MASTERS RESEARCH

An Analysis of Housing Quality in South Africa: Former vs non-Former Homeland Areas

A Research Report submitted in partial fulfilment of the Degree of

Master of Commerce (Economics/Economic Science)

in the School of Economic and Business Sciences,

University of the Witwatersrand

by

Victor Sithole

Student No: 479523

Supervised by **Professor Prudence Magejo**

Word Count: 10 442

Date: 27 October 2020

Acknowledgements

To my mother Khethiwe Sithole, with love.

Abstract

This study estimates differentials in housing quality between former and non-former homelands areas in South Africa. Using the 2011 population census (10% household sample) collapsed by municipal level, the paper uses an ordinary least squares (OLS) regression to assess the magnitude and patterns of differentials of housing quality between the two areas. Results reveal that former homeland areas face more housing quality deficiencies compared to non-former homeland areas. When former homeland status is defined as a dummy variable, results show a 0.22%-point difference in housing quality to the disadvantage of former homeland areas. Accounting for municipal characteristics narrows the gap significantly to 0.03% points. The factors that influence housing quality in former homeland areas are municipal compositional differences in race, gender, age, education, income, tenure and urbanisation. The study recommends that policy interventions should be targeted towards improving incomes of the affected groups with more attention directed towards black South Africans and female headed households to address the current housing quality disparities.

Keywords: Housing quality, Former homeland areas, Municipality

1. Introduction

Rapid urbanization coupled with a need to prioritize human welfare has placed housing at the cornerstone of economic development. Despite its global significance, adequate quality housing remains skewed along socio economic status (Bradley and Putnick, 2012; Lejeune, et al., 2016; Statistics New Zealand, 2015; World Health Organization, 2018). Adequate quality housing not only affords privacy to the inhabitants but also improves their health and wellbeing. Gifford and Lacombe (2006) find that children who resided in households with poor physical conditions were more likely to experience challenges in their socio-emotional health. More importantly, the role of housing in fostering economic growth is often understated. When adequately developed, housing can serve as a crucial asset against which households can borrow funds to invest in other activities that stimulate growth.

Within the South African context, the provision of decent housing is at the forefront of development policy. The constitution enshrines the right for all citizens to adequate housing – an issue also reflected in the Housing Act 107 of 1997[1] (Tissington, 2011). The centrality of this issue in the country's transformation agenda stems from the injustices propagated during Apartheid which left many South Africans devoid of decent living conditions. A key policy relevant to this study is the establishment of former homeland areas (Bantustans) undergird by the Groups Areas Act of 1950.[2] This provided for spatial segregation along racial lines. Black South Africans were relegated by their ethnicity into former homeland areas. The apartheid machine created ten homelands that occupied 13% of the total area; the remaining 87% was reserved for the white population (Leibbrandt, et al., 1996). Former homeland areas were located in the periphery of the country and received minimal investment (Seekings, 2010). This engineered spatial inequalities which ensured that the black majority was subject to poor and limited economic resources which had devastating consequences for their economic prospects – including housing.

Following independence in 1994, the post-apartheid government in its quest for social transformation embarked on the Reconstruction and Development Programme (RDP) which initially sought to build one million houses for the poor in a period of 5 years but has since

[1] Refer to Section 2(1) of the Housing Act 107 of 1997 for a more detailed explanation.
[2] The Group Areas Act of 1950 created separate residential and business areas for each race, and members of other races were prohibited from living, operating businesses, or owning land in them. Many blacks, coloureds and Indians were removed from areas classified as "whites only". The areas which black people were relegated to were known as Bantustans.

been extended (see Goebel, 2007). Government has delivered approximately 3 million housing units since 1994 and is set to increase its annual expenditure on housing by 4.4 percent; from R32.2 billion in 2018/19 to R36.7 billion in 2021/22 (National Treasury, 2019). While some progress has been made towards the provision of decent housing, a considerable share of South Africans remain in need of formal housing. In 2010, the housing backlog was over 2.1 million with 13.4 percent of South African households residing in informal dwellings in 2017 with a further 5.5% in traditional dwellings (Statistics South Africa, 2017; Tissington, 2011). In a society recovering from socio-economic injustices stemming from colonialism and apartheid, the provision of quality housing not only improves basic human rights but also aids in narrowing the spatial inequalities that are inherent in South Africa.

