

Sector-Wise Exploratory Analysis of Household Residential Location Choice in the African Context: Empirical Evidence from Benin City, Nigeria

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Abstract

This study explored the residential choice of households based on the discrete choice model. Although, many authors in Africa cities have commented on this choice behavioural process. Notwithstanding, empirical study in this area is still lacking. There is a need to provide understanding on the household choice and decisions that influences the structure of urban landscape. A sector-wise model was formulated and used to estimate the choice behaviour of 1100 households in the area. However, the model shows that there exists somewhat complex household sorting pattern which is initiated by sociocultural, socioeconomic, accessibility and neighbourhood composition. Among these, sociocultural factors show robust influence. Such factors support that African households tend to develop strong ties to their origin. Generally, the model shows that the pattern of household choices in the region is distinct across sectors.

Keywords

Residential Location Choice, Multinomial Logit Model, Sector-Wise Model, Residential Sorting, Benin City

1. Introduction

A plethora of studies on residential location and urban mobility in Africa cities have been published in recent decades (Ozo, 1986; Afolayan, 1982; Gbakeji & Rilwani, 2009). Empirical analysis of the household choices and decisions that help to reshape and partition the African urban landscape into clusters of ho-

homogenous residential characteristics has been given little or no attention. Such decisions underlie much of urban growth and change (Wu, 2003). The process of making residential location choice is paramount to the understanding of urban social, economic, morphological changes and spatial stratification in the cities. It is also clear from the literature (Bayoh et al., 2006; South & Crowder, 1997) that residential location is based on choice and that this choice generates strong competition for the most desirable locations. The unrestricted choice which is an off-shoot of this competition for the most preferred locations may be considerably reduced as a result of the variation between people in the locations and lifestyles they prefer. This choice is often influenced by the household's pressing needs and desires at that point in time. As these household's needs and desires change overtime, the zeal for a residential relocation becomes imminent. For instance, while some people prefer to reside in the city centre others prefer the suburban area, and yet others, an intermediate urban section.

Most of the previous studies conducted in recent years, have assumed that travel-related attitudes such as the desire to reside close to place of work are fundamental and exogenous to household residential location preference (e.g., Chatman, 2009; Cao, 2014; Abraham & Hunt, 1997; Cho et al., 2008; Schwanen & Mokhtarian, 2007; Mokhtarian & Cao, 2008; Bohte et al., 2009; Crane, 1994; Levine, 1998; Ingram, 1997; Meyer et al., 1965; Mohan, 1994; Clark et al., 2003) i.e. job locations are independently selected before household residential location choice is made. Others have assumed that housing market, dwelling characteristics and real estate values such as housing quality and pricing are endogenous to the choice process (e.g. Choudhury & Ayaz, 2015; Sermons & Koppelman, 1998; Kumarage, 2007; Cervero, 1998; Frenkel et al., 2013; Jun et al., 2013; Zhuge et al., 2016; Yi & Lee, 2014).

Notwithstanding such substantial amount of studies on this topic, significant proportion emanated from cities of developed economies specifically North American and European cities. In these advanced economies, household residential location choices are primarily influenced by fewer factors such as the real estate market value (Frenkel et al., 2013; Cervero, 1998; Ettema, 2011; Magliocca et al., 2011; Hurtubia et al., 2012) and travel-related issues (Cao, 2014; Bohte et al., 2009; Cho et al., 2008). Perhaps, the reason for this is that the level of basic public utilities (housing facilities, electricity, portable water supply, security, road network and structure, public transport and other infrastructures) is much more homogenous across urban space, in contrast to African cities.

For these reasons and others, African scholars (Onokerhoraye, 1977; Afolayan, 1982; Sada, 1972; Ozo, 1986) have questioned the applicability of western residential location models (e.g. Alonso, 1964)—built majorly on the premise of open market system—to African cities, which present unique case study since they are rooted in a different sociocultural environment and reflect different socioeconomic values. In many African cities, household residential location choice is a complex issue because it is constrained not only by travel-related at-

titudes or housing market system, but also by socioeconomic status, diverse cultural and ethnic norms, family ties and kinship affiliation, traditional obligations and property inheritance, religion, lifestyle, spatial infrastructural disconnect and overall neighbourhood quality.

Moreover, European and North American households may have stronger predisposition to self-select or segregate residential-wise, because as noted earlier, factors influencing decision process are limited and somewhat well-defined. African households may prove otherwise due to the large amount of varying factors influencing individual household choice formation. For example, in Benin City residential neighbourhoods are defined by household with heterogeneous background, which make it quite difficult to unequivocally highlight neighbourhoods with dominant residential characteristics. Against this backdrop, this paper is of the view that amidst heterogeneity intrinsic and distinct residential location choice pattern may be detected with individual level analysis using disaggregate sector-wise models. Such knowledge may help improve understanding of the household decisions that reshapes the urban landscape.

The objectives of this paper are to develop a sector-wise residential location choice models within the African context and using wide collection of variables to identify significant determinants that propel households to select where to live. Sector-wise modeling using disaggregate statistics is a significant approach proposed for African cities pertaining to this topic since it may detect pattern distinctively associated to individual households within the city sector where they reside. In addition, households may first make their decision to choose among series of alternative and competing sectors within the city based on some presumed utility inherent in such location, therefore, variables such as housing type, dwelling units and other housing attributes may become secondary.

In African scenario, for instance, where public utilities and infrastructures are less homogenous across space and housing characteristics (as noted by [Ozo \(1986\)](#)) are far more heterogeneous across city sectors, household may first seek out locations with adequate and attractive infrastructures before deciding on the dwelling attribute. Apparently, any sector they prefer has similar housing characteristics within it. In line with this, literature has revealed that some households prefer a type of housing similar to their previous home ([Axhausen et al., 2004](#)). This kind of intra-sectorial relocation may be somewhat irrelevant for African-based residential location choice model because it may not capture self-selection and in most cases, the change is unnoticed. However, it is the view of this paper that the essence of this sector-wise model is to capture sectorial variation and stratification regarding residential location preference so as to present an understanding for urban planners and public policy makers.

2. Literature Review

Residential land use has generated a lot of researches over the years. Empirical studies have been conducted on their structure, form and overall characteristics

(Mabogunje, 1962; Sanni & Adunola, 2007; Yin, 2009; Borjas, 1998; Onokerhoraye, 1977). In developing countries, the bulk of the literature in urban studies have identified various residential areas and have explained the level of social amenities provided in the various residential density areas (Olatubara, 2008; Molina et al., 2002; Olayimola et al., 2006). Literature emanating from developed countries have proposed and explored diverse reasons why residents prefer certain residential location to others. For example, while Cho et al. (2008); Morrow-Jones and Kim (2009); Ebertz (2009); Kain (1961) found strong relationships between individual's travel pattern and residential location choice; others believed that there is a strong tie between choice of location and existing social infrastructures and amenities; such as good schools, security, regular power supply, potable water supply, shopping complex and accessibility (Kim & Morrow-Jones, 2005; OHRN, 1994; Giuliano & Small, 1993; Bhat & Guo, 2004).

The decision of households to reside in a particular sector within a city could be due to socioeconomic status (de Palma et al., 2007; Zondag & Pieters, 2005; Weisbrod et al., 1980), administrative and central character (Andrew & Meen, 2006; Axhausen et al., 2004; Kim et al., 2005), Sociocultural network and ethnic ties (Ozo, 1986; Owusu, 2004; Kapoor et al., 2004), environmental and neighbourhood attributes (Clarke et al., 2006; Galster & Santiago, 2006), etc. Urban residential location models (Alonso, 1964; Muth, 1969; Mills, 1967, 1972) indicate that the determinants of choice of residential location include income of the household, family size, population density, rent and cost of movement. The models have played a fundamental role in the explanation of urban residential processes with reference to location. The tendency of poor households to reside close to the city centre while the rich live at the suburban area is well documented in the literature. In view of the understanding drawn from previous literature, the determinants of household's residential location choice can be aggregated into: households need for housing adjustment; neighbourhood and environmental attractiveness; sociocultural network and ethnic ties; accessibility and proximity to place of work. The remaining part of this section is discussed based on these generalized determinants (as subheadings).

2.1. Households Need for Housing Adjustment

Rossi (1980) developed a model which focused on life-cycle stages of household decision to move and subsequently choose a residence. This pioneering work was done in Philadelphia, USA and in it, Rossi suggested that residential mobility is "a process by which household adjust their housing to meet the needs that are generated by increase in the family size and composition that accompany life-cycle changes". As the household evolves over time, for instance from being independent single household, getting married, having children, child rearing; the expanding family is likely to express a desire for a larger house and a good neighbourhood environment with quality school.

Clarke and Onaka (1983) in an attempt to improve Rossi's model on life-cycle

change utilized 18 different parameters which were based on reasons of household residential mobility. They found that adjustment to household needs appeared to be prominent and most significant amongst the various characteristics surveyed. Other evidence has shown that some households move in order to adjust to their children's school needs and housing prices (Bogart & Cromwell, 2000).

2.2. Neighbourhood and Environmental Attractiveness

Although there is substantial work (both theoretical and empirical) on residential mobility and housing choice, the role of the neighbourhood is still only partly understood in that process (Clarke et al., 2006). Clarke et al. (2006) studied the role of neighbourhood in the residential choice formation and discovered that neighbourhood factors present an independent and significant choice process. The study was carried out in the Netherlands using data collected from various sources such as the Netherlands Housing Survey 1998. They found that households who had moved from their previous residential location had deliberately made improvement in the socioeconomic status of the neighbourhood and the environmental quality of the area they live in, without a significant improvement in size of the dwelling or change in tenure from renter to occupier.

Other literature has shown that households may be attracted to a particular area because some neighbourhoods provide satisfaction or dissatisfaction due to the presence or absence of good quality schools, crime, noise, social interaction and community spirit (Parkes et al., 2002; Galster & Santiago, 2006). For example, in China households seeking for a home are willing to pay more for reputable sectors and for areas where the quality of neighbourhood with respect to security, accessibility and convenience is high (Wang & Li, 2006). In line with this Ozo (1986) observed that new migrants in Benin City settled in the outer zone because the central city was saturated and some also are attracted to the outskirts because of the possibility of engaging in informal activities that required space e.g. car repair workshops and the opportunities for unskilled work such as casual labourers.

Conway & Brown (1980) also observed the importance of peripheral areas on the Port of Spain, Trinidad where the city experienced different periods of urbanization and subsequent urban structures. In Tanzania, Kombe & Kreibich (2006) and Lupala (2002) demonstrated in their studies of peripheral residential development that migration to these areas by new migrants is attractive because of the availability of land and rooms at lower prices as well as land for economic activities such as urban farming. Gbakeji & Magnus (2007) used three indicators of residential desirability, to determine the quality of each neighbourhood in Warri metropolis in Delta State, Nigeria. Their study shows that residents generally placed more emphasis on environmental quality, proximity to and availability of neighbourhood facilities and the quality of the immediate surroundings when taking decision on where to relocate to within the urban space.

2.3. Sociocultural Network and Ethnic Ties

The bulk of empirical researches in this area have concluded that sociocultural network and ethnic ties or kinship affiliation are major determinants of household residential location choice. Ahmad (1992) in his study of choice of residential location among migrants in Karachi region located in Pakistan, found that migrants prefer to settle close to friends or relatives or in area where the majority of households are of the same ethnic backgrounds as they are. Lupala (2002) also reported similar findings in Dar es Salaam in Nyanira, Tanzania a peripheral informal settlement that continues to attract migrants from the same ethnic group who provide financial and social support for each other.

Dokmeci et al. (1996) studied the residential choice of households in planned districts of Istanbul City. They conducted a survey with a sample of 1105 households proportionally taken from districts divided according to their distance from the CBD. They found that greater proportion of low-income earners desired to move than middle or high-income earners. The basic reasons for the location choices were related to being closer to relatives. They needed to maintain ties with their kin in order to get financial support during difficult times in the city.

As mentioned earlier a substantial number of other studies have suggested that kinship affiliation and social ties dominate location decision particularly in developing countries (Kapoor et al., 2004; Ozo, 1986; Owusu, 2004). Gilbert & Gugler (1982) observed that households having the same ethnic origins typically form residential clusters in cities of developing countries. Immigrants, mostly from developing countries, in developed countries also cluster in some neighbourhoods for more or less the same reasons. Perceived closeness to the village of origin is sometimes stated as a reason for choosing a location. In Ozo (1986) it was observed that migrants choose to settle along a major arterial route going to the resident's village. This "ensured that one could always take a direct transport there and also regularly have access to, and information from, relatives coming from the village".

2.4. Accessibility and Proximity to Place of Work

Workplace as a determinant of household's residential location choice is one factor that has been under-explored and overlooked most especially in developing countries. The review of literature has shown that majority of empirical research findings which show a positive correlation between work place and residential location decision emanate from the more developed countries. For instance, Crane (1994) showed that the individual value of a given home and the choice of commuting length are based not only on the current job site, but also on the expectation of where future jobs will be and the likelihood of both job separations and residential moves. However, various theories and empirics have indicated that household residential locations are systematically determined rel-

ative to the household's workplaces (Ingram, 1997). It has also been shown that workers tend to live and work in the same neighbourhood of a city (Meyer et al., 1965; Mohan, 1994).

Whiting (1952) examined the travel patterns of workers living in public housing projects in Chicago around 1948. In the study, travel pattern is linked to the places where household resided before they moved into the public housing projects. He discovered a tendency for public housing residents to commute back to the traditional work sites associated with their old places of residence and also some tendency overtime for these residents to seek employment closer to their new homes. Wabe (1967) in 1964 surveyed the then current employees of a firm of engineering consultants who in 1962 had moved their offices from central London about 24 km to Epsom. He compared the journey to work distances before and after the move of workers still with the firm on the survey date. The typical commuting trip was found to be substantially shorter after the move. Several interpretations of this finding are possible; one is that it reflects the greater decentralization of household than of jobsite: the typical travel distance falls as the work site move closer to proliferating suburban residence sites. Recently, Cho et al. (2008) used Mecklenburg County, North Carolina, a polycentric city with 10 employment sub-centres, as a case study to explore the role of employment sub-centres in determining residential location decisions. They estimated discrete choice models of residential location decisions: conditional logit models and heteroscedastic logit models with both the full choice set and sampled choices. They found that access to certain employment sub-centres, measured in terms of generalized cost, is an important determinant of households' residential location decisions.

Variables capturing job accessibility (Anas, 1982, 1995; Ben-Akiva & Bowman, 1998) have been included in choice models and most have been found to be statistically significant. Using data from Calgary in Canada, Abraham & Hunt (1997) found that distance-related variables such as journey to work, out of pocket costs and travel time are the most important location factors influencing residential choices. Levinson (1998) pointed out the relative importance of accessibility; showing that accessibility to jobs and housing are more effective variables than demographic and socioeconomic variables such as age, gender, home ownership and household size. Shen (1998) and Bhat & Guo (2004) also confirmed that accessibility to workplace is a critical determinant of residential location choice. Yet, this factor, i.e. accessibility to workplace has not been included in many residential choice researches in African cities.

3. Conceptual Framework

Household residential location is one of the propelling forces of urban dynamics. It impacts employment, economic advancement, social structure, spatial segregation and the transport system (Schirmer et al., 2014). Modeling residential location choice so as to understand the inherent pattern is a primary concern for

urban planners, policymakers, researchers and other stakeholders. Such models on the one hand, provide an understanding on how residential location choices are made; and the extent to which factors such as accessibility, socioeconomic status, distance to work; school quality, neighbourhood character, ethnicity and security have impacted on where people choose to live. On the other hand, residential location choice models are an important component of integrated land use-transport modeling systems, as they predict the dynamics in the urban environment and help to determine how the urban landscape is shaped over time.

In models of households' residential location choice, simultaneous decision regarding preferred neighbourhood, tenure, accessibility, housing quality etc., are made. There are not many empirical models available that can systematically and simultaneously capture the multidimensional choice situation faced by decision makers. Discrete choice models originally credited to [Luce \(1959\)](#) and [Thurstone \(1927\)](#) are disaggregate behavioural models designed to predict the behaviour of individuals in choice situations ([Antonini et al., 2006](#)). They have been the most widely used empirical framework due to their simple mathematical composition and estimation (see [Guo & Bhat, 2001](#); [Wafaa, 2005](#); [Manski & McFadden, 1981](#); [Koning, 1991](#); [McFadden, 1978](#); [Ben-Akiva & Lerman, 1985](#); [Ben-Akiva et al., 1984](#); [Ben-Akiva & Bierlaire, 1999](#); [Antonini et al., 2006](#); [Cascetta et al., 1992](#)).

Discrete choice model is one in which decision makers choose among a set of alternatives. To fit within a discrete choice framework, the set of alternatives (the choice set) must exhibit three fundamental characteristics: alternatives need to be mutually exclusive, alternatives must be exhaustive and the number of alternatives must be finite. Some examples of the discrete choice models are binary response models and ordered response models etc. Conceptually, residential location choice is a dynamic process, in which households are exposed to a dynamically changing set of residential alternatives from which, at any point in time, they assemble and evaluate a choice set of credible alternatives and ultimately, at some point in time make a selection ([Habib & Miller, 2007](#)).

Discrete choice models have played an important role in the explanation and modeling of choice-based researches in the field of economics, transportation, marketing and geography. Most discrete choice models are based on the random utility maximization (RUM) hypothesis. Within the class of RUM-based models, the multinomial logit (MNL) model has been the most widely used ([Bhat & Guo, 2004](#)). The random components of the utilities of the different alternatives in the MNL model are assumed to be independent and identically distributed with a type I extreme value (or Gumbel) distribution ([Johnson & Kotz, 1970](#)).

Ultimately, households will choose the location which most reflects their status. If the household is of a lower status, there is high tendency that such household will reside close to its status pole (ghetto area) even though the dwelling may not be socially acceptable. This is the socioeconomist aspect of the model

which explains not only the residential stratification by social or income status but also the choice of residing in the city centre where travel cost is low and rent is high as a result of limited residential space and the periphery with larger space but high travel cost. This choice set is also applicable to the cultural, environmental/neighbourhood quality, accessibility and the level of security of the preferred location.

4. Methods

4.1. Study Area

This study analyzes the household residential location choice and identified the significant propelling factors of such choices within the African context with specific focus on a historical and traditional Nigerian city (Benin). Geographically, Benin City is located in the Mid-western part of Southern Nigeria and the Southern edge of Edo State, between latitudes 6° 16'N and 6° 33'N and longitudes 5° 31'E and 5° 45'E. The city spreads into five Local Government Areas (Oredo, Egor, Ikpoba-Okha, Ughunmwode and Ovia North East). Benin City has a unique nodal characteristic in the sense that it is connected by road to the Western (Benin-Lagos Road), Eastern (Benin-Asaba Road), Southern (Benin-Warri Road) and Northern (Benin-Auchi Road) parts of the country. The nodal function is dependent on six principal distributors which originate from the Ring Road area in a radial pattern. These distributors are Akpakpava Road, Mission Road, Sokponba Road, Sapele Road, Oba Market Road and Airport Road (**Figure 1**).

The city is characterized by a solid historical antecedent mixed with contemporary urban attributes with diverse ethnic composition. Documented evidence showed that in 1930, Benin had a population of about 11,000 (**Onokerhoraye, 1977**) and this rose to 1,085,676 in 2006. The growth in population concomitantly initiated a steady increase in the territorial coverage of the city. Urban expansion and sprawl in the region is initiated by residential development as a result of rapid economic forces (**Nkeki, 2016**). As noted in literature (**Onokerhoraye, 1977**), urban spatial expansion became intense from the 1950s. In fact, from a small city of less than 4 km² in 1800, the city rose to about 204 km² in 2006. Currently, based on its urban footprint, the region is approximately 531 km² with 170 km in perimeter. Estimate from census statistics shows that the region is composed of 248,620 households and an average of 6 to 7 people per household (**NPC, 2006**).

Onokerhoraye (1977) highlighted the two major consequences of such growth upon the residential structure of the city. The first consequence is the diversification of socioeconomic and sociocultural compositions, such as the occupation type, formal education, religion, life style and ethnicity. This diversification had been implanted into the contemporary urban fabric in two ways. The first involved the hierarchical stratification of the population into three major groups-upper income group (consisting of professionals and top ranking

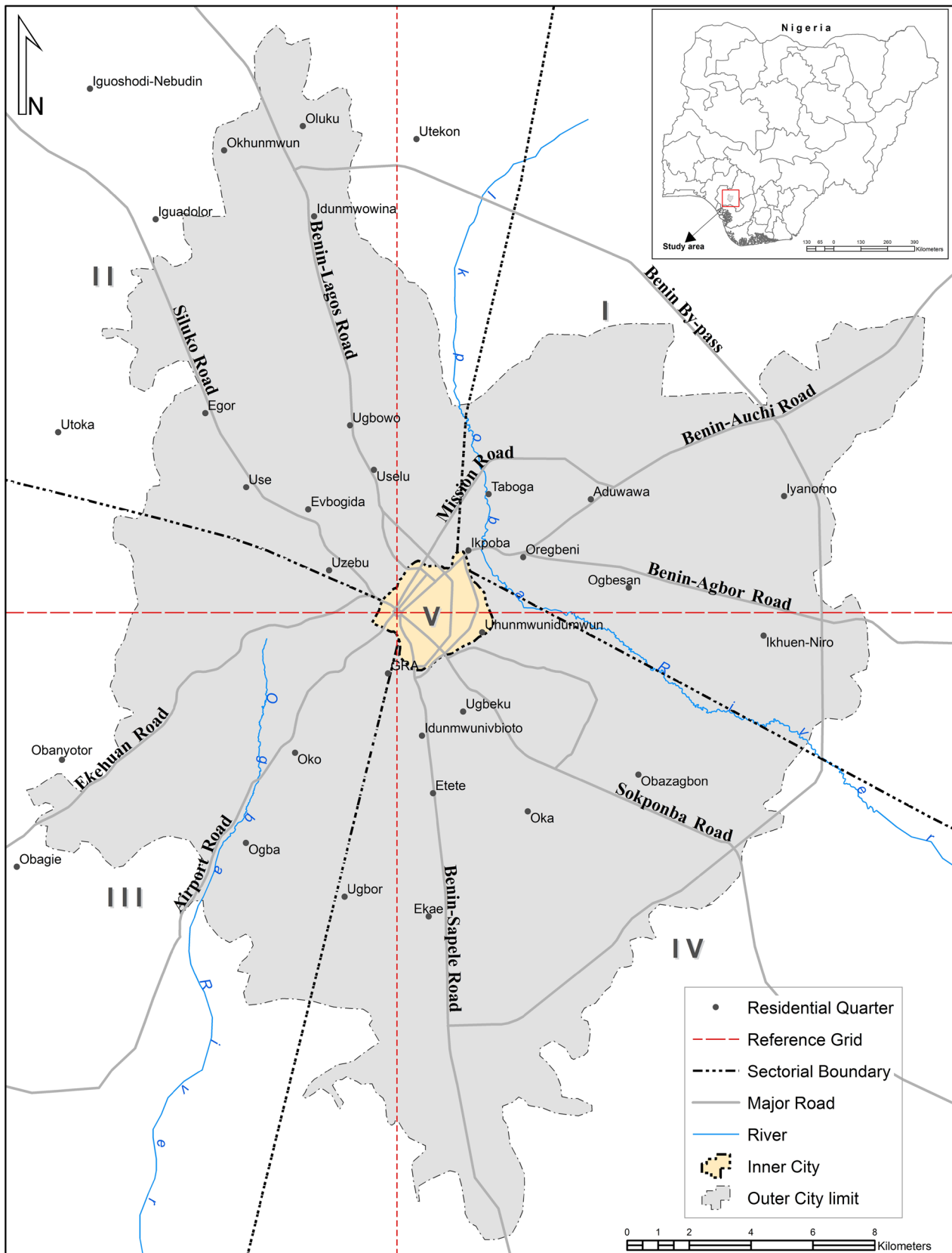


Figure 1. Benin city-sectorial demarcation. Source: Modified from Nkeki (2016).

administrators in federal and state government offices), middle income group (consisting of elementary school teachers, clerical officers etc.), and lower income group (comprises lower wage earners, small-scale business owners, local craftsmen, farmers and other unskilled workers). The second arises from its growth in ethnic diversification and variations resulting in social mix of the indigenous Bini, and migrant Yoruba, Ibo, Hausa-Fulani, Urhobo etc.

The second major consequence of the urban growth, relates to the evolution and development of various types of residential sectors. There was a structural and architectural reorganization of residential buildings in the built-up part of the city, specifically the precolonial city centre. In the 1920s, the traditional architectural design of the residential buildings in the traditional city centre began to lose its value as many of them were replaced with more upgrade design suited for nuclear family. At the peripheral sector of the city, modern designed residential dwellings were being put in place and basically such dwellings accommodated migrants from other part of the country. Today, Benin City has emerged as fast sprawling urban centre with complex sociocultural and built environment compositions.

4.2. Sampling Procedure

This study is based on a multi-level sampling approach. Thus, Benin City was divided into two broad spatial units (the core unit and the suburban unit). The complexity of land use structure (mixed land use) makes it impossible to stratify the area using land use criterion. The core unit is defined as the area within the inner most ancient Benin moats and walls (considered as the first layer of residential clustering). The adjoining built-up areas that spread in concentric manner around the core axis define the suburban unit. Based on the fact that the study area is sprouting radially from the CBD towards the four corners of the city and along the trunk corridor roads, the suburban unit was further stratified into four sectors (**Figure 1**). Overall, the sectors are: Aduwawa-Oregbeni; Ugbowo-Siluko; Ekehuan-Airport road; Sokponba-Sapele road and the core sector. The delineation was done with the reference gridlines of the map of Benin City. Particularly, these lines are the most centralized vertical and horizontal gridlines which intersect at the king square or core axis. The stratification is done in such a way that the eight trunk corridor roads connecting the four corners of the suburban unit from the core area were distributed evenly among the four suburban sectors. The objective of this stratification is to ensure that the sample population is as homogenous as possible with respect to socioeconomic and sociocultural characteristics.

The second level involves the further stratification of these five residential sectors into strata of neighbourhoods. In the third level, two neighbourhoods were randomly selected from each of the five sectors. Based on this, ten neighbourhoods were drawn from the study area. The fourth level includes the further stratification of the selected neighbourhoods in each sector into transverses

(streets). The fifth level entail that 1 transverse was randomly drawn from each selected neighbourhoods in each residential sector. Therefore, 10 selected sample locations were identified in the study area as sampling sites. Among each selected transverses, one in every 10 residential buildings was systematically selected and relevant information was collected with questionnaire on the heads of household in the residential building.

4.3. Data Collection

The data for this study were collected through a cross sectional survey design from heads of household in the study area. Data pertaining to this study was gathered with the aid of 1100 questionnaire forms (see **Appendix 1**) from selected heads of household. The categorization was done in such a way that 110 questionnaires were systematically administered in each sample location in the various sectors. The questionnaire was designed to gather information about the respondent's socioeconomic status, sociocultural stand, neighbourhood settings, accessibility and residential location choice. The survey composed of 1100 questionnaires returned with 98 percent success rate (i.e. 1078 questionnaires were used for the analysis). These include those retrieved from respondents and those considered valid. The names and definitions of the variables extracted from the questionnaire forms are shown in **Table 1**.

4.4. Model Specification

In this empirical analysis, each sampled household were presented with 5 discrete alternatives-whether to reside in sector I, II, III, IV or V. The 5 geographic sectors include the urban core centre (inner layer) and the periphery (outer layer) consisting of 4 sectorial demarcations (Adwawa-Oregbeni, Ugbo-wo-Siluko, Ekehuan-Airport Road, Sokponba-Sapele Road). The probability that a household chooses any of the alternatives is the estimated probability that the utility of that alternative is higher than the utility of the other 4 alternatives. The multinomial logit (MNL) model is the most frequently and universally adopted model to explain such kind of discrete choice situation (e.g. Bayoh et al., 2006; Zolfaghari et al., 2012; McFadden, 1978). This type of regression model examines the influence of various factors on unordered categorical outcome by estimating the probability of the event's occurrence. This is done by examining the relationship between one or more independent variables and the log odds of the categorical outcome by calculating changes in the log odds of the dependent as opposed to the dependent variable itself.

The multinomial logit model assumes a linear relationship between the logit of the independent variables and the dependent variables. The multinomial logit model is a technique that basically fits multiple logistic regressions on a multi-category unordered response variable that has been dummy coded. This model was preferred because it tends to (as found out by Bhat & Pulugurta's, 1998) outperform ordered response models (such as ordered logit or probit models).

Table 1. Variable names and definitions of variables used in the choice models.

Variables	Description
<i>Socioeconomic:</i>	<i>Description</i>
1. Gender	0 = male; 1 = female (nominal variable)
2. Age of respondent	1 = below 20; 2 = 21 - 40; 3 = 41 - 60; 4 = above 61 (ordinal variable)
3. Household size	Continuous variable
4. *Household income	1 = below ₦50,000; 2 = ₦50,000 - 69,000; 3 = ₦70,000 - 99,000; 4 = ₦100,000 and above per month (ordinal variable)
5. Number of cars per-household	Continuous variable
6. Type of job	1 = Farmer; 2 = trader; 3 = civil servant; 4 = cooperate worker; 5 = applicant (nominal variable)
7. Education	1 = no formal education; 2 = primary education; 3 = secondary education; 4 = tertiary education (ordinal variable)
8. Origin	0 = migrant; 1 = indigene (nominal variable)
<i>Determinants of Residential Choice District:</i>	<i>Nominal Variable</i>
9. Sociocultural	1 = Proximity to relatives 2 = Proximity to hometown/ village of origin
10. Neighbourhood settings	3 = Safety and security 4 = Good road network 5 = Clean and well-planned
11. Accessibility	6 = Proximity to workplace 7 = Access to good school 8 = Proximity to place of worship 9 = Access to vacant land 10 = Access to cheap accommodation
12. **Residential districts	1 = Aduwawa-Oregbeni sector 2 = Ugbowo-Siluko sector 3 = Ekehuan-Airport road sector 4 = Sakpoba-Sapele road sector 5 = Core region sector

*Currently ₦1.00 is approximately equal to \$0.0028; **Categorical dependent variable.

The general formulation of the sector-wise multinomial logit model is shown as:

$$\log \frac{\Pr(Y = j)}{\Pr(Y = j')} = \alpha + \beta_1 X_1 + \beta_2 X_2 + \cdots \beta_k X_k \quad (1)$$

where: j is the identified residential sectors and j' is the reference residential sector. The model of choice behaviour between five residential sectors can be represented using four logit models.

$$\left. \begin{aligned} \log \frac{\Pr(Y = \text{sector I})}{\Pr(Y = \text{sector V})} &= \alpha + \beta_1 X_1 + \beta_2 X_2 + \cdots \beta_k X_k \\ \log \frac{\Pr(Y = \text{sector II})}{\Pr(Y = \text{sector V})} &= \alpha + \beta_1 X_1 + \beta_2 X_2 + \cdots \beta_k X_k \\ \log \frac{\Pr(Y = \text{sector III})}{\Pr(Y = \text{sector V})} &= \alpha + \beta_1 X_1 + \beta_2 X_2 + \cdots \beta_k X_k \\ \log \frac{\Pr(Y = \text{sector IV})}{\Pr(Y = \text{sector V})} &= \alpha + \beta_1 X_1 + \beta_2 X_2 + \cdots \beta_k X_k \end{aligned} \right\} \quad (2)$$

where:

Sector I is Aduwawa-Oregbeni road

Sector II is Ugbowo-Siluko road

Sector III is Ekenhuan-Airport road

Sector IV is Sokponba-Sapele road

Sector V is Urban core centre

Equation (2) provides 4 estimates for the effect that each explanatory variable has on the categorical dependent variable. This is useful information as the effect of the explanatory variables (X_k) can be assessed for each logit model (i.e., the effect of X_1 on the choice between sector I and V and the effect of X_1 on the choice between sector II and V etc.) and also for the model as a whole (i.e., the effect of X_1 across all sectors in the sample). The model allows the effects of the explanatory variables to be assessed across all the logit models and provides estimates of the overall significance (i.e., for all comparisons rather than each individual comparison). The variables for the choice model are defined in **Table 1**.

4.5. Descriptive Analysis

Explanation in this section is carried out in relation to the residential sectors. The home-based interview survey data shows that the core area as a residential sector holds the highest proportion of low income earners (less than ₦50,000 per month) among other residential sectors. While the Ekehuan-Airport road sector holds the highest proportion of high income earners (over ₦100,000 per month). **Table 2** shows that good road network, closeness to place of work, safety and security are crucial determinant factors for choosing to reside in the core region. This is shown in the larger percentages (51.9%, 67.3% and 69.2% respectively) of respondents residing in the core sector choosing yes for these variables as factors influencing their location decision in the survey. In Sokponba-Sapele road sector, 68% choose to reside there because accommodation is relatively cheap. In Ekehuan-Airport road residential sector, good road network, safety and security, clean and well-planned area were indicated by 61.2%, 57.1% and 55.1% of the residents as the major reasons why they chose to live there. Closeness to place of work, safety and security are also major determinant factors that attract people to live in the Ugbowo-Siluko road sector. These were indicated by 71.4% and 61.2% of the residents in these areas respectively as the reasons that attracted

Table 2. Distribution of respondents by residential location factors and the residential sectors.

Variable	Response category	Residential sector				
		Aduwawa-Oregbeni sector	Ugbowo-Siluko sector	Ekehuan-Airport road sector	Sokponba-Sapele road sector	Core sector
		(%)	(%)	(%)	(%)	(%)
Household income	<50,000	55.3	44.9	28.6	43.6	59.6
	50,000 - 69,000	17.0	22.4	18.4	29.2	34.6
	70,000 - 99,000	21.3	22.4	16.3	18.6	1.9
	>100,000	6.4	10.2	36.7	8.3	3.8
Close to relatives	Yes	38.3	26.	6.1	16.7	44.2
	No	61.7	73.5	93.9	83.3	55.8
Ease of access to home town/village of origin	Yes	57.4	8.2	2.0	12.5	3.8
	No	42.6	91.8	98.0	87.5	96.2
Safety and security	Yes	38.3	61.2	57.1	18.8	69.2
	No	61.7	38.8	42.9	81.4	30.8
Good road network	Yes	19.1	16.3	61.2	6.3	51.9
	No	80.9	83.7	38.8	93.7	48.1
Close to place of work	Yes	55.3	71.4	46.9	43.8	67.3
	No	44.7	28.6	53.1	56.2	32.7
Access to good children school	Yes	14.9	18.4	28.6	6.3	23.1
	No	85.1	81.6	71.4	93.7	76.9
Close to place of worship	Yes	12.8	14.3	22.4	4.2	32.7
	No	87.2	85.7	77.6	95.8	67.3
Vacant land	Yes	10.6	22.4	16.3	35.4	0.0
	No	89.4	77.6	83.7	64.6	100.0
Access to cheap accommodation	Yes	23.4	32.7	8.2	68.8	28.8
	No	76.6	67.3	91.8	31.2	71.2
Clean and well-planned area	Yes	0.0	12.2	55.1	0.0	5.8
	No	100	87.8	44.9	100.0	94.2

them to the areas. **Table 2** also shows that people choose to live in the Aduwawa-Oregbeni sector to have easy access to their home town or village of origin (57% of the residents in the district).

5. Empirical Results

5.1. Determinants of Household Residential Location Choice

Factor analysis was calculated to ascertain the significant factors that makes people choose where to reside. There are 12 variables that were entered into the

factor analysis; the basic reason for carrying out this procedure is to empirically extract the most prominent determinants of household choice of residential location in the study area. The eigenvalue statistic prescribes that three components should be retained since they have eigenvalues greater than one. The fourth factor explained less than 8 percent of the variability in the data set. **Table 3** shows the eigenvalues for all 12 variables. Only factors 1 to 3 have eigenvalues greater than one and therefore was extracted. They not only have eigenvalues greater than one but also collectively explained about 45 percent of variability in the data set.

Table 4 shows the rotated component matrix for the three retained factors. In order to highlight the significant factors of household residential choice in the study area, only component loadings with absolute values of equal to or higher than 0.2 are shown. The values in bold font are factors with high loadings. Factor analysis was able to identify the prominent and most significant determinants of household choice of residential preference in Benin City. Among the group of variables entered into factor analysis, socioeconomic variables such as household income and household size does not seem to significantly influence the location where people choose to live. The result shows that factor 1 is positively associated with the variables of accessibility and neighbourhood settings. This is because it loads high on good road network, closeness to place of work, access to good children school, closeness to place of worship. Safety and security exhibit significant but low factor loadings.

Factor 1 seems to represent such residential area found in the core axis where residents perceived as safe and secured with good road network and close to work place. It also represents residential areas in Ekehuan-Airport road sector which residents perceived as relatively secured and characterized with good road network. The highest factor loading of 0.644 in component factor 1 is reflected in close to work place as a choice of residential location and this character depicts the core region and the Ugbowo area. According to the evidence from the home-based survey, these are the sectors where majority of the respondents claimed to reside in because it is close to their place of employment. Factor 2 is positively associated with variables related to neighbourhood structure. These include neighbourhood safety, good road structure, clean and well-planned environment. Factor 2 load high on these determinants of household residential choice and to a lesser extent, access to good children school. Factor 2 therefore represents the Sokponba-Sapele road sector most especially the G.R.A. residential zone. The people that reside here are particularly attracted by the neighbourhood settings.

Factor 3 is positively associated with both the variables of sociocultural and accessibility as determinants of household choice of residential location. This component factor loads high on such choice as closeness to relatives, ease of access to hometown/village of origin and access to cheap accommodation and to a lesser extent, access to vacant land. Factor 3 is found in the Aduwawa-Oregbeni

Table 3. Eigenvalue of retained components.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.387	19.895	19.895	2.387	19.895	19.895	2.035	16.962	16.962
2	1.526	12.719	32.615	1.526	12.719	32.615	1.779	14.821	31.784
3	1.434	11.949	44.563	1.434	11.949	44.563	1.534	12.780	44.563
4	0.958	7.986	52.549						
5	0.893	7.445	59.994						
6	0.843	7.028	67.022						
7	0.809	6.744	73.766						
8	0.781	6.506	80.272						
9	0.708	5.897	86.169						
10	0.676	5.631	91.800						
11	0.552	4.596	96.396						
12	0.432	3.604	100.000						

Extraction method: Principal component analysis.

Table 4. Rotated component matrix from factor analysis.

Variables	Component factors		
	1	2	3
Household size			
Household income			
Close to relatives			0.527
Ease of access to home town/village			0.676
Safety and security	0.327	0.683	
Good road network	0.573	0.551	
Close to place of work	0.644		
Access to good children school	0.513	0.267	
Close to place of worship	0.514		
Vacant land			0.376
Access to cheap accommodation			0.524
Clean and well-planned area		0.669	

Extraction method: Principal component analysis. Rotation method: Varimax with Kaiser Normalization. Note: Component loadings with absolute values less than 0.2 are not shown.

sector and the Sokponba axis of the Sokponba-Sapele road sector. The result shows that a significant proportion of the respondents residing in the Aduwawa-Oregbeni sector preferred the location so as to be close to their relatives and easy or quick access to their village of origin, while those in Sokponba axis live here because of cheap accommodation.

5.2. Sector-Wise Logit Model of Household Residential Location Choice

A multinomial logit model was estimated to empirically explore the effect of the explanatory variables on people's choice of residential location. The goodness of fit statistics which presents two tests for the model show that the model adequately fit the data. Since the Pearson and Deviance statistics both have values for chi-square (634.097 and 280.374 respectively) and degree of freedom (804) and the significance (Sig.) values greater than 0.05 it is evident that the model fit the data. **Table 5** shows the likelihood ratio test of the model. The chi-square statistic is the difference between the -2 log-likelihoods of the Null and Final models. The Table reveals that the *chi-square statistic* = 505.194, *degree of freedom* (*df*) = 168 and the significance (*p*) *value* = 0.000. This indicates generally, that the model is statistically significant since $p < 0.05$.

The model's parameter estimate was interpreted in such a way that it summarizes the individual effect of the predictors. However, for the purpose of clarity in the presentation of the models result, the parameter estimate is explained specifically by residential sector and only the statistically significant parameters were explained. The model used the various residential sectors as the categorical dependent variable. The results of the analysis are presented in **Tables 6-9**.

Table 6 shows that the negative coefficient represented by (*B*) beta decreases the likelihood of that response category with respect to the reference category. In the same manner, positive coefficient increases the likelihood of selecting that category. The model's result reveals that the gender variable, male category, significantly increases the likelihood of choosing the Aduwawa-Oregbeni sector as a place of residence. Hence, there is high probability that the male-headed household (especially the Bachelors) will prefer to live in this sector. In addition, ease of access to hometown/village of origin—a variable under the sociocultural group significantly increases the likelihood of selecting the Aduwawa-Oregbeni residential sector.

Table 5. Model fitting information.

Model	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood	Chi-Square	Df	Sig.
Intercept Only	786.955			
Final	281.761	505.194	168	0.000

Table 6. Parameter estimate for Aduwawa-Oregbeni sector.

Residential sector	B	Std. Error	Wald	Df	Sig.	Exp (B)
Intercept	-3.621	1.1494	0.000	1	1.000	
Gender (male)	3.414	1.254	7.408	1	0.006	30.375
Gender (female)				0		
Age (<18 yrs)	35.891	7674.818	0.000	1	0.996	3.86415
Age (18 - 25 yrs)	-0.777	2.580	0.091	1	0.763	0.460
Age (26 - 35 yrs)	-0.992	1.254	0.626	1	0.429	0.371
Age (36 - 45 yrs)	-1.059	1.130	0.877	1	0.349	0.347
Age (>46 yrs)				0		
Household size	9.971	1.1124	0.000	1	0.999	2.1404
Income (<₦50,000)	-1.558	1.938	0.646	1	0.421	0.211
Income (₦50,000 - 69,000)	-2.843	2.082	1.864	1	0.172	0.058
Income (₦70,000 - 90,000)	15.320	594.658	0.001	1	0.979	4.5036
Income (>₦100,000)				0		
No. of cars own (0)	-20.527	1970.434	0.000	1	0.992	1.2169
No. of cars own (1)	-20.524	1970.434	0.000	1	0.992	1.2219
No. of cars own (2)	-21.256	1970.435	0.000	1	0.991	5.87110
No. of cars own (3)				0		
Job type (farmer)	30.550	2496.256	0.000	1	0.990	1.85313
Job type (trader)	16.446	2099.355	0.000	1	0.994	1.3887
Job type (civil servant)	18.196	2099.355	0.000	1	0.993	7.9887
Job type (cooperate worker)	18.056	2099.355	0.000	1	0.993	6.9467
Job type (applicant)				0		
Level education (no formal)	-1.899	1.943	0.956	1	0.328	0.150
Level education (primary)	-3.978	2.188	3.306	1	0.069	0.019
Level education (secondary)	-1.844	1.273	2.098	1	0.147	0.158
Level education (tertiary)				0		
Origin (migrant)	-0.752	0.967	0.605	1	0.437	0.471
Origin (indigene)				0		
Close to relatives (yes)	-0.274	0.935	0.086	1	0.769	0.760
Access to hometown (yes)	5.036	1.683	8.957	1	0.003	153.787
Safety and security (yes)	-2.472	1.052	5.525	1	0.019	0.084
Good road network (yes)	-2.037	1.037	3.858	1	0.050	0.130
Place of work (yes)	-1.197	1.026	1.360	1	0.244	0.302
Children school (yes)	-2.322	1.356	2.932	1	0.087	0.098
Place of worship (yes)	-0.048	1.232	0.002	1	0.969	0.953
Vacant land (yes)	12.193	640.650	0.000	1	0.985	1.9745
Cheap accommodation (yes)	-0.419	1.017	0.170	1	0.681	0.658
Well-planned area (yes)	-17.196	934.225	0.000	1	0.985	3.4038

Significant parameters at 0.05 are in bold. The core sector is the reference category.

This means that households prefer to reside in this area basically because they desire to be close to their place of origin. The parameter estimate shows that neighbourhood safety and security and access to good road network as variables grouped under neighbourhood settings significantly decrease the likelihood of choosing to live in this area. Based on this, it is likely that good road network and safety of neighbourhood is not a significant prerequisite when making choice of residential location in the Aduwawa-Oregbeni sector.

The parameter estimates of the model pertaining to Ugbowo-Siluko road sector revealed that lower level of education (primary and secondary) decreases the likelihood of choosing the Ugbowo-Siluko road area as place of residence. This result is not unexpected because the presence of the University of Benin probably may show strong influence on the educational level of the people living there. **Table 7** shows that the factors such as safety and security and closeness to work place returned positive coefficient values (2.019 and 2.984 respectively). Hence, they significantly increase the probability of choosing this sector as residential location. Good road network on the other hand reduces the likelihood of selecting this area as residential location. This, as shown by **Table 7** returned negative *B value* of 3.106.

The parameter estimates for Ekehuan-Airport road residential sector (**Table 8**) shows that age ranging from 18 to 45 years increases the likelihood of selecting this residential sector. This means that the people within this age bracket prefer to live in the Ekehuan-Airport road residential area. The analysis indicates that low income households (ranging from <₦50,000 to ₦69,000) reduce the probability of choosing to reside in this area. By implication, low income households prefer to live elsewhere, perhaps because accommodation is expensive in this location. However, the neighbourhood settings show strong influence in the choice of residents of this area. Such factors of household residential location preference as safety and security; clean and well-planned environment increases the probability of choosing this residential sector. Contrarily, accessibility variables such as closeness to place of work, access to good children school and access to cheap accommodation decreases the likelihood of choosing to reside in the Ekehuan-Airport road sector.

Table 9 indicates that like the Ekehuan-Airport road sector, low income households (ranging from <₦50,000 to ₦69,000) decreases the likelihood of choosing to live in the Sokponba-Sapele road sector. This is probably influenced by the G.R.A. which extended into this area, especially at the Etete axis along Sapele road where majority of the residents are high income earners. In addition, low level of education also decreases the probability of selecting this sector for residential purposes. Safety and security, good road network and access to cheap accommodation increases the probability of choosing Sokponba-Sapele road sector as area of residence. Access to cheap accommodation in this area may have been strongly influenced by part of Sokponba road in this sector, which generally is a slum area.

Table 7. Parameter estimate for Ugbowo-Siluko road sector.

Residential sector	B	Std. Error	Wald	Df	Sig.	Exp (B)
Intercept	14.595	9968.541	0.000	1	0.999	
Gender (male)	1.645	1.015	2.626	1	0.105	5.183
Gender (female)				0		
Age (<18 yrs)	1.506	0.000		1		4.509
Age (18 - 25 yrs)	-1.037	2.201	0.222	1	0.637	0.354
Age (26 - 35 yrs)	-1.063	1.264	0.707	1	0.401	0.345
Age (36 - 45 yrs)	0.273	1.075	0.065	1	0.799	1.314
Age (>46 yrs)				0		
Household size	-2.851	9102.385	0.000	1	1.000	0.058
Income (<₦50,000)	-2.280	1.695	1.809	1	0.179	0.102
Income (₦50,000 - 69,000)	-3.482	1.787	3.796	1	0.051	0.031
Income (₦70,000 - 90,000)	14.224	594.658	0.001	1	0.981	1.5056
Income (>₦100,000)				0		
No. of cars own (0)	-7.624	4064.278	0.000	1	0.999	0.000
No. of cars own (1)	-6.091	4064.278	0.000	1	0.999	0.002
No. of cars own (2)	-7.348	4064.279	0.000	1	0.999	0.001
No. of cars own (3)				0		
Job type (farmer)	18.592	1350.557	0.000	1	0.989	1.1878
Job type (trader)	3.757	2.003	3.516	1	0.061	42.813
Job type (civil servant)	2.398	1.999	1.438	1	0.230	11.000
Job type (cooperate worker)	0.862	2.071	0.173	1	0.677	2.367
Job type (applicant)				0		
Level education (no formal)	-22.075	1009.295	0.000	1	0.983	2.58910
Level education (primary)	-6.435	2.117	9.245	1	0.002	0.002
Level education (secondary)	-3.271	1.185	7.615	1	0.006	0.038
Level education (tertiary)				0		
Origin (migrant)	-0.048	0.933	0.003	1	0.959	0.953
Origin (indigene)				0		
Close to relatives (yes)	-0.107	0.901	0.014	1	0.905	0.898
Access to hometown (yes)	0.355	1.872	0.036	1	0.850	1.426
Safety and security (yes)	2.019	1.015	3.955	1	0.047	0.133
Good road network (yes)	-3.106	1.119	7.708	1	0.005	0.045
Place of work (yes)	2.984	1.020	8.563	1	0.003	0.051
Children school (yes)	-0.763	1.267	0.363	1	0.547	0.466
Place of worship (yes)	-0.253	1.129	0.050	1	0.823	0.776
Vacant land (yes)	15.810	640.648	0.001	1	0.980	7.3496
Cheap accommodation (yes)	-1.078	1.023	1.111	1	0.292	0.340
Well-planned area (yes)	-0.885	1.586	0.311	1	0.577	0.413

Significant parameters at 0.05 are in bold. The core sector is the reference category.

Table 8. Parameter estimate for Ekehuan-Airport road sector.

Residential sector	B	Std. Error	Wald	Df	Sig.	Exp (B)
Intercept	33.388	1.2774	0.000	1	0.998	
Gender (male)	-0.151	1.399	0.012	1	0.914	0.860
Gender (female)				0		
Age (<18 yrs)	10.557	0.000		1		3.8434
Age (18 - 25 yrs)	5.485	2.798	3.843	1	0.050	240.955
Age (26 - 35 yrs)	5.131	1.946	6.949	1	0.008	169.109
Age (36 - 45 yrs)	5.351	1.953	7.504	1	0.006	210.749
Age (>46 yrs)				0		
Household size	4.514	1.2624	0.000	1	1.000	91.288
Income (<N50,000)	-3.911	2.145	3.326	1	0.049	0.020
Income (N50,000 - 69,000)	-9.497	2.817	11.369	1	0.001	7.5115
Income (N70,000 - 90,000)	11.894	594.659	0.000	1	0.984	1.4655
Income (>N100,000)				0		
No. of cars own (0)	-35.732	1970.461	0.000	1	0.986	3.03216
No. of cars own (1)	-32.849	1970.460	0.000	1	0.987	5.42015
No. of cars own (2)	-31.732	1970.460	0.000	1	0.987	1.65614
No. of cars own (3)				0		
Job type (farmer)	26.032	1350.564	0.000	1	0.985	2.02211
Job type (trader)	2.935	2.853	1.059	1	0.304	18.823
Job type (civil servant)	0.867	2.944	0.087	1	0.769	2.379
Job type (cooperate worker)	-4.889	3.545	1.902	1	0.168	0.008
Job type (applicant)				0		
Level education (no formal)	-20.365	928.516	0.000	1	0.983	1.4319
Level education (primary)	-9.928	3.074	10.428	1	0.001	4.8815
Level education (secondary)	-6.018	2.024	8.842	1	0.003	0.002
Level education (tertiary)				0		
Origin (migrant)	1.301	1.507	0.746	1	0.388	3.675
Origin (indigene)				0		
Close to relatives (yes)	-5.176	2.184	5.617	1	0.018	0.006
Access to hometown (yes)	-4.544	3.353	1.837	1	0.175	0.011
Safety and security (yes)	6.888	1.738	15.718	1	0.000	0.001
Good road network (yes)	2.464	1.680	2.152	1	0.142	11.757
Place of work (yes)	-3.137	1.451	4.671	1	0.031	0.043
Children school (yes)	-4.778	2.119	5.085	1	0.024	0.008
Place of worship (yes)	0.834	1.518	0.302	1	0.583	2.302
Vacant of land (yes)	17.345	640.650	0.001	1	0.978	3.4097
Cheap accommodation (yes)	-4.381	1.745	6.301	1	0.012	0.013
Well-planned area (yes)	3.734	1.749	4.559	1	0.033	41.844

Significant parameters at 0.05 are in bold. The core sector is the reference category.

Table 9. Parameter estimate for Sokponba-Sapele road sector.

Residential sector	B	Std. Error	Wald	Df	Sig.	Exp (B)
Intercept	-20.724	1.1654	0.000	1	0.999	
Gender (male)	2.025	1.217	2.770	1	0.096	7.576
Gender (female)				0		
Age (<18 yrs)	21.072	0.000	0.000	1	0.455	1.4179
Age (18 - 25 yrs)	2.146	2.465	0.758	1	0.384	8.555
Age (26 - 35 yrs)	-1.664	1.397	1.419	1	0.233	0.189
Age (36 - 45 yrs)	-0.473	1.193	0.157	1	0.692	0.623
Age (>46 yrs)				0		
Household size	12.254	1.1064	0.000	1	0.999	2.0975
Income (<₦50,000)	-3.806	1.959	3.773	1	0.050	0.022
Income (₦50,000 - 69,000)	-4.650	2.086	4.967	1	0.026	0.010
Income (₦70,000 - 90,000)	13.624	594.658	0.001	1	0.982	8.2605
Income (>₦100,000)				0		
No. of cars own (0)	-7.090	3227.159	0.000	1	0.998	0.001
No. of cars own (1)	-6.774	3227.159	0.000	1	0.998	0.001
No. of cars own (2)	-8.248	3227.159	0.000	1	0.998	0.000
No. of cars own (3)				0		
Job type (farmer)	34.117	2152.137	0.000	1	0.987	6.55914
Job type (trader)	19.963	1675.617	0.000	1	0.990	4.6788
Job type (civil servant)	19.343	1675.617	0.000	1	0.991	2.5148
Job type (cooperate worker)	19.076	1675.617	0.000	1	0.991	1.9258
Job type (applicant)				0		
Level education (no formal)	-4.559	2.020	5.094	1	0.024	0.010
Level education (primary)	-5.475	2.273	5.801	1	0.016	0.004
Level education (secondary)	-2.083	1.290	2.606	1	0.106	0.125
Level education (tertiary)				0		
Origin (migrant)	-0.324	1.007	0.103	1	0.748	0.723
Origin (indigene)				0		
Close to relatives (yes)	-1.572	0.998	2.480	1	0.115	0.208
Access to hometown (yes)	1.515	1.916	0.625	1	0.429	4.547
Safety and security (yes)	3.814	1.095	12.133	1	0.000	0.022
Good road network (yes)	3.804	1.360	7.819	1	0.005	0.022
Place of work (yes)	0.327	1.049	0.097	1	0.755	1.387
Children school (yes)	-1.623	1.448	1.257	1	0.262	0.197
Place of worship (yes)	-1.800	1.419	1.610	1	0.204	0.165
Vacant land (yes)	18.524	640.649	0.001	1	0.977	1.1098
Cheap accommodation (yes)	2.109	1.054	4.003	1	0.045	8.237
Well-planned area (yes)	-15.572	959.321	0.000	1	0.987	1.7277

Significant parameters at 0.05 are in bold. The core sector is the reference category.

5.3. Discussions

The study has shown empirically that Benin City exhibits a very distinct character pertaining to the residential location choice of the people living in the area. Overall, it was discovered that the core area as residential sector holds the highest proportion of low income class when compared to other residential sectors in the study area. On the other hand, high income class is concentrated more on the Ekehuan-Airport road residential sector. This area is often loosely referred to as the G.R.A. extension because it is composed of modern building structures and located contiguously to the G.R.A. especially the Airport road axis. This household residential stratification by income class is relatively well documented by recent literature in the field of urban geography. For instance, Bayoh *et al.* (2006) found out that more affluent household relocate from the city centre to suburban areas perhaps due to an increase in income status (Margo, 1992) or to separate themselves from the lower income household (South & Crowder, 1997). Basically, this finding reveals that socioeconomic view of household residential choice model plays prominent role in the residential sorting of the region.

As expected, it was found that indigenes are more concentrated within the core region than anywhere else in the metropolis, while Ekenhuan-Airport road residential sector possess the highest concentration of migrants. In addition, the analysis revealed that most migrants prefer to live in the outer-most part of the metropolis especially the direction leading to their hometown or village of origin so as to be nearer or have easy access to their hometown. This character is peculiar to the Aduwawa-Oregbeni residential sector. This pattern corroborates the findings of Ozo (1986). It therefore confirms that this sociocultural sorting pattern still strongly exist in the metropolis till date. This finding confirms and reflects the uniqueness of African cultural ties. This can be deduced on the one hand, from the character of the indigenes (Bini) of the region who are not willing to give up their family land (residence) or reside farther away from their natural source. On the other hand, the migrants who had to detach from their initial cultural ties and origin seek out new location in the city based upon the ease of accessibility to their hometown.

A major finding is the identification and categorization of the significant factors of household residential location preference for the metropolis. The result of factor analysis revealed that sociocultural factors (such as closeness to relative, ease of access to hometown or village of origin); structure of the neighbourhood factors (such as safety and security, good road network, clean and well-planned environment) and accessibility factors (such as proximity to place of work, access to good children school, proximity to place of worship, access to vacant land and access to cheap accommodation) are statistically significant and prominent determinants of residential location preference of Benin City. In the Western and European models, these factors are somewhat prevalent, except sociocultural factors which seem to be strongly rooted in Africa owing to the value attached to ethnic and kinship affiliation.

The residents of the core sector perceived the area as safe and secure with good road network and structure and close to their place of work. The choice of location among the residents of the core sector, Ekenhuan-Airport road sector and Sokponba-Sapele road sector is largely influence by neighbourhood settings. Key findings based on the model's estimation of the residential location preference with respect to the residential sectors show that in the Aduwawa-Oregbeni sector, sociocultural factor (ease of access to hometown) is the most important determinant of household's residential location preference, confirming the result of the factor analysis. In the Ugbowo-Siluko road sector, security and nearness to place of work are paramount determinants of choosing where to reside and those that prefer to live here are most likely to be educated above secondary level. Education in this sector is largely influence by presence of University of Benin, University Teaching Hospital and a college of education in a nearby community. In the Ekehuan-Airport road residential sector, low income households are discouraged from choosing to live here and younger household heads who prefer neater, well-laid out environments and are security cautious are steadily drawn to this area. The influence of the G.R.A. especially at the Etete axis along Sapele road came to play in the choice of households residing there. It was also discovered that like the Ekenhuan-Airport road sector, the Sokponba-Sapele road sector (Etete area) discourages low income households and attracts households with strong desire for safety and good road network. The Sokponba area on the other hand, attracts households that prefer cheap accommodation.

6. Conclusion

This study used multidimensional approach to identify and model the determinants of households' residential location choice in an African city. This approach involves the incorporation of wide range factors of residential location highlighted in literature into robust analytical techniques. These factors are grouped into socioeconomic, sociocultural, neighbourhood settings and accessibility. In addition, the study was able to identify the prominent factors that motivate households to seek out where to live within the city. It was also possible to determine or investigate whether there is homogeneity in the preferences of the residential sectors pertaining to where to reside.

Factor analysis was used to extract the significant factors that motivate households to choose certain location over another. Determinants under the sociocultural, neighbourhood settings and accessibility were extracted as significant components of residential location choice in the study area. However, sector-wise logit model was used to estimate the effect of the predictors on residential location choice.

This study has demonstrated with the use of multidimensional variables in a sector-wise model that broad generalization of the determinants of household's residential choice in Benin City cannot be done. The patterns of household choices are distinct across sectors. In other words, each residential sector has its

unique set of determinants and so, households sort themselves according to their own individual preference. Based on the findings of the study, it is therefore concluded that in the study area there is a strong tie between existing social infrastructures, socioeconomic status and the choice of where to reside. These findings will perhaps aid urban planning and policy-making because it provides the knowledge that will help predict the dynamics in the urban environment and help determine how the urban landscape is shaped over time.

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Appendix 1

Department of Geography and Regional Planning, Faculty of Social Sciences,
University of Benin, Benin City, Nigeria.

Questionnaire

Dear Respondent,

I am a postgraduate student carrying in out a research work in the above Department and University. The study in on residential location choice within Benin Metropolitan Area.

Kindly provide the information requested. The information will be treated confidentially.

Thank you for your attention.

Section A: General

Please tick (✓) where applicable or provide an appropriate answer to the question.

1. Sex:

(a) Male () (b) Female ()

2. Age of respondent:

(a) below 18 yrs () (b) 18 - 25 yrs () (c) 26 - 35 yrs ()

(d) 36 - 45 yrs () (e) 46 yrs and above ()

3. Marital status:

(a) Single () (b) Married () (c) Divorced ()

(d) Widow or widower () (e) Separated ()

4. Level of education

(a) No formal education () (b) Primary education ()

(c) Secondary education () (d) Tertiary education ()

5. Occupation of respondent:

(a) farmer () (b) trader () (c) civil servant ()

(d) corporate worker () (e) applicant ()

(f) others specify.....

Section B: Determinants of Residential Choice District

6. Residential location/Address:.....

7. Employment location/Address:.....

8. What is the size of your household?

(a) less than 3 () (b) 3 - 6 () (c) 7 - 10 ()

(d) 11 - 14 () (e) 15 and above ()

9. How much does your household earn per month?

(a) below 50,000 () (b) 50,000 - 69,000 ()

(c) 70,000 - 99,000 () (d) 100,000 and above ()

10. Do you have any car in your household?

(a) Yes () (b) No ()

11. If yes, how many cars does your household have?
(a) 1 () (b) 2 () (c) 3 ()
(d) 4 () (e) 5 and above ()
12. Are you Bini by tribe?
(a) Yes () (b) No ()
13. If No, please state your tribe.....
14. How long have you resided in this your present location?
(a) less than 1 yr () (b) 1 - 5 yrs () (c) 6 - 11 yrs
(d) 12 - 16 yrs () (e) 17 - 21 yrs () (f) 22 yrs and above ()
15. Please state your previous area of residence.....
16. Among the factors (reasons) listed below, identify the major one(s) that you considered before choosing the area to reside:
(a) Close to relative or friends ()
(b) Close to hometown or village of origin ()
(c) Safety and security ()
(d) Good road network ()
(e) Clean and well-planned area ()
(f) Close to place of work ()
(g) Close to good children's school ()
(h) Close to place of worship ()
(i) Access to vacant land ()
(j) Access to cheap accommodation ()
(k) Others specify.....
17. Please state the reasons why you chose to relocate to your present area of residence:.....

Thank you for your co-operation