186 *
Lahore	0.060 (0.049)	0.019	0.236 (0.094) *	0.073 *	0.018 (0.064)	0.006	-0.090 (0.132)	-0.027
Multan	0.634 (0.080) *	0.167 *	0.415 (0.134) *	0.120 *	0.941 (0.125) *	0.219 *	0.535 (0.178) *	0.129 *
Islamabad	-1.208 (0.072) *	-0.453 *	-1.293 (0.141) *	-0.481 *	-1.414 (0.111) *	-0.526 *	-0.967 (0.146) *	-0.348 *
Bhawalpur	0.645 (0.135) *	0.165 *	1.501 (0.311) *	0.260 *	0.883 (0.224) *	0.205 *	-0.272 (0.229)	-0.088
Sukkur	0.712 (0.131) *	0.177 *	1.371 (0.285) *	0.252 *	0.412 (0.168) *	0.118 *	1.030 (0.411) *	0.188 *
Hyderabad	0.587 (0.072) *	0.158 *	0.692 (0.131) *	0.180 *	0.491 (0.103) *	0.138 *	0.757 (0.172) *	0.168 *
Peshawar	-0.127 (0.059) *	-0.043 *	0.036 (0.109)	0.012	-0.161 (0.083)	-0.055	-0.325 (0.141) *	-0.106 *
Quetta	0.044 (0.069)	0.014	0.097 (0.125)	0.031	0.007 (0.095)	-0.002	0.591 (0.314)	0.135
Year 2001-02	-0.014 (0.039)	-0.005	0.213 (0.071) *	0.069 *	-0.134 (0.053) *	-0.045 *	-0.091 (0.093)	-0.027
Year 2004-05	-0.270 (0.041) *	-0.091*	-0.237 (0.078) *	-0.080 *	-0.336 (0.059) *	-0.115 *	-0.286 (0.107) *	-0.087 *
Constant	-6.251 (0.430) *		-6.056 (0.952) *		-6.320 (0.609) *		-8.933 (1.094) *	
Total observations	8368		2505		4327		1536	
No: of owner-occupied	5926		1760		3036		1130	

Figures in parenthesis are robust standard errors

* denotes coefficients that are statistically significant at 5% level.

Table 8

Housing demand regression for own housing

	National	Low-Income	Middle-Income	High-Income
Variables	Coefficient (Standard Error)	Coefficient (Standard Error)	Coefficient (Standard Error)	Coefficient (Standard Error)
Permanent Income	0.101 (0.026) *	0.199 (0.055) *	-0.012 (0.037)	0.160 (0.048) *
Transitory Income	0.199 (0.111) *	0.191 (0.040) *	0.163 (0.018) *	0.146 (0.020) *
Log of House Price	-0.798 (0.056) *	-0.534 (0.076) *	-0.750 (0.064) *	-0.528 (0.150) *
Middle-income Group	0.269 (0.033) *			
High-income Group	0.780 (0.054) *			
Rent to Income Ratio	-0.097 (0.059)	-0.312 (0.150) *	-0.073 (0.068)	-0.262 (0.168)
Head's Age	-0.0028 (0.002)	0.005 (0.002) *	-0.002 (0.002)	0.004 (0.005)
Male	-0.0094 (0.049)	-0.093 (0.089)	-0.022 (0.063)	-0.116 (0.150)
Married	-0.082 (0.074)	-0.137 (0.113)	-0.133 (0.097)	-0.032 (0.230)
Number of Earners	0.051 (0.019) *	-0.062 (0.027) *	0.069 (0.026) *	0.020 (0.042)
Family Size	-0.033 (0.006) *	-0.006 (0.009)	-0.016 (0.008) *	-0.051 (0.014) *
Head's Education	0.034 (0.004) *	0.014 (0.008)	0.042 (0.005) *	0.019 (0.009) *
Rawalpindi	0.173 (0.070) *	0.467 (0.123) *	0.548 (0.091) *	-1.397 (0.167) *
Sargodha	-0.678 (0.093) *	0.312 (0.142) *	-0.864 (0.131) *	-1.503 (0.206) *
Faisalabad	-0.662 (0.098) *	0.017 (0.128)	-0.512 (0.118) *	-1.136 (0.242) *
Gujranwala	-0.409 (0.092) *	0.167 (0.135)	-0.360 (0.108) *	-0.620 (0.256) *
Sialkot	-0.903 (0.114) *	-0.073 (0.170)	-0.254 (0.158)	-2.024 (0.247) *
Lahore	0.020 (0.042)	0.308 (0.071) *	0.123 (0.050) *	-0.702 (0.142) *
Multan	-0.562 (0.087) *	-0.016 (0.106)	-0.634 (0.128) *	-0.945 (0.198) *
Islamabad	1.043 (0.162) *	0.295 (0.270)	1.556 (0.226) *	-0.621 (0.254) *
Bhawalpur	-0.426 (0.114) *	0.288 (0.219)	-0.533 (0.175) *	-1.276 (0.263) *
Sukkur	-0.643 (0.120) *	-0.078 (0.210)	-0.312 (0.156)	-0.947 (0.364) *
Hyderabad	-0.508 (0.079) *	-0.128 (0.128)	-0.215 (0.090) *	-1.025 (0.195) *
Peshawar	0.027 (0.054)	0.117 (0.074)	0.037 (0.072)	-0.662 (0.178) *
Quetta	0.013 (0.060)	0.063 (0.085)	0.219 (0.072) *	-1.312 (0.332) *
Year 2001-02	0.076 (0.031) *	0.046 (0.056)	0.100 (0.043) *	0.171 (0.095)
Year 2004-05	0.207 (0.042) *	-0.026 (0.058)	0.235 (0.055) *	0.399 (0.113) *
Constant	10.715 (0.871) *	6.413 (1.222) *	10.212 (1.009) *	7.765 (2.190) *
Lambda	-1.541 (0.243) *	-0.232 (0.340)	-1.468 (0.275) *	0.006 (0.495)
Rho	-1.000	-0.298	-1.000	0.005
Sigma	1.541	0.780	1.468	1.208

Figures in parenthesis are robust standard errors

* denotes coefficients that are statistically significant at 5% level.

7.3.2 Housing Demand Regression

Perhaps the most interesting finding that is achieved as a result of dissecting the study further based on income groups, is the differing effect permanent and transitory incomes have on demand for housing services. While national results suggest that transitory income has a greater effect on housing demand (20%), its can be observed that for the low income group, the effect of an increase in both incomes by Rs 100,000, has an almost equal positive and statistically significant effect. An increase in permanent income increases housing demand by 20% and transitory income increases demand by 19 % (only slightly lower than the former)[50]. In the case of middle income group, any increase in demand is entirely accounted for by an increase in transitory income only. Demand increased by 16% for every additional 100,000 increase in transitory income. This suggests that for the middle income, the ability to demand more housing units comes entirely from windfall gains. Within the high income group, permanent income is observed to play a greater role by increasing demand by 16%, whereas transitory income increases demand by almost 15%. Estimates of group-wise income elasticity of demand using permanent income are 0.23 and 0.32 for low and high income groups, respectively.[51] While both income groups report an inelastic demand, that of high income group is less inelastic compared to low income. Therefore, results show an interesting similarity between both the low and high income groups. While both incomes (permanent and transitory) play a highly significant role in demand for housing services, both the income groups (low and high) also face highly inelastic demand. The only difference lies in the magnitude of the two incomes; of course the low income group needs a greater increase in both components of income to demand the same housing unit as a household from the high income group.

Another study, by Shefer (1990), similar to the one undertaken here, estimates housing demand by urban households based on urban size, income class and location, in Indonesia. The Permanent income elasticity that the study reports for the entire urban sample is 1.169. The income elasticity across 4 income groups is 0.983, 1.054, 1.242 and 1.285 (for low, middle and high income groups, respectively).[52] All these are much higher, hence more elastic, than the income elasticity

[50] It can be argued that for low income groups the amount earned from windfall gains and wealth tend to be of the same amount, for wealth in their case is mostly observed earned income.
[51] Income elasticity for middle income is estimated to be -0.01656. This is not reported here because the permanent income does not play a statistically significant role in housing demand for the middle income group.
[52] Shefer (1990) points out that he estimated income elasticity of demand for housing using current income but does not report these results in his paper. However, he does attempt to inform the reader that based on current income, income elasticity estimates were found to be statistically significant and in general smaller

that our study reports. In another study by Ballesteros (2001), on Philippines, income elasticity for urban poor is reported to be 1.03 and for non-poor to be 1.014. Similarly, in a study by Tiwari and Parikh (1998), who used Indian household data, reported income elasticity of 0.89 for lower income group (below Rs 1000) and 0.81 for higher-income group (above Rs 5000), where as for the middle income groups (below Rs 5000 and above Rs. 1000) the income elasticity was observed in the range of 1.06 to 0.86.

The house price is reported to be relatively less inelastic. Among both the low and high income groups the price elasticity is reported to be -0.53. The house price elasticity faced by middle income group is -0.75, an elasticity much elastic than the low and high income groups. The price elasticities estimated here suggest that perhaps households most vulnerable to exploitative housing supply behavior are those belonging to the low income and that, those from the middle income are most responsive to changes in prices. Tiwari and Parikh (1998) reported price elasticity of -0.88 for lower income group (below Rs 1000) and -0.86 for higher-income group (above Rs 5000), where as for the middle income groups (below Rs 5000 and above Rs. 1000) the price elasticity was observed in the range of -0.81 to -0.84.

The rent to income ratio, a proxy for affordability, is negative and only statistically significant for low income group. The coefficient of -0.312 implies that as a result of either a decrease in income or an increase in rent, the ratio will increase, leading to a fall in demand by 31.2%. This variable, however, has no significant impact on demand for neither middle nor the high income group. These results present an important policy implication and not only show that low income group face affordability issues but also identifies the magnitude of the impact of affordability that the increasing rents and decreasing incomes have over demand for housing units. The issue is even more pressing in the light of the increases in house rent index that have been reported to be the second largest component of CPI (23.4 percent) after food (40.3 percent) (Pakistan Economic Survey 2006-07). Moreover, revisiting affordability ratios in Table 2, it can be seen that as income increases (in other words as income group ascends) rent to income/ affordability ratios also increase. The mean values for the ratio reported in Table 2 are 0.17, 0.21 and 0.24 for low, middle and high income group, respectively. These trends are in line with observations made in literature that have also used rent to income as proxy for affordability. For example, Tiwari and

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than 1. These, he further highlights, are still rather high estimates and in comparing these estimates with those obtained with permanent income, observes a consistently higher value for each of these estimates.

Parikh (1998) observe that for ownership housing, the affordability ratio goes up with increases in income.[53]

Among the demographic variables, marital status and gender do not seem to be having any significant bearing on housing demand neither on national nor across income groups. However, the statistically significant results observed for number of earners, family size and years of education on national level lend representation only of the middle income group. Within the low income group, demand for housing increases by only 1.4% as a response to increased education and number of earners decrease housing demand by 6%. Family size is not statistically significant. Results for high income group show that only family size and years of education are statistically significant. The coefficient on education of 4.2% is highest in middle income group as opposed to low and high income group. This shows that an increase in years of education in the middle income, has the greatest effect on increasing housing demand. Additionally, the high income group reports a decrease of 5% in housing demand as family size increases by one additional person.

Results observed across cities show that, when compared to Karachi, households belonging to low income group demand 47%, 31% and 31% more housing if they are either in Rawalpindi, Sargodha or Lahore, respectively. For the middle income group, demand for housing is more relative to Karachi in Rawalpindi (55%), Lahore (12%), Quetta (22%) and with the highest in Islamabad (156%). This suggests that increased housing demand in Islamabad is largely attributable to households from the middle income. The remaining cities have lesser demand for housing relative to Karachi with the exception of Sukkur, Peshawar and Sialkot that are not reported to be statistically different from Karachi. Among the high income group, all cities report a lesser and statistically significant housing demand relative to Karachi, suggesting that households from high income demand more housing units in Karachi than any other city in the country. These city wise observations are important since it can potentially aid in directing policymakers towards compositions of various urban centres of the country. Of course a separate

[53] Tiwari and Parikh (1998) report observation for affordability ratios across 5 income groups as follows;

Income ranges (Rs)	Affordability ratio
Above 5000	0.1
3001-5000	0.16
2001-3000	0.18
1001-2000	0.165
Below 1000	0.147

city-wise analysis would prove even more useful, however, the nature of the HIES data used here is limited in scope for such an analysis.

An increase in housing demand is observed only for the middle and high income groups in the year 2001-02 and 2004-05, relative to 1998-99. Housing demand by low income group is reported to be unchanged over the three years. The demand by middle income is consistently on a rise; a 10% in 2001-02 and 24% in 2004-05 relative to 1998-99. On the other hand, the high income group shows stable demand in 2001-02 which increases by 40% in 2004-05 relative to 1998-99, the highest demand so far reported. Thus it can be inferred that increase in owner-occupied housing demand over the years is clearly attributable to the middle and high income groups only. This may be explained in support of the view that low income households find it financially difficult to own a house, as also supported by low affordability ratios, instead they opt for renting.

The LAMBDA coefficient means that the choice of ownership is simultaneously made with the decision of how much housing to consume. Only models including national and middle income group have lambda as significant and show signs of selectivity bias, which has been corrected for by using the Heckman two stage selection model. Ahmed (1992) also observes a significant but positive LAMBDA showing that choice of ownership is simultaneously made with the decision of how much housing to consume. Rho refers to the correlation of the error terms of both the demand equation and the tenure choice regression. Sigma refers to the standard deviation of the error term that affects the demand for housing.

8. CONCLUSIONS

The scope of analysis presented so far in this study extends useful evidence towards the issues that this study sets out to campaign. Results convincingly reflect the increased need to study housing markets not on national level alone but also recognize the need to quantify the differing determinants of housing demand for low, middle and high income groups. Many variables like house price and income (permanent and transitory) effects have limited interpretability when studied at a national level. Although it can be seen that on a national level an increase in house price decreases demand for housing units, a further breakdown across income groups proves that changes in prices has a greater effect on middle income than on low and high income group. Furthermore, the price inelastic demand faced by low income group and lower affordability ratios presents as a concern since they can potentially be hurt the greatest, as a result of land price hikes. Income group wise analysis also reveals the role of permanent income and transitory income on housing demands across income groups which would have been otherwise overlooked if national level results were only relied on. What presents as the most glaring call for an analysis across income groups is perhaps the significant effect that the inclusion of income group dummies, have on housing demand; an effect which one would assume will not be significant if income levels were taken into account. The coefficient on high income group suggests that demand increases by 78% relative to the low income group; an effect almost 3 times the middle income group.

Moreover, while national level results show how demand for housing units defers across cities an income wise analysis explains the variation even better. The results show that among middle income households, the demand for housing units is greatest in Islamabad (almost 156% more relative to Karachi) and the least probability of ownership too. On the other hand, the highest concentration of housing demand by high income households is seen to be in Karachi. Among the low income households, demand for Rawalpindi followed by Sargodha and Lahore are greater than the demand in Karachi. These results build on the motivation for a city wise analysis for future studies and prove that what may be true in one city may not necessarily be true in another.

By no means does the evidence presented here provide a complete and definitive analysis. Recommendations for future research in Pakistan can possibly include demand analysis across submarkets, stratified by location, city or ethnic groups. An analysis using consumption in place of permanent income will also extend useful comparative analysis. Moreover, inclusion of dummy variables for government programs, where appropriate will also help enrich the housing

analysis. Lastly and perhaps of considerable importance, will be studies that determine demand for various housing attributes like floor space, water supply, gas connection and various other amenities. Studies of these sorts can (e.g. Follain and Jimenez, 1985, Arimah, 1992, Pasha and Butt, 1996 and Cheshire and Sheppard, 1998) prove useful for the design of specific housing programs for various income groups. Estimates of demand elasticities for various attributes will quantify the responsiveness of quantity demanded of each attribute.

It has been stressed across housing studies that policy formulations should be informed by a careful understanding of the behavior of urban markets; a disconnect often found in policies adopted in developing countries, with Pakistan as no exception. This study hopes to shed light on the potential connection between housing research and policies that can be developed and attempts to propel even more stratified and detailed analysis on housing markets in Pakistan.

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