Acknowledging the importance of understanding the housing challenges facing the country, some researchers (i.e., Goebel, 2007; Zunguzane, et al., 2012; Govender, et al. 2011) have explored the quality of government provided low-income housing. For instance, Zunguzane (2012) examines the quality of RDP houses in Amathole district of the Eastern Cape Province while Goebel (2007) studies the Msunduzi Municipality in KwaZulu Natal. Although informative, at sub-national levels, these studies are limited in three respects: First, the focus on government provided housing provides an incomplete picture of the state of housing infrastructure in South Africa by omitting non-state provided housing. Second, previous studies' sub-national focus yield results that cannot be generalized to other provinces given the high degree of socio-economic heterogeneity characterising the South African landscape. Third, previous studies do not provide any insights pertaining to spatial differences that exist especially between previously marginalized areas (i.e. former homeland areas) and previously privileged areas (i.e. non-former homeland areas). These limitations call for studies that evaluate spatial differences in housing quality and the corresponding determinants. To fill this gap, this study seeks to answer the following questions:

Q1. Are there differentials in housing quality between former homeland areas and non-former homeland areas, if yes, how large are the differences?

Q2. What are the determinants of housing quality in South Africa's municipalities?

Answers to these questions are important in informing policy on the extent of spatial disparities in housing quality. The focus on former and non-former homeland areas sheds light on the extent of disadvantage that previously marginalised areas face relative to non-previously maginalised areas. An exploration of the determinants of housing quality is also essential for

informing policy in South Africa. To this end, this study computes a housing quality index using the 2011 census 10% sample and Multiple Correspondence Analysis. A housing quality function is estimated by OLS with the aim of identifying the correlates of housing quality in South Africa's municipalities.

The remainder of this research report is structured as follows: Section 2 provides an overview of the literature review and conceptual framework. Section 3 presents the data and methodology; Section 4 describes the data; Section 5 presents and discusses the results whilst section 6 concludes.

2. Literature Review and Analytical Framework

Literature review

There are a few writings exploring how to measure housing quality. Goodman (1978) agrees on the ease of creating one, however, there is no common ground with regards to the indicators or housing characteristics used to construct a meaningful and valid housing index. The existing literature focus on the physical characteristics of the dwelling (see Table 1 for a list of studies). Bradley and Putnick (2012); Arias and Devos (1996) and Gifford and Lacombe (2006) use construction materials, cooking facilities, sanitation facilities amongst others as determinants of housing quality. A few scholars elect to measure housing quality using non-physical characteristics (e.g. rent burden, quality of air). This is rationalised by the fact that housing policy initiatives are not necessarily about the dwelling units themselves, but rather it is more about the welfare of citizens (Goodman (1978) Lejeune, et al. (2016)). A review of the literature in Table 1 confirms the diversity of indicators used to measure housing quality which cover both interior and exterior house features.

There is limited but growing research on housing quality in developing countries, amongst them Rashid, et al. (2016) explores housing quality by constructing a comprehensive quality of housing index using data from Pakistan. The study finds that on average non-poor households in urban relative to those in rural areas have higher housing quality in Pakistan.

Table 1: Summary of previous studies - indicators for housing quality

Study	Region	Estimation Type	Major Statistically significant variables
Developing Country Studies			
(Marais & Cloete, 2014)	South Africa	Logistic regression	Housing quality, Gender, Season, Climate, Subsidy, Tenure
(Moolla, et al., 2011)	South Africa Soweto	Qualitative Study	Roofing, Windows, Doors, Walls, Floors, Number of rooms, Size of house
(Govender, et al., 2011)	South Africa: Cape Town	Qualitative Study	Sanitation, Age, Gender, Educational Status
(Goebel, 2007)	South Africa: KwaZulu Natal	Qualitative Study	Dwelling Type, Energy/Fuel Type, Tenure, Health
(Manomano & Tanga, 2018)	South Africa: Eastern Cape	Qualitative Study	Roofing, Windows, Doors, Walls, Floors, Number of Rooms, Size of House, Spacing of Houses.
(Aigbavboa & Thwala, 2012)	South Africa: Gauteng	Qualitative Study	Good sanitary systems, Clean environment, Adequate hot and cold water, Structure with quality finishes, Free services
(Govender, et al., 2011)	South Africa: Cape Town	Qualitative Study	Sanitation, Age, Gender, Educational Status
Gang & Hall (2006)	Lima, Peru	OLS	Physical sustainability, overcrowding, housing services, extra amenity, tenure, safety, accessibility, housing price
Hendershot (1973)	Manila, Philippines	OLS	Rooms in households, Structural features, Household furnishings, family type
Rashid, et al. (2016)	Pakistan	OLS	Facilities (Location of facilities from the house, frequency of use, perception about quality of services)
Arias and Devos, (1996)	Latin America	OLS	Wall material, floor material, roof material, availability of electricity, type of sewerage and water facilities.
Fiadzo, et al. (2001)	Ghana	OLS & Logistic Regression	Wall material, roofing material, cooking fuel, lighting fuel, main source of drinking water, sewage system, tenure.
Developed Country Studies			
Spain, (1990)	US	OLS	Overcrowding
Rosenbaum (1996)	New York (US)	Logistic Regression	Proximity to abandoned buildings, Housing unit inadequacy, Home ownership
Goodman (1977)	US	OLS	Unit and neighbourhood quality score, overcrowding, financial burden
Zey-Ferrell, et al. (1977)	US	Factor analysis & OLS	Housing condition, plumbing, heating and cooling and the number of persons per bedroom.
Marr & McGready (1997)	Canada	OLS/Probit Regressions	Homeowners, mean value of owned units, mean gross yearly rent, mean crowding ratio, households in units built.
Cook & Bruin (1994)	US	Stepwise Regression	Number of persons per room, percentage of income devoted to housing, satisfaction with housing

Some studies have been concerned about the distribution of housing quality across race and gender dimensions. Rosenbaum's (1996) study on New York found substantial bias against minority groups of Black and Hispanic households who are less likely to occupy high-quality units. These findings are in line with other studies, particularly the works of Meyer (1973) Zey-Ferrell, et al. (1977) and Cook and Bruin (1994). Gender inequalities in housing quality are also flagged as a rising concern. Female headed households continue bearing the burden of low-quality housing, with black women experiencing particularly high levels of housing deprivation. Findings by Marr and McGready (1997) reveal that in Canada, female-headed households are more likely to live in low housing quality conditions with crowded or older living quarters in comparison to their male-headed households. Similar findings were uncovered also for the United States. Female-headed African American and Hispanic households were found to have a high probability of experiencing higher housing expenditure-to-income ratios and were also likely to reside in crowded spaces (Cook and Bruin, 1994).

Within the South African context, there are several studies (e.g. Zunguzane, et al. 2012; Govender, et al. 2011; Goebel, 2007; Moolla et al., 2011; Aigbavboa and Thwala 2012, Manomano and Tanga, 2018). Existing studies offer some insights into the housing conditions at subnational-city-level or municipality level – but do not crystallize the nuances of housing patterns and obstacles on a national scale. For instance, Zunguzane, et al. (2012) explored the factors underpinning housing quality in the township of Wentzel Park in Port Elizabeth in the Eastern Cape province. This study flags incompetent contractors as the root cause to poor housing quality. Govender, et al. (2011) attains similar findings in a study of low-cost housing settlements in the city of Cape Town. The authors found that the walls of the dwelling structures were faulty, with 58% of the toilets non-operational and the design of these houses made them susceptible to transmittable diseases. In another study, Goebel (2007) explored the effect of demographics on housing quality for the Msunduzi Municipality in KwaZulu Natal using the 1996 and 2001 Census data. Findings of this paper indicate that the distribution of housing quality exhibits strong racial patterns, with white suburbs scoring favourably against black townships.

Scholars that have explored housing quality in South Africa have favoured qualitative research methods i.e. conduct surveys in conjunction with participant interviews to explore housing quality. Due to data collection constraints, these studies typically have small sample sizes in the range of 50 households in the case of Zunguzane, et al. (2012) and 293 households for

Goebel (2007). The nature of the methodologies used, and their sub-national[3] focus provides informative but limited information on the state of housing quality in the country. Importantly, previous studies which focus on small areas mask the vast geographical heterogeneities that exists in South Africa's housing quality. Particularly, there is no empirical evidence on the distribution of housing quality between previously marginalised areas i.e. Former Homeland Areas (FHAs) and non-previously marginalised areas i.e. Non-Former Homeland Areas (NFHAs). The present study seeks to fill this gap by evaluating spatial differentials in housing quality and exploring factors that drive observed differences.

Analytical framework

Homeland status is an important determinant in studying the variances in housing quality between households. Households located in FHA are likely to exhibit poor housing quality revealing the historical income neglect they have experienced during and after the years of apartheid. These households are likely to be located far from economic hubs and are subject to low incomes, low quality education and high unemployment. These factors generate persistent poverty cycles among the residents and who besides not having the economic means to invest in their dwellings have no incentives to do so. Similarly, those located in NFHA have enjoyed historical economic privileges and are more likely to have dwellings of higher quality.

[3] For instance, Govender, et al. (2011) focuses on Cape Town, Aigbavboa and Thwala (2012) examines households in Gauteng, Manomano and Tanga (2018) looks at the Eastern Cape while Goebel (2007) explores housing quality in KwaZulu Natal.

Figure 1: Determinants of Housing Quality

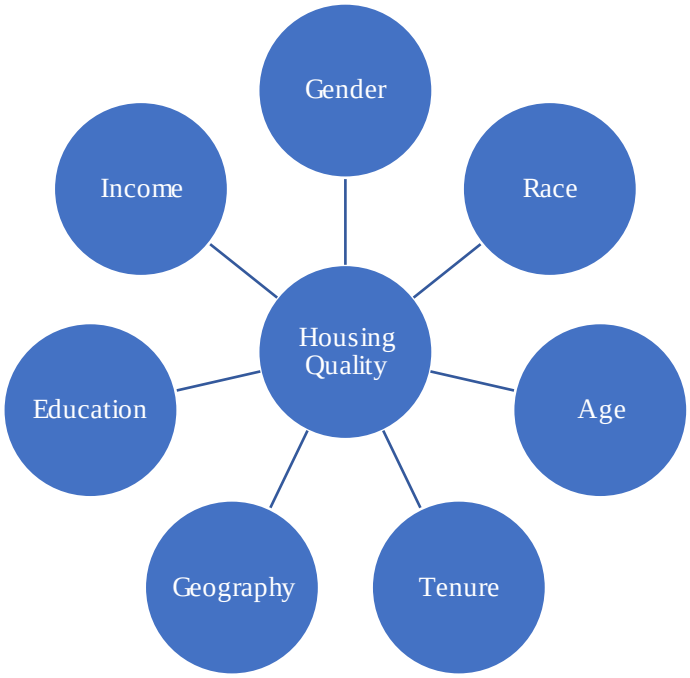


Figure 1 shows the factors that drive differences in housing quality across FHA and NFHA. Amongst these factors, income is a critical factor that determines if a household can access secure tenure and afford to live in a good neighbourhood. The homeland policy[4] instituted by the Apartheid government had far reaching consequences for the economic inequality between race groups in South Africa. The homelands were subjected to poor service delivery and the living conditions were poor. Blacks living in these areas faced job insecurities since most job opportunities were offered on a short-term basis and income flows were mostly irregular (Abel, 2016). To compound to the income factor, these households often migrated from one town to the next in search of better opportunities. This coupled with the Apartheid government's exclusionary policies impacted negatively the ability of households to enjoy security of tenure.

Equally significant was the introduction of the Bantu Education Act of 1954[5] which sanctioned educational segregation against non-whites. The black schools were funded through the taxes paid by the communities they served, which meant that black schools were underfunded, and the quality of education suffered as a result (Rose, 1965). Also, most of the economically active in the homelands were men. This historic exclusion of women placed them at a disadvantage

[4] See https://newhistory.co.za/Part-4-Chapter-14-A-state-of-change-Homelands-or-dumping-grounds/ for a detailed analysis of the homelands policy

[5] Bantu Education Act, enacted in 1953 and in effect from January 1, 1954, that governed the education of black South African (called Bantu by the country's government) children

and thus were unlikely to own or live in quality dwellings. Younger more active men were favoured to the older generation because of their ability to provide productive labour. As a result, the younger economically active youth had more access to decent housing.

Although there are studies unpacking the incongruencies in housing quality in different locations in the South African context (e.g. Moolla, et al. 2011; Govender, et al. 2011; Zunguzane, et al., 2012), only a few (e.g. Marais & Cloete, 2014) use empirical techniques to study the patterns of housing quality on a national scale. However, more importantly they do not factor in national geographical heterogeneities that explain differences in housing quality. Not accounting for these factors leads to an incomplete investigation of the housing quality problem faced by the country. This historical background guides the present discussion of the differentials in housing quality between FHA and NFHA.

3. Data and Methodology

3.1. Data

Data for this study is drawn from two sources. The first source is the 2011 South African Population Census (10% household sample) conducted by Statistics South Africa (StatsSA) and the second source is cartographic information on former homeland areas and the 2011 South African geography. The first data source - the 10% Census sample – contains information on individuals (e.g. demographics, education and employment status), households (e.g. household size and composition, headship, house tenure, and location) and housing characteristics (e.g. roofing, wall and floor materials, number of rooms, water source, toilet facilities and energy sources). Although the Census is quite rich in information, the data does not contain information on the exact location of households (i.e. geo-referenced). The smallest administrative unit in which households can be observed in this data is municipality[6]. Consequently, this study will be conducted at municipal level. In 2011 there was a total of 234 municipalities, consisting of 226 local municipalities and 8 metropolitan areas[7] (Statistics

[6] In census data, local municipalities are divided into "main places". These generally correspond to towns, small cities, boroughs of large cities, or tribal areas also known as townships. Those areas that do not fall within any of the above are incorporated in a *main place* named for the municipality

[7] Metropolitan areas are conurbations featuring high population density; intense movement of people, goods and services; extensive development; and multiple business and industrial districts. These are, Buffalo City, City of

South Africa, 2011). See Figure 1.A in the Appendix for the overall structure of the South African administrative units.

3.2. Methodology

This study is conducted in three basic steps. First, the paper uses multiple correspondence analysis to develop a Housing Quality Index (HQI). Second, former and non-former homeland area municipality identification. Third, the study estimates housing quality function by OLS to assess magnitude, if any, of HQI differentials between former and non-former homeland areas.

First Step: Construction of the Index

There is no universally agreed measure of housing quality. Variables such as crowding, or quality of construction material have been proposed as measures of housing quality, however, they are often too narrow a definition to capture different aspects of housing quality (Fiadzo, et al., 2001). Hence, this study elects to present housing quality as a multidimensional construct by aggregating the different housing quality indicators into a single composite index using Multiple Correspondence Analysis (MCA). This is a data reduction technique which handles multiple data tables with the same correlations (Abdi, et al., 2013) [8]. While there are various data reduction techniques that can be employed to create a housing quality index, amongst them is principal component analysis (PCA), this study will use MCA since PCA is appropriate in instances where the variables are continuous in nature. As a result, PCA is not appropriate for the current study as the housing quality indicators available in the data are categorical.

In this study's context, MCA ensures that the constructed index filters out any trivial effects and only focuses on variables that contribute significantly to housing quality (Yong & Pearce, 2013). The procedure for creating a multi correspondence analysis index involve the following steps:

A. Choose a set of housing quality indicators

B. Define a weighting scheme for each indicator

Cape Town, City of Ekurhuleni, City of Johannesburg, City of Tshwane, eThekwini, Mangaung, Nelson Mandela Bay Metropolitan

[8] See Greenacre (1993) and Asselin (2002) for a detailed review of multiple correspondence analysis.

C. Combine the various housing quality indicators into one component (i.e., the housing quality index - HQI)

Choice of housing quality indicators

The choice of housing quality indicators was informed by the works of Fiadzo, et al. (2001), Goodman (1978) and Gang & Hall (2006) amongst others. These indicators are all intercorrelated and represent the structural qualities of the household dwelling. The proposed housing quality index combined scores for the following indicators: i) Roof materials, ii) Wall materