

Demand for Housing in Urban Kenya: The Case of Households in Nairobi and Mombasa Counties

Philip K. Musyoka

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Demand for Housing in Urban Kenya: The Case of Households in Nairobi and Mombasa Counties

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Infrastructure and Economic Services Division
Kenya Institute for Public Policy
Research and Analysis

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Abstract

This study sought to understand what influences urban household demand for housing in Kenya, given the persistent inadequacies of housing amidst various policy interventions. Limited understanding of housing demand among urban households contribute to housing mismatch, ineffective targeting and distortion of the urban housing market.

Household data from the urban counties of Nairobi and Mombasa was applied to hedonic price model to capture the heterogeneity of housing as a commodity before conducting household demand analysis for urban housing.

Results showed a price elasticity ranging from 0.318 to 0.328 for different tenure categories, and income elasticity of 0.50 to 0.52. Other household factors influencing demand for housing, such as household size, age of household head, length of urban stay and living together with spouse produce mixed results. The price inelasticity indicates limited choice for housing among urban households. The income variable, especially when disaggregated along tenure and income categories, indicates unwillingness of the poor and renting households to spend more with an increase in income. The limited effect of household characteristics on housing demand is indicative of a constrained urban housing market in which housing is demanded as an aspect for survival and not responsive to specific household preferences or needs.

The recommendations highlight the need for mass supply of urban housing, checking of extensive commercialization of housing and related services, innovative approaches to subsidization of the cost of access to housing services, and finally legislation on minimum floor size per standard household, and quality standards to minimize over-crowding in urban housing.

Abbreviations and Acronyms

EA	Enumeration Area
GDP	Gross Domestic Product
KIHBS	Kenya Integrated Household Budget Survey
KNBS	Kenya National Bureau of Statistics
MDGs	Millennium Development Goals
NASSEP	National Sample Survey and Evaluation Programme
PPP	Public Private Partnership
SDI	Slum Dwellers International
USAID	United States Agency for International Development
WHO	World Health Organization

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1. Introduction

Housing provides the basic human necessity of shelter and has important implications on household functionality, productivity and social harmony. Studies have shown that housing conditions influence individual's outcome in health, education, socio-political participation, and labour participation, among other aspects of life (World Health Organization, 1989; Rohe and Stegman, 1994; Dietz, 1998; Arunatilake, 2002, Page, 2002; Cattaneo *et al.*, 2007; and, Lubell and Maya, 2007).

Housing can be demanded either as a good (investment purposes) or as a service (consumption purposes). This study will be based on the utility households derived from consuming housing services. Households consider various aspects of housing such as its location, dwelling type, tenure form, age and quality in making choice (Smith *et al.*, 1988). These household choices are influenced by the price of housing service, household income and a host of other factors such as household size, life cycle, government regulations, among others.

Household demand for housing thus reflects the willingness of households to pay for a set of housing services, while considering social and demographic needs (Tiwari and Parikh, 1997; and Vajiranivesa, 2008).

1.1 Background Information

The urban population in Kenya grew from 18 per cent in 1991 to 32.3 per cent in 2011 and is projected to be over 50 per cent by 2033 at the urbanization rate of 4.2 per cent (Kenya National Bureau of Statistics, 2010; World Bank, 2011).

Urban households in Kenya's two major urban centres—Nairobi and Mombasa—increased from estimated 853,982 in 1999 to estimated 1,253,716 in 2009 (Government of Kenya, 2001; Kenya National Bureau of Statistics, 2010) mainly due to population growth, household formation and rural-urban migration. Urbanization has been associated with significant economic and social benefits, with urban centres regarded as centres of growth—in economic activities and functions (World Bank, 2011). The city of Nairobi, for instance, with 8 per cent of the country's population, contributes 60 per cent of Kenya's Gross Domestic Product (GDP) (Dafe, 2009; Kenya National Bureau of Statistics, 2011). Nairobi and Mombasa have 10 per cent of the national

population, but account for 40 per cent of wage earnings in the country (World Bank, 2011).

Urbanization, however, comes with challenges, among them the provision of basic economic infrastructure services to support the urban socio-economic fabric. Supply of decent urban housing, especially for low-income households, has been constrained in Kenya's major urban areas. Official estimates place the annual urban housing shortage at 150,000 units, with the poor constituting over 70 per cent of the deprived households. On the other hand, only 23 per cent of the annual shortage can be supplied formally, and only 20 per cent of this annual formal supply caters for low-income households (Government of Kenya, 2008).

Kenya's urban poor have resorted to informal housing. Seventy (70) per cent of urban population live in slums and informal/squatter settlements characterized by inadequate basic and essential infrastructure, poor quality housing structures, over-crowding, insecurity of tenure, unhealthy/hazardous living environment and high level of poverty and social exclusion (UN Habitat and UN ESCAP, 2008; UN Habitat, 2009). The proximity of income-earning opportunities in the commercial and industrial centres of urban areas (UN Habitat and UN ESCAP, 2008) has motivated urban households to squat on any available vacant land oblivious of apparent inappropriateness and danger to human habitation. Majority of slum settlements in urban Kenya are found on abandoned quarries, marshlands, utility way-leaves, flight paths, riverines and public land (Pamoja Trust and Slum Dwellers International, 2008). The slum dwellers live in over-crowded houses made of poor quality materials, devoid of basic infrastructural services and situated in such inappropriate locations exposing residents to disease, fire, flooding, indignity and other risks and dangers.

Owners of low-income urban informal settlements are generally absent and driven by maximizing rental income and little motivation for improving the settlement's conditions (Amis, 1984). Mwangi (1994) found that about 57 per cent of Kibera landlords lived in Nairobi but not in Kibera itself, while 80 per cent of landlords in Mathare North, also in Nairobi, do not live there. Eighty per cent of Kibera's residents are tenants of illegal structure owners (Olima and Karirah-Gitau, 2000). In Nairobi, slum residents make up over 50 per cent of the population and yet occupy only 5 per cent of the total residential land (Mitullah, 2003).

In formal housing estates, extra rooms, floors and extensions have been illegally added as well as illegal alterations leading to overcrowding and strain on basic amenities such as water and sewerage (Ochieng' 2001; Mwangi, 1997). The pursuit of affordable and adequate housing has led to urban sprawl in major towns and cities. This unchecked and informal urban growth increases the cost of transport and public infrastructure and of residential and commercial development, consumes more energy, causes loss of prime farmland, and adds to environmental degradation (UN-Habitat, 2008).

Formal supply of urban housing has failed to match the increased demand fuelled by rapid urbanization, sustained rural-urban migration and population expansion, especially the household-formation age cohorts. Supply has also been hampered by constrained provision of serviced land, strict and outdated building code and land zoning laws, anti-urbanization approaches, general poor economic performance and poverty (Nzioki, 2002). Urban building code and zoning regulations have contributed to the high cost of construction, which has subsequently hampered provision of low-cost quality housing (World Bank, 2011b).

Kenya has since pre-independence pursued delivery of urban housing in the sense of a social good through state as well as non-state actors. These include formal provision of low-cost and affordable urban housing through local authorities,¹ slum upgrading, sites-and-service housing schemes as well as through churches, Non-Governmental Organizations (NGOs) and foreign development agencies. To date, these initiatives have yielded limited success mainly because of scale limitations, corruption in implementation and allocation and, in many instances, this results in housing mismatch (Huchzermeyer, 2008). Housing mismatch occurs in situations where low-income households are unable to afford the 'low-cost' housing or in situations where housing is located far from the sources of livelihood as well as situations where beneficiary households opt to rent out or sell the allocated housing instead of occupying it.

The current government policy on housing aims at providing adequate housing for all Kenyans as spelt out in various policy documents. The Constitution of Kenya (Government of Kenya, 2010) accords all Kenyans the right to accessible and adequate housing. The Millennium Development Goals (MDGs) target improving slum housing conditions and deterring formation of new slums (Government

¹Local authority tenants still benefit from subsidized rents.

of Kenya, 2005), while Kenya Vision 2030 envisages ‘an adequately and decently housed nation in a sustainable environment’ (Government of Kenya, 2007) and the goal of the National Housing Policy for Kenya 2004 is to provide adequate, affordable and habitable shelter to all Kenyans (Government of Kenya, 2004).

The supply of urban housing is generally market driven, with government only limited to small scale provision of civil servants housing and slum upgrading. Local authorities too are not undertaking major housing production programmes. This is consistent with a shift in national housing policy from direct government intervention to a ‘market-enabling’ approach of infrastructure provision and land use planning, while the private sector produces housing. The Kenya Informal Settlements Improvement Programme (KISIP), for instance, aims at improving living conditions in informal settlements in selected municipalities by investing in infrastructure, improving security of land tenure as well as supporting proactive planning to dampen formation of new slums. Through the Kenya Vision 2030 economic blueprint, there is implementation of slum upgrading in Kibera, construction of new housing units in Mavoko Municipality, as well as other indirect interventions to promote decent and adequate urban housing, such as formation of housing cooperatives (Government of Kenya, 2007). An evolution of national housing policy is provided in Appendix Table 1.

Kenya’s population growth rate and demographic patterns, as well as the rate of urbanization provide necessary stimulation for household demand for urban housing. Consequently, the government’s commitment to adequate shelter for all Kenyans is clear in various policy documents. However, the challenges that faced past urban housing delivery programmes are still present and may hamper the success of any current and future initiatives of supplying urban housing to meet the apparent demand. These challenges include availability of affordable serviced land, scalability of urban housing projects, and housing mismatch, among others.

1.2 Statement of the Problem

A review of performance of past urban housing policies, programmes and strategies indicates that failure to match the household needs and the ability to pay for urban housing contributes to unsuccessful and ineffective implementation of such housing interventions (Macoloo,

1988; Magutu, 1997; Gichunge, 2001; Leckie, 2003; Ochieng, 2007; and, Huchzermeyer, 2008). Housing policies and programmes were thus not guided by empirical evidence on housing demand and supply fundamentals (Hoek-Smit, 1989; Magutu, 1997), nor based on an accurate and dynamic understanding of local realities, especially the complexity of household demand for urban housing (UN-Habitat, 1997). Housing mismatch was evident for example in slum upgrading programmes in which houses were designed to the standards of middle-class households from the outset, while targeting low-income households (Huchzermeyer, 2008). The income levels of the beneficiary households were also not considered in the various low-income housing interventions, resulting into trading of ownership rights, sub-letting and generally commercialization of social housing intents (Mwangi, 1997).

Still, it is not known what influences household demand for urban housing. For instance, it is not known how Kenyan households respond to urban housing tenure, the magnitude of income and price elasticities of housing, how other factors such as location, demography and culture affect household demand, and how these aspects differ across income categories.

Such knowledge is useful in designing and implementing policies and strategies to deal with the aggregate demand and supply dynamics of urban housing, especially in situations of resource-constraint, liberalized housing, land markets and severe housing shortages.

1.3 Research Questions

The study was guided by the following questions:

- (i) What determines urban household demand for housing services?
- (ii) What are the housing demand elasticities for urban households across tenure and income categories in Kenya?
- (iii) What policy inputs can be inferred from answers to these questions to inform effective urban housing delivery in Kenya?

1.4 Objectives

The overall objective of this study was to examine household-level demand for urban housing services across tenure and income categories

in Kenya using the case of two urban counties of Nairobi and Mombasa.

Specifically, the study sought to:

- (i) Identify determinants of household demand for urban housing services
- (ii) Estimate housing demand elasticities for urban households across tenure and income categories in Kenya
- (iii) Determine the nature, extent and magnitude of urban housing demand elasticities
- (iv) Identify policy recommendations for effective urban housing delivery in Kenya

1.5 Significance of the Study

Knowledge of how urban households demand housing services will enrich policy options for effective solutions to housing problems in Kenya's urban areas. The Kenya Vision 2030 commits to provide adequate housing to all Kenyan households, while growing the economy through the housing multiplier nexus. This is so because inadequate urban housing has been linked to the high cost of labour, which subsequently affects the national economic productivity (Cannari, Nucci and Sestito, 2000).

Additionally, the government must be guided by clear understanding of household housing demand dynamics in order to craft policy guidelines for granting every Kenyan the constitutional right to housing as required under the Constitution, and International Covenant on Economic, Social and Cultural Rights as well as national obligation to the Millennium Development Goals and Vision 2030.

This study will, therefore, produce useful findings for informing strategies to address current urban housing challenges and those likely to emanate from urbanization, population and demographic trends in the country. Moreso, provision of housing in the background of limited national resources will require empirical evidence to target interventions that produce the greatest impact, while minimizing resource wastage.

2. Literature Review

2.1 Theoretical Literature

Household demand for housing

A household demand for housing (services or good) can be modelled with standard utility/choice theory. A utility function, such as $U = U(X_1, X_2, X_3, \dots, X_n)$, can be constructed where household's utility is a function of various goods and services (X_s). This will be subject to a budget constraint such as $P_1X_1 + P_2X_2 + P_3X_3, \dots, P_nX_n = Y$, where Y is the household's available income and the P_s are the prices for the various goods and services. The equality indicates that the money spent on all the goods and services must be equal to the available income. Because this is unrealistic, the model must be adjusted to allow for borrowing and/or saving. A measure of wealth, lifetime income, or permanent income is required. The model must also be adjusted to account for the heterogeneity of housing as a good or service.

Hedonic price approach

Housing is a heterogeneous commodity that is demanded as a bundle of characteristics (Smith *et al.*, 1988). Housing units commanding the same price can differ in size, type, age, design, surrounding land uses among others. Thus, prices for housing services observed in the market reflect the value of different amounts of housing bundles (Zabel, 2003). Therefore, it is important to analyze hedonic price functions of consumer demand for various attributes of housing as a good or service. Justification of the hedonic approach to analysis of markets is premised on the fact that estimation of the hedonic price for a characteristic and the choice made by the consumer provide local information about the consumer's preferences or willingness to pay for attributes in the neighbourhood of the observed choice, under the assumption of optimizing behaviour (Sheppard, 1999).

Permanent-income hypothesis of housing

The hypothesis states that the choices made by consumers regarding their consumption patterns are determined not by current income but by their longer-term income expectations (Friedman, 1957). Households make housing consumption decisions based more on permanent/expected incomes and less on current/transitory (measured) incomes (Mayo, 1981). The argument is that consumption decisions (including that of housing services) are made in a forward-looking manner, and

that the current income is a poor determinant of consumption patterns and does not incorporate expectations.

2.2 Empirical Literature Review

2.2.1 Review of past urban housing studies in the country

Housing affordability

Studies indicate that standard decent housing is mostly unaffordable to majority of low-income urban households. Slum households were allocated houses in the Kibera Highrise slum upgrading project but sold them off to middle income households as they could not afford the improved housing conditions. In Pumwani-Majengo slum upgrading projects, beneficiary households could not afford even the subsidized mortgage, resorting to sub-letting some rooms at market rents in order to pay (Ochieng, 2007). Targeted households for the World Bank sponsored Dandora site-and-service housing project could not service the subsidized mortgage nor afford to develop their serviced plots (Amis, 1984; Alder, 1995). The cost of urban housing is prohibitively high for poor households whose only recourse is in slum housing (Mwangi, 1997). However, World Bank (2006) found the house rent relatively expensive for the households residing in slums, despite poor quality with possible crowding out of other household expenditures. Rent was only second to food in Nairobi slum's household expenditure. Income was found to be positively related to housing expenditure (World Bank, 2006).

Macoolo (1994) contends that the modern financing mechanism adopted in donor funded urban house-ownership programmes for poor households in Kenya was costly and inappropriate for the targeted low-income households because of stringent conditions. It instead resulted to 'clandestine plot sales, absentee landlordism, escalating rents, and the invasion of low income settlements by higher income groups. He avers further that the informal financing basis under a traditional method known as the 'tenancy at will' system could have promoted progressive housing development for low-income households.

Household preferences

Kenya's urban building code was adopted from the British, whose habitable housing standards are different from indigenous Kenyan

standards. Slum houses, normally considered inhabitable according to the official Kenyan standards, are actually socially acceptable by the residents, majority of them with rural background. The rural culture of sharing facilities such as water, toilet and cooking is normally applied when in urban informal settlements.

Some urban households have strong rural attachment and consider single rooms adequate enough to house them temporarily as they seek economic opportunities in the urban areas. Ninety (90) per cent of households in Nairobi slums occupy single rooms of 9 to 14 square metres and accommodate from 3 to 5 people (Lamba, 1994), yet government programmes provide a standard two bed-roomed house which is unnecessary to target households who only need minimum space to get by in the city. World Bank (2006) found high incidences of crowding in Nairobi slums. There were 2.6 persons per room in the slums, compared to 1.7 persons for Nairobi city as a whole, and 1.55 for Kenya.

Low income households prefer temporary housing, which grants them freedom to shift as they follow economic opportunities. Own occupying tenure may mean higher transport costs in case of income-generating sources changing, or inaccessibility of basic services such as cheap schools, cheap household grocery, meat from unwanted animal parts, and kadogo² economy (Huchzermeyer, 2008; World Bank, 2006).

A multivariate hedonic regression analysis of urban slum housing in Nairobi found that rent depends or varies with a unit's size, location, construction quality, and access to infrastructure and related facilities such as public schools, despite the possible outsider's view of apparent homogeneity in slum housing conditions (World Bank, 2006).

Urban slum household's size has a negative relationship with household per capita income and expenditure, housing spending included. The study also found evidence of members of one family living in separate units in the same settlements or other parts of the city due to space and housing constraints.

A World Bank study found that Nairobi slum households were more mobile compared to other households (World Bank, 2006). While most urban housing interventions by government aim at home ownership,

² Kadogo economy refers to trade in common household (but divisible) consumer goods measured in smaller than approved/mainstream standards. It is common in Kenya slum settlements where majority of households cannot afford most products in the factory-set quantities.

studies indicate that this option is not only unaffordable by the target households, but inappropriate for a highly transient population that keeps on changing locations in search of economic opportunities in the urban areas (Ochieng, 2007; Macoloo, 1988; and, Huchzermeyer, 2008).

Informal settlements as source of livelihoods

Urban slums present unique livelihoods. These include owners of slum housing structures who charge rent on slum households, suppliers of illegally connected water and electricity, as well as dealers in refuse-collection and security-provision. The informality of these settlements provide thriving business of illicit brews, *kadogo* economy, trading in sub-standard products as well as those unfit for human consumption, prostitution, informal schools and child labour; all possible because government regulation is lacking or very minimal.

Tampering with the urban informal settlements usually compromises these economic stakes and is mostly resisted, or similar settlements are formed at newer locations in order to protect income generation as well as access affordable services.

Speculative interests

Urban housing in Kenya is highly commercialized and, therefore, attractive for speculation. Instances abound of beneficiary households of slum-upgrading programmes trading off their upgraded houses, while they remain in slums. In Kisumu, low income households rented out their USAID-funded houses to middle class households (Macoloo, 1988). In Mombasa, a World Bank funded project in Chaani settlement meant for upgrading housing and infrastructure facilities for the poor residents ended up attracting upper income households who bought off the serviced land, causing the original beneficiaries to start up a new squatter/slum settlement (Magutu, 1997). In Dandora First Urban project by the World Bank, target beneficiaries sold their land rights or improved/upgraded housing to richer people (Amis, 1984; Alder, 1995).

Since home-ownership is mostly out of reach for most urban households, middle-class income households speculate on slum-upgraded housing units, which they buy from the original owners who are naturally poor, transient and easily manipulated (Huchzermeyer, 2008). Home-ownership effectively hands urban households freedom to sell their right to ownership to the highest bidder, eventually distorting the intended housing objectives.

Slum housing in Kenya's urban centres, especially Nairobi, is provided by entrepreneurs who are more concerned about maximizing profit from rental earnings rather than the urban poor providing the housing themselves, as supported by theory of urban slum formation (World Bank, 2006). Additionally, Nairobi slum housing is characterized by high tenancy rates and absentee landlords and neglect of house maintenance (World Bank, 2006).

Rural urban migration

The increasing urban population in Kenya is significantly due to households locating to urban centres from rural areas. Therefore, how and why households come to town explains the context of urban household demand for housing. Agesa (2004) found out that migration to bigger cities induces household heads to retain the rest of the family in rural areas due to the perceived higher expected cost of living compared to smaller towns, while household heads with higher level of education were more likely to migrate with their family as well as those with prior experience residing in an urban setting. Direct migration from rural areas was found to predispose an urban slum household to lower welfare (World Bank, 2006). Urban households with members in rural areas send relatively higher remittances, effectively reducing their consumption in urban areas, including that of housing (Agesa, 2004; World Bank, 2006).

As World Bank (2006) found, urban slums mostly serve as entry points for rural migrants into major towns in Kenya. The study found that there were more males than females, and disproportionately few children in Nairobi slums, supporting the notion that young men came to the city to look for jobs, leaving their families behind in rural areas.

World Bank (2006) found that urban household's welfare improved with the length of stay in an urban settlement. Length of stay impacts positively on the household welfare due to formation of useful economic and social networks, and gained skills to survive in urban areas.

Effective urban housing intervention

Mathare 4A Housing Upgrading project through a Government of Kenya, Catholic Church and German Development Bank partnership is credited for considering target-households' needs in its execution, with resultant relative success (Mwangi, 1997). Transfer of land ownership

from absentee landlords to government, determination of appropriate rent to be paid, and identification of household priorities in the project was done consultatively. Even during project implementation, relocation of residents was minimized to avoid disruption of lifestyles and livelihoods. The community provided labour to minimize project costs, and rental income was being reinvested in the project to cover administration costs and expand the scope of the project. However, the sustainability of the project and its duplicability hinged upon availability of subsidies, as the target households could not afford market-determined rents.

2.2.2 Review of other empirical findings

Fontenla and Gonzalez (2008), using data for 21 metropolitan areas of different sizes and geographical location in Mexico for the period 2002 to 2004 conducted econometric estimation of price and income elasticities of housing demand and demographic and socio-economic characteristics of households. They found the price elasticity of housing demand to be -0.3, lower than previous studies for developed countries and within the range for developing countries. Permanent income is a major component of housing demand, with an elasticity of 0.8. In contrast, temporary income has a very low elasticity of 0.04. Regarding the demographic characteristics of the household, it was found out that males demand less housing than females, and married heads of household demand more than their unmarried counterparts. The age of head of household elasticity of demand is negative at -0.14 and -0.15. The effect of the number of dependents on the quantity demanded is small and negative at -0.02, indicating the possibility that more dependents reduce the amount of resources that the household can allocate to housing in Mexico.

García and Hernández (2008) studied housing demand in Spain according to tenure and dwelling types using 1999 micro-econometric data in Spain. Using generalized two-stage Heckman estimation to correct the bias of the sample selection, with a mixed logit multinomial model in the first stage, their results show differences in the housing demand between owners and renters according to the building type, with larger values of income elasticity and demand price in rented dwellings.

Ballesteros (2002) estimated a simple, one-period housing demand model using log-log regression analysis in the Philippines using Family Income and Expenditure Survey (FIES) conducted every three years among a representative sample of 40,000 households in the country on rent, income/household expenditure, relative price of housing to non-housing goods, and housing characteristics. Results showed that housing expenditure is highly responsive to a change in income. Location also influences housing demand. Housing expenditure of married-headed households tend to be more responsive to change in income compared to single-headed households.

Tiwari and Parikh (1997) estimated a housing demand function for Bombay metropolitan area using a two-step econometric analysis of first estimating the hedonic price index for different regions in Bombay, then estimating demand for housing as a function of economic and household characteristics. A household survey with a sample size of 6,128 was used. They found that housing demand is inelastic with respect to income and price. The income elasticities for owners and tenants are around 0.33 and 0.38, respectively, while the price elasticities are -0.21 and -0.75, respectively, for owners and tenants. Income and price elasticities for different income classes show that high income groups have lower income elasticity compared to low income group for home owners, but the results are opposite for renters. Price elasticity is higher for low income renters than high income renters, and opposite for home owners.

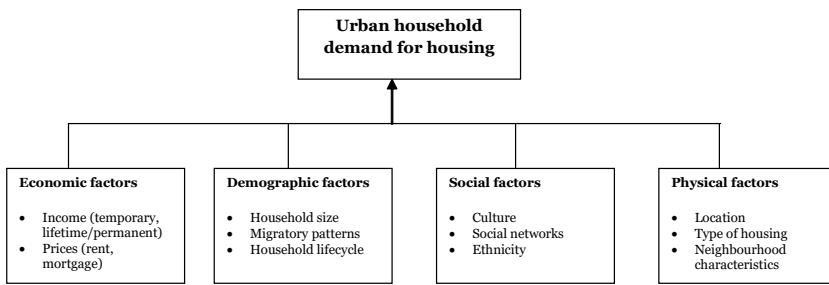
Tiwari and Hasegawa (2000) estimated demand for housing for tenants in Tokyo Metropolitan Region using household level data for 1993. A three-step econometric analysis was applied specifically to estimate a hedonic price for housing characteristics, a permanent income and finally effective demand for housing. The results indicate that the rental housing demand is inelastic with respect to permanent income and price, with coefficients as 0.31 and -0.093, respectively. Other important variables that determine housing demand for tenants are duration of stay and type of household. Larger households demand more housing. However, keeping the size of household constant, households with elderly members have higher demand for housing.

3. Methodology

3.1 Conceptual Framework

Literature has established that urban household demand for housing services is influenced by a variety of factors, ranging from economic (income, prices, supply), demographic (household size, migratory patterns, household life cycle), social (culture, ethnicity), to physical (location, type of housing, neighbourhood characteristics). Conceptually, demand for housing can be presented as follows:

Figure 3.1: Conceptual framework



Source: Author's construction from literature

3.2 Model Specification

3.2.1 Estimation of hedonic price function

Sheppard (1999) derives hedonic price function $P(Z)=f(Z_1, \dots, Z_n)$ where (Z_1, \dots, Z_n) is a vector of various housing characteristics. The hedonic price can be estimated by regressing market values of house prices, measured as rents, as a function of various housing attributes. Thus:

$$P(Z)=f(Z_1, \dots, Z_n) \dots\dots\dots 1]$$

The main housing characteristics usually included in estimating the hedonic price function of housing are the dwelling type, location of the housing unit in relation to a central reference point (for instance Central Business District), wall, roof, floor types, tenure type, location of kitchen, presence of toilet, size of floor and the number of habitable rooms, among others.

Therefore, the estimation equation will be:

$$\begin{aligned} LnR_i = & \alpha_0 + \alpha_1 ROOM_i + \alpha_2 SQAREA_i + \alpha_{3-10} WALL_i + \alpha_{11-15} ROOF_i + \alpha_{16-20} FLOOR_i + \alpha_{21-26} \\ & DWELL_i + \alpha_{27-31} TENURE_i + \alpha_{33} KITCHN_i + \alpha_{34} TOILE + \alpha_{35} CHMNY + \varepsilon_i \end{aligned} \quad \dots 2]$$

where i represents the household; and LnR is the natural log for monthly rent. Table 3.1 shows the definitions and measurements of variables used in the hedonic price function of housing.

Table 3.1: Definitions and measurement of variables

Variable	Description	Measurement	Expectation
ROOM	No. of habitable rooms in the main dwelling unit of household	Number	Positive
SQAREA	Total floor area of all the rooms in the main dwelling unit of household	Square metres	Positive
WALL	Dummies for wall: Reference category–stone wall		
	Brick block wall	(1=yes; 0=no)	Positive
	Mud wood wall	(1=yes; 0=no)	Negative
	Mud cement wall	(1=yes; 0=no)	Negative
	Wood wall	(1=yes; 0=no)	Negative
	Corrugated iron sheet wall	(1=yes; 0=no)	Negative
	Grass straw wall	(1=yes; 0=no)	Negative
	Tin wall	(1=yes; 0=no)	Negative
	Other wall	(1=yes; 0=no)	Negative
ROOF	Dummies for roof: Reference category–corrugated iron sheet		
	Tiles roof	(1=yes; 0=no)	Positive
	Concrete roof	(1=yes; 0=no)	Indeterminate
	Asbestos roof	(1=yes; 0=no)	Negative
	Makuti roof	(1=yes; 0=no)	Negative
	Tin roof	(1=yes; 0=no)	Negative
FLOOR	Dummies for floor: Reference category–cement floor		
	Tiles floor	(1=yes; 0=no)	Positive
	Wood floor	(1=yes; 0=no)	Positive
	Earth floor	(1=yes; 0=no)	Negative
	Other floor	(1=yes; 0=no)	Indeterminate

DWELL	Dummies for dwelling type: Reference category–flat		
	Bungalow	(1=yes; 0=no)	Positive
	Maisonette	(1=yes; 0=no)	Positive
	Swahili	(1=yes; 0=no)	Negative
	Shanty	(1=yes; 0=no)	Negative
	Other dwelling	(1=yes; 0=no)	Indeterminate
	Manyatta/traditional house	(1=yes; 0=no)	Negative
TENURE	Dummies for tenure: Reference category–rented		
	Owner occupied	(1=yes; 0=no)	Positive
	Owner occupied nomads	(1=yes; 0=no)	Indeterminate
	Employer provided subsidized	(1=yes; 0=no)	Indeterminate
	Employer provided free	(1=yes; 0=no)	Indeterminate
	Free	(1=yes; 0=no)	Indeterminate
KITCN	Dummies for kitchen location: Reference category–indoor without partition		
	Outdoor	(1=yes; 0=no)	Positive
	Enclosed detached	(1=yes; 0=no)	Positive
	Enclosed attached	(1=yes; 0=no)	Positive
	Indoor partitioned	(1=yes; 0=no)	Positive
	Other kitchen	(1=yes; 0=no)	Indeterminate
TOILE	Dummy for toilet inside dwelling unit	(1=yes; 0=no)	Positive
CHMNY	Dummy for kitchen with chimney	(1=yes; 0=no)	Positive

3.2.2 Estimation of housing demand

Conventional demand analysis for housing services can be expressed as follows:

$$Q_h = f(P_h, Y, H_1, H_2, \dots) \dots\dots\dots 3]$$

where Q_h is the quantity of housing services demanded. P_h is the relative price of housing vis-a-vis other goods, Y is the household permanent income, and $H_i (i=1 \dots n)$ the household characteristics such as household size, family life cycle and culture, among others.

In estimating household demand for housing, expenditure on housing in the form of rent paid (as a surrogate for housing consumption) is commonly used as a dependent variable (Malpezzi and Mayo, 1985).

But rent, R , is a product of the unit price and the quantity consumed . Equation 3 then becomes:

$$R = P_h * Q_h = f(P_h, Y, H_i) \dots\dots\dots 4]$$

Expanding equation 4 gives:

$$RENT_i = \phi_0 + \phi_1 PRICE_i + \phi_2 INC_i + \phi_3 AGE_i + \phi_4 HHSIZ_i + \phi_5 YRNB_i + \phi_6 SPSE_i + \varepsilon_i \dots\dots\dots 5]$$

A log-linear form of this model is adopted to provide for the estimates of constant income and price elasticities that are independent of levels of income, prices or demographic variables. This is unlike linear form, which is restrictive in the sense that income and price elasticities measured through it are constrained to increase monotonically as prices and income change.

$$LnRENT_i = \phi_0 + \phi_1 LnPRICE_i + \phi_2 LnINC_i + \phi_3 AGE_i + \phi_4 HHSIZ_i + \phi_5 YRURB_i + \phi_6 SPSE_i + \varepsilon_i \dots\dots\dots 6]$$

3.3 Data Type and Sources

The study used household-level data from 2005/2006 Kenya Integrated Household Budget Survey (KIHBS). The survey was undertaken for 12 months in 1,343 randomly selected clusters³ across all districts in Kenya

Table 3.2: Definition and measurement of variables: Household demand for housing function

Variable	Description	Measurement	Expectation
PRICE	The estimated hedonic prices of housing services	Kenya shillings	Negative
INC	Estimated values of permanent income	Kenya shillings	Positive
AGE	Reported age of the household head	Years	Positive
HHSIZ	Size of the household	Number of people in the household	Positive
YRURB	Years of urban stay	Cumulative years spent in Nairobi by the household head	Negative
SPSE	Staying with spouse/partner	Whether the head of household stays with spouse/partner in the household (1=yes; 0=no)	Positive

³ Clusters were selected with probability proportional to size (pps) from a set of all Enumeration Areas (EA) used during the 1999 Population and Housing Census (a cluster is either an EA or an EA segment of about 100 households).

and comprised 861 rural and 482 urban clusters. Ten households were randomly selected with equal probability in each cluster, resulting in a total sample size of 13,430 households. Nairobi and Mombasa districts are chosen for this study because they are entirely urban. The 1,343 KIHBS clusters are the Primary Sampling Units (PSUs) from the National Sample Survey and Evaluation Programme (NASSEP) IV sampling frame, which is designed to give nationally, and sub-nationally, representative household survey samples. The KIHBS clusters sampled in each district were selected with equal probability from the NASSEP IV frame.

The survey collected data on socio-economic aspects of the Kenyan population, including education, health, energy, housing, water and sanitation as well as data on poverty, welfare, employment and consumption.

Since the focus of the study is on urban households, Nairobi and Mombasa counties were chosen because they are entirely urban, producing a sample of 912. This sample was further disaggregated into renters (households) and owner occupiers (households). The sampled households were further classified according to income groups.

4. Results and Discussions

4.1 Hedonic Price Function

4.1.1 Descriptive Statistics

Table 4.1 summarizes housing characteristics for all sampled households as well as for renters and owner occupiers separately. Households occupying own houses have on average 4.23 rooms in the dwelling unit, compared to 1.8 and 2.3 rooms for renters and aggregated households, respectively. On average, floor area occupied per household is more for owners (111.1 m²) than for renters (32 m²) and aggregated households (48.8 m²). In all tenure categories, there is substantial dispersion in the floor area as indicated by the large standard deviations.

Table 4.1: Characteristics of hedonic price function for housing

Variable	Combined Ho			Renters			Owners		
	N	Mean	Std. Dev	N	Mean	Std. Dev	N	Mean	Std. Dev
Rooms	871	2.28	1.83	603	1.80	1.47	164	4.23	1.98
Floor area	856	48.76	79.40	600	32.04	48.39	161	111.10	127.80
Wall									
Brick-block	862	0.23	0.42	602	0.23	0.42	163	0.25	0.43
Mud-wood	862	0.10	0.30	602	0.11	0.32	163	0.11	0.31
Mud-cement	862	0.05	0.21	602	0.04	0.21	163	0.04	0.19
Wood	862	0.01	0.12	602	0.01	0.12	163	0.01	0.08
Corrugated iron sheet	862	0.08	0.27	602	0.09	0.29	163	0.03	0.17
Grass/straw	862	0.00	0.03						
Tin	862	0.01	0.08	602	0.01	0.09			
Other	862	0.00	0.03						
Roof									
Corrugated iron sheet							163	0.39	0.49
Tiles	862	0.22	0.41	602	0.13	0.34			
Concrete	862	0.21	0.41	602	0.26	0.44	163	0.11	0.31
Asbestos	862	0.03	0.16	602	0.02	0.16			
Makuti	862	0.03	0.17	602	0.02	0.14	163	0.08	0.27
Tin	862	0.00	0.06	602	0.00	0.06			
Floor									
Tiles	861	0.12	0.33	601	0.09	0.29	163	0.21	0.41

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Wood	861	0.09	0.29	601	0.06	0.25	163	0.21	0.41
Earth	861	0.10	0.30	601	0.10	0.30	163	0.15	0.36
Other	861	0.01	0.11	601	0.00	0.06	163	0.04	0.20
Dwelling type									
House/ bungalow	862	0.16	0.36	602	0.07	0.25	163	0.31	0.47
Flat	862	0.25	0.43	602	0.33	0.47	163	0.04	0.20
Swahili							163	0.29	0.45
Maisonette	862	0.13	0.33	602	0.07	0.25			
Shanty	862	0.12	0.33	602	0.16	0.36	163	0.01	0.11
Manyatta/ traditional	862	0.00	0.06				163	0.01	0.11
Other	862	0.02	0.15	602	0.02	0.15	163	0.01	0.08
Tenure									
Owner- occupied	865	0.19	0.39						
Owner- occupied nomads	865	0.00	0.03						
Employer- provided subsidized	865	0.03	0.16						
Employer- provided free	865	0.06	0.25						
Free	865	0.02	0.14						
Kitchen location									
Outdoor	861	0.07	0.26	601	0.07	0.26	163	0.11	0.31
Enclosed- detached	861	0.06	0.24	601	0.04	0.19	163	0.12	0.33
Enclosed- attached	861	0.27	0.45	601	0.21	0.41			
Indoor without partition							163	0.11	0.31
Indoor with partition	861	0.15	0.36	601	0.12	0.33	163	0.21	0.41
Other	861	0.01	0.10	601	0.01	0.10	163	0.01	0.08
Toilet inside	862	0.42	0.49	602	0.34	0.47	163	0.69	0.47
Chimney on kitchen	862	0.16	0.37	602	0.10	0.30	163	0.26	0.44
Valid N (listwise)	855			599			161		

4.1.2 Regression results of hedonic price function of housing

Table 4.2: Results of hedonic price function, dependent variable: Ln (Monthly rent⁴)

Variable	Description	All tenure	Renters	Owners
CONSTANT	Constant	6.987*** (0.063)	7.030*** (0.064)	8.777*** (0.320)
ROOM	No. of habitable rooms in the main dwelling unit	0.167*** (0.019)	0.154*** (0.023)	0.138*** (0.036)
SQAREA	Total floor area of rooms in the main dwelling unit	0.002*** (0.000)	0.005*** (0.001)	0.001** (0.001)
WALL	Dummies for wall: Reference category–stone wall	0.048 (0.063)	-0.018 (0.071)	0.492*** (0.165)
	Brick block wall	-0.444*** (0.125)	-0.497*** (0.130)	0.259 (0.346)
	Mud wood wall	-0.331*** (0.116)	-0.401*** (0.125)	0.562 (0.356)
	Mud cement wall	0.333 (0.211)	0.254 (0.202)	-0.815 (1.097)
	Wood wall	-0.150 (0.113)	-0.136 (0.113)	-0.759* (0.401)
	Corrugated iron sheet wall			
	Grass straw wall	-1.883** (0.752)		
	Tin wall	-0.766** (0.332)	-0.902*** (0.302)	
	Other wall	-0.714 (0.746)		
ROOF	Dummies for roof: Reference category–corrugated iron sheet (all tenure and renters), tiles–owners			
	Corrugated iron sheet roof			-0.374 (0.235)
	Tiles roof	0.157* (0.090)	0.213 (0.106)	
	Concrete roof	0.164* (0.089)	0.175* (0.092)	-0.308 (0.221)
	Asbestos roof	-0.246 (0.162)	-0.243 (0.176)	
	Makuti roof	-0.305* (0.159)	-0.348* (0.190)	-0.048 (0.399)
	Tin roof	0.329 (0.438)	0.139 (0.439)	

⁴ Imputed rent is used for owner-occupiers: This is the amount households think their house would fetch if it were rented.

FLOOR	Dummies for floor: Reference category–cement floor			
	Tiles floor	0.834*** (0.090)	0.699*** (0.102)	0.486* (0.227)
	Wood floor	1.293*** (0.108)	1.021*** (0.132)	0.978*** (0.249)
	Earth floor	-0.257** (0.105)	-0.090 (0.106)	-1.195*** (0.323)
	Other floor	1.179*** (0.242)	0.703* (0.422)	0.936** (0.379)
DWELL	Dummies for dwelling type: Reference category–Swahili (all tenure and renters), maisonette–owners			
	Bungalow	0.234** (0.097)	0.207* (0.123)	-0.197 (0.170)
	Flat	0.264*** (0.096)	0.222** (0.098)	-0.206 (0.323)
	Maisonette	0.511*** (0.114)	0.535*** (0.142)	
	Swahili			-0.869*** (0.261)
	Shanty	-0.296*** (0.113)	-0.375*** (0.114)	-0.018 (0.675)
	Other dwelling	-1.617*** (0.422)	-0.801 (0.833)	
	Manyatta/ traditional house	0.277 (0.170)	(0.202) 0.166	-0.856 (0.812)
TENURE	Dummies for tenure: Reference category–rented			
	Owner occupied	0.288*** (0.078)		
	Owner- Occupied Nomads	0.837 (0.674)		
	Employer provided subsidized	-0.642*** (0.166)		
	Employer provided free	0.019 (0.114)		
	Free	-0.217 (0.165)		
KITCN	Dummies for kitchen location: Reference category–indoor without partition (all tenure and renters), enclosed-attached kitchen- owners			
	Outdoor	0.055 (0.097)	-0.106 (0.102)	-0.104 (0.247)
	Enclosed detached	0.449*** (0.114)	0.363** (0.144)	0.269 (0.217)
	Enclosed attached	0.550*** (0.088)	0.825***	
	Indoor without partition			-0.737** (0.290)
	Indoor partitioned	0.397*** (0.096)	0.554*** (0.111)	-0.178 (0.176)
Other kitchen	0.240 (0.228)	0.029 (0.244)	-0.252 (0.797)	

TOILE	Dummy for toilet inside dwelling unit	0.356*** (0.084)	0.140 (0.101)	0.370* (0.221)
CHMNY	Dummy for kitchen with chimney	-0.256*** (0.075)	-0.540*** (0.090)	0.211 (0.165)

The standard errors are in brackets. *, ** & *** indicates level of statistical significance at 10%, 5% and 1%, respectively.

Table 4.2 presents regression results of hedonic price function of housing for renters, owner-occupiers and combined tenure. Generally, results indicate that rents paid depend on or vary with a unit's size and its construction quality. These results are consistent with a similar study by World Bank (2006) on drivers of rent in Nairobi slums. In all tenure categories, the number of habitable rooms in the main dwelling unit as well as the floor area has positive impact on rent paid. Specifically, an extra room increases rent for owner-occupiers by 13.8 per cent, 15.4 per cent for renters and 16.7 per cent for aggregated households irrespective of tenure. An additional unit square metre in the floor of the owner occupied housing increases rent by 0.1 per cent compared to 0.5 per cent and 0.2 per cent for renters and combined tenures.

The other housing attributes have different impacts on the rent paid for different tenure categories. Generally, inferior wall, roof and roofing materials such as wood, tin and mud walls, earth floor, and makuti roof have negative effect on rent. Tiles, wood and other floor have positive impact on the rent paid as well as concrete and tiles roofing, respectively.

Rent is also influenced by dwelling type, with house/bungalow, flat and maisonnettes positively influencing rent among the renters and aggregated tenure, but insignificant among owner-occupiers. Swahili houses, shanties and manyattas/traditional houses have negative impact on rent.

The location of kitchen within the dwelling unit, to some extent, affects the rent paid. Enclosed kitchen, whether attached or detached, positively influences rent, with attached kitchen contributing more to rent. An indoor kitchen with partition has a positive influence on rent for renters and aggregate tenure, but insignificant for owner-occupiers.

Having toilet inside the dwelling unit positively influences rent for aggregated tenure and owner-occupiers, but it is not statistically significant among renters.

Chimney on kitchen has a negative influence on rent paid among the aggregate tenure category and renters but insignificant among owner-occupiers. This relationship could be due to the fact that modern cooking appliances have rendered chimney on houses irrelevant and therefore not considered in modern building designs. Thus, chimneys are found on relatively aged houses attracting less rent.

4.2 Determinants of Urban Household Demand for Housing

4.2.1 Descriptive statistics

Basing on hedonic pricing of housing, rented houses are on average cheaper (Ksh 6,575) than owner-occupied houses (Ksh 37,083). Average price of all housing irrespective of tenure is Ksh 11,465. Owner-occupied houses would fetch higher price because of the inherent investment element and the fact that the implied rent is subjective to household opinion on the cost of the housing. The wide dispersion of hedonic price among owner-occupiers can be attributed to the fact that there are even poor households who own shanties in the slums and informal settlements.

On average, rich households own the houses they live in urban areas, but also, among the owner-occupying households are the poorest households, especially those living in slums and informal settlements, as indicated by the largest standard deviation (Ksh 1,104,405).

Households occupying own houses are generally headed by older people (52 years) compared to other urban households in different housing tenure categories. Household size is also on average slightly bigger in this housing tenure category (5 members compared to 4 in other tenure categories). Additionally, own-occupying households have lived in an urban area longer than other households in different housing tenures (an average of 29 years as compared to 15 and 17 years for renting and combined-tenure households, respectively).

4.2.2 Household demand for urban housing

Household expenditure on housing (monthly rent) is regressed on household permanent income (total annual household expenditure used as proxy for permanent income), hedonic price for housing, household size, the age of the household head, years living in urban centres, and

Table 4.3: Characteristics of housing demand variables

Variable	All housing tenure			Owners			Renters		
	N	Mean	Std. Dev	N	Mean	Std. Dev	N	Mean	Std. Dev
Hedonic price (Ksh)	912	11,464.82	29,753.07	604	6,574.79	17808.52	164	37,083.35	40,665.20
Permanant income (Ksh)	885	46,4384.53	70,3237.92	601	382,766.51	563,370.66	158	944,676.69	1,104,405.39
Age (years)	909	40.16	12.95	603	37.12	11.76	162	51.96	11.70
Household size	912	3.97	2.46	604	3.72	2.07	164	5.33	3.41
Length of urban stay (years)	698	16.53	12.33	490	14.60	10.65	92	28.93	13.54
Living with spouse/partner (1=Yes, 0=No)	668	0.81	0.39	432	0.82	0.38	128	0.86	0.35
Valid N (distwise)	511	11,464.82	29,753.07	353	6574.79	17,808.52	74	37,083.35	40,665.20

whether living together with spouse or not. The underlying hypothesis is that all these variables significantly influence household demand for housing.

Diagnostic tests were carried out on the suitability of the regression model. Tests of normality of model residuals, multicollinearity among independent variables, heteroscedasticity and model specification were carried out.

Regression results for all tenure categories are presented in Table 4.2. The R^2 for the model in all tenure categories is above 0.8, indicating that it is a fairly good predictor of household demand for housing.

Estimation was done first for all sampled households irrespective of tenure, before estimating separately for renting and owner-occupying households. Coefficients for the price, income and age of the household head variables exhibited the a priori signs in relation to household demand for urban housing.

Price elasticity of demand

Household demand for urban housing has the expected inverse relationship with price. A one per cent increase in price of housing will decrease household demand for housing by 0.32 per cent for all households irrespective of tenure as well as renting households, but for owner-occupying households, the demand will reduce by 0.33 per cent. Results indicate that changes in the price of urban housing have limited influence on household demand. Since housing is a basic human necessity and has no substitutes, the low price elasticity is expected. The limited housing supply in Kenya's urban areas, especially Nairobi and Mombasa has contributed to limited choices for housing among urban households. The results also indicate that urban households seeking rental housing have less choice compared to those seeking to occupy own houses.

Income elasticity of demand

Holding other factors constant, a percentage change in household income leads to 0.50 per cent change in demand for housing for combined households, and 0.51 per cent and 0.52 per cent for renting and owner-occupying households, respectively. The results show that housing is a normal good as well as a necessity good for both consumption demand and investment demand. Income elasticity is higher among owner-occupying households, indicating the contribution of the effect of investment motive inherent in this housing tenure. Household income elasticity of urban housing in Kenya is lower than other areas as shown in Lin and Lin (1999) where income elasticity is as high as 1.04 for renters and 1.26 for owner-occupiers, indicating possible ambivalence among Kenyan households towards investing in urban housing.

Age of household head

A one year change in the age of the household head changes household demand for housing by 0.9 per cent for combined households and by

Table 4.4: Urban household housing demand function

	All housing tenure	Renters	Owners
Variable	Coefficient	Coefficient	Coefficient
Constant	-3.760*** (0.340)	-3.776*** (0.378)	-4.241*** (1.093)
Hedonic price ⁵ of housing	-0.318*** (0.034)	-0.320*** (0.043)	-0.328*** (0.095)
Permanent income	0.500*** (0.044)	0.508*** (0.050)	0.524*** (0.123)
Age of household head	0.009*** (0.003)	0.007** (0.003)	0.013 (0.013)
Household size	-0.031** (0.014)	-0.016 (0.016)	-0.069* (0.037)
Years staying in town	-0.005 (0.003)	-0.009*** (0.003)	-0.005 (0.011)
Living with spouse/partner (Yes=1, No=0)	-0.011 (0.069)	-0.022 (0.078)	0.094 (0.243)
Dependent variable	Ln (Monthly Actual and Imputed Rent)	Ln (Monthly Rent)	Ln (Imputed Rent)
R ²	0.877	0.861	0.867
Adjusted R ²	0.875	0.859	0.855
Sample size	912	604	164

The standard errors are in brackets. *, ** and *** indicate level of statistical significance at 10%, 5% and 1%, respectively.

⁵According to Tiwari and Parikh (1997), to calculate price elasticity for household demand for housing, expand equation 3, which gives $Q_h = \alpha + E_y Y + E_p P_h + XH$ where Q_h is the quantity of housing consumed, $E_y Y$ is the income variable and its coefficient, $E_p P_h$ is the price variable and its coefficient, and XH are the other demand shifters (household characteristics) and their coefficients. Taking the natural logs of $Q_h = \alpha + E_y Y + E_p P_h + XH$ above: $LnQ_h = \alpha + E_y LnY + E_p LnP_h + XH$ Housing expenditure (in the form of rent paid) is used as proxy for housing consumption (Malpezzi and Mayo, 1985). Therefore, expenditure on housing (R) can be stated as: $LnR = Ln(P_h Q_h) = \alpha + (1 + E_p) LnP_h + E_y LnY + XH$ Therefore, price elasticity = coefficient of price term minus one.

0.7 per cent for renters. For owner-occupiers, the age of household head has no significant effect on household demand for housing. Generally, these findings indicate the insignificant influence of household life cycle on urban Kenyan household demand for housing. The mean age of the household head in the sample is 40 years, which is a prime age of raising a family. Obviously, this stage in household life cycle has likely effect on the quantity and quality of housing demanded.

Household size

The size of household has inverse relationship with household consumption of housing. An addition to the household by one person reduces the household's housing demand by three per cent for all households and by seven per cent for owner-occupiers. This effect is not significant among the renting households. While it is expected that household size would have a positive relationship with housing demanded, it should be noted that household demand for housing is measured by the expenditure on housing services. This expenditure involves quality and quantity interactions with price. These results indicate that an increase in household size reduces household expenditure on housing (probably due to marginal strain on household budget by the additional member). The household might increase demand for housing space but reduce quality. Also, additional family members may increase consumption of non-housing goods and services, while reducing housing consumption, with likely outcomes being over-crowding, living as extended families and slow household formation and settling for lower quality housing. Alpay and Koc (2002) found similar results in Turkey, where household size reduced housing expenditure by 0.149 per cent.

Length of urban stay and living together with spouse

These variables were introduced in the model to capture situations of household separation due to urban-rural allegiance, occupational demands and other household arrangements applicable to Kenyan context. These variables have no significant effect on household housing consumption except for renters, which demand less housing (by 0.9%) for every additional year in an urban area. This could be attributed to the fact that older households in urban areas benefit from municipal housing, which are generally cheaper compared to the highly commercialized and loosely regulated housing market currently being offered to new immigrants in urban centres.

4.3 Household Demand Analysis by Income Category

To further understand household demand for housing in urban Kenya, a similar analysis based on income category of sampled households was adopted. The results are presented in Table 4.5, also disaggregated per tenure.

Sampled households were categorized⁶ into lower income (monthly income of Ksh 23,671 and below), middle income (monthly income of Ksh 23,672–119,999) and upper income (monthly income of above Ksh 120,000) (Kenya National Bureau of Statistics, 2011).

Price elasticity

Low-income households respond less to housing price changes compared to households in other income categories. These findings are consistent with the fact that low income housing is under-supplied, leaving low income households with limited choice. Demand is generally inelastic regarding price changes in urban housing across all income categories, indicating that no income class has much freedom to respond to housing price changes, except owner-occupying households in the upper income class. This may lead to the fact that household's change of housing is rigid in the short run, and therefore household's response to housing price changes could be minimal. Occupying own housing among upper income urban households could be a luxury, or it could indicate availability of more housing choices, resulting into the fairly higher price elasticity.

Income elasticity

Results show that lower income households will be least willing to spend additional income on urban housing compared to other income groups. Upper income households are most willing. This could indicate that low income households' income do not increase substantially for them to have a significant change on their housing conditions, or it could indicate that low income households use the additional income in other non-housing consumption.

Other housing demand shifters

Under income categorization, these other variables are mostly insignificant.

⁶This income classification is based on KIHBS 2005/2006 data and indicates household incomes for Nairobi and Mombasa counties.

Table 4.5: Urban household housing demand function for different income categories

Variables	Low income category			Middle income category			Upper income category		
	All housing tenure	Renters	Owners	All housing tenure	Renters	Owners	All housing tenure	Renters	Owners
Constant	-3.729*** (0.704)	-3.950*** (0.783)	-1.088 (6.188)	-4.811*** (1.359)	-2.504* (1.358)	-5.575* (2.906)	-8.053*** (2.991)	-3.105 (2.595)	1.353 (5.162)
Price	-0.062*** (0.057)	-0.078*** (0.066)	-1.722 (0.610)	-0.102*** (0.068)	-0.136*** (0.072)	0.025*** (0.135)	-0.153*** (0.209)	-0.295*** (0.117)	-0.893 (0.541)
Income	0.355*** (0.066)	0.389*** (0.069)	1.151** (0.381)	0.418*** (0.120)	0.274** (0.124)	0.432* (0.247)	.561*** (0.204)	0.429** (0.198)	0.362 (0.353)
Age of household head	0.006 (0.004)	0.004 (0.004)	0.005 (0.035)	0.012* (0.006)	0.004 (0.005)	0.009 (0.016)	0.008 (0.007)	0.006 (0.004)	0.004 (0.021)
Household size	-0.024 (0.020)	-0.018 (0.021)	0.204 (0.197)	-0.059*** (0.022)	-0.013 (0.022)	-0.081** (0.036)	-0.056 (0.037)	-0.061* (0.031)	0.021 (0.064)
Years of town stay	-0.001 (0.004)	-0.003 (0.004)	-0.034 (0.021)	-0.014*** (0.005)	-0.012** (0.005)	-0.006 (0.013)	0.012* (0.007)	Dropped	0.043**
Living with spouse	-0.086 (0.075)	-0.077 (0.080)	-1.098 (0.820)	0.149 (0.143)	Dropped	Dropped	1.337*** (0.488)	Missing	1.957*** (0.620)
Dependent variable	Ln (Monthly Rent)	Ln (Monthly Rent)	Ln (Monthly imputed rent)	Ln (Monthly rent)	Ln (Monthly rent)	Ln (Monthly imputed rent)	Ln (Monthly rent)	Ln (Monthly rent)	Ln (Monthly imputed rent)
R ²	0.627	0.596	0.760	0.741	0.737	0.790	0.604	0.767	0.586
Adjusted R ²	0.619	0.585	0.616	0.730	0.726	0.763	0.547	0.736	0.430
Sample size	535	399	45	281	167	80	69	35	33

The standard errors are in brackets. *, ** and *** indicate significant levels at 10, 5 and 1%, respectively

5. Conclusion and Policy Recommendations

5.1 Conclusion

Quality and quantity of urban housing in Kenya is below the internationally-accepted standards that put housing thresholds to protect the health and dignity of human beings. With over 70 per cent of urban households living in slums and other substandard dwelling conditions, the realization of Kenya Vision 2030 growth-targets and achievement of the Millennium Development Goals is uncertain.

While various interventions have been used to address urban housing challenges in the country, there has been little impact. Slums continue to exist and expand; cost of housing services continues to adversely affect household welfare as well as compromising the competitiveness of the national labour market, among other negative outcomes of inadequate, unaffordable and inaccessible housing.

This study sought an understanding of urban household demand for housing services, and used data from the urban counties of Nairobi and Mombasa. Specifically, the study highlighted key determinants of urban household demand for housing and subsequently generated quantitative estimates of the extent and magnitude of these determinants with the intent of informing urban housing-delivery policy. Such factors as location and household socio-cultural characteristics were not included in the analysis due lack of data.

Analysis of literature highlighted cases where past housing delivery initiatives led to situations of housing mismatch. This was mainly because of limited understanding of urban housing demand dynamics at the household level.

Regression results indicate that urban household demand for housing services depends significantly on tenure and income. Regardless of income categorization, price and income, elasticity for demand is higher for owner-occupying households than for renting households.

The other housing demand shifters such as age of household head, household size, years staying in town and the impact of staying with a spouse have little and, in some tenures, insignificant effect on demand for urban housing services, indicating that the standard household housing demand model may not be applicable fully in the Kenyan urban context.

Analyzing household demand for urban housing per income category produces significantly different results which strengthen the hypothesis that better understanding of urban housing demand must consider household income classes.

5.2 Policy Recommendations

This study hypothesized the importance of considering household-level factors that influence demand for housing for effective urban housing delivery programmes, especially for income-constrained households. Findings support the hypothesis and the need for Kenyan policy makers to consider evidence when coming up with strategies to solve urban housing shortage, to avoid situations of housing mismatch witnessed in the past.

The inelastic demand to housing price changes indicates that urban households have limited choice in regard to price changes of housing services. This is attributable to the basic necessity that is shelter, as well as limited supply of housing in urban areas. Though the government has prioritized the right to housing in the Constitution, an overhaul of supply strategies is needed to ensure every Kenyan household accesses housing as a basic necessity. Revision of the building code, planning and zoning regulations should be guided by the fact that housing is a basic necessity, and regulations should foster mass production of urban housing.

The household ability to pay for urban housing services should be considered before any housing provision interventions commence. There is considerably high inelasticity of income, especially among the low-income households. Low income households will least likely increase housing expenditure with an increase in household income. Therefore, interventions based on income to improve urban housing conditions may not be successful, especially among low-income households.

In order to ensure every urban household has access to decent housing, the government may consider subsidizing housing services, but caution should be exercised in the administration of such subsidy given the price and income elasticities of housing. Supplementing household income to increase consumption of housing would be counterproductive. A desirable option would be to introduce mass

rental dormitories for recent immigrants and low-income households whose rent is subsidized.

Since these study results show that housing expenditure reduces with increase in household size, legislations on minimum floor size per standard household and quality standards should be considered to protect urban household from dangers of over-crowding, as well as resorting to substandard housing conditions.

5.3 Limitations of the Study and Areas for Further Research

Location is an important variable in housing studies, and it was not adequately covered in this study. Comprehensive data with distance of housing units from a central place (central business district) would provide a spatial dimension to urban housing demand.

Data used in this study was collected in 2005/2006 and can have time/period limitations in modelling urban housing demand given significant changes that have been witnessed in the real estate sector since then.

The use of value of assets, rental value for owner occupier, and value of own consumption of goods and services, are all based on estimates given by the respondents. These values should be interpreted with caution.

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Appendix

Table 1: Evolution of housing policy in Kenya since independence

Phase/Period	Focus of attention	Major instruments used	Key documents
1960s	Physical planning and production of shelter by public agencies	Direct construction; eradication of informal settlements	Sessional Paper No. 5 of 1966/67
1970s-1980s	State and donor support to ownership on a project-by-project basis	Recognition of informal sector; squatter upgrading and sites-and-services	National Development Plans 1970-1974, 1974-1978
Late 1980s- early 2000s	Enabling environment	Provision of basic infrastructure; Direct production; Collaboration of public, private sectors and international community	National Housing Strategy for Kenya 1987-2000
Post-2000	Right to adequate housing to all	Slum upgrading; Direct construction; Physical infrastructure provision; Innovative financing; Research on low cost appropriate building materials; Poverty alleviation and wealth creation; Consolidation of all Acts regulating the housing sector	Sessional Paper No. 3 of 2004 on National Housing Policy for Kenya
	Enabling environment to private sector	Incentives to private sector; Secondary mortgage finance; Corporation, PPP	Kenya Vision 2030
	Right to housing		Constitution of Kenya 2010

Source: Modeled from UN-Habitat (1997), Various Government of Kenya publications

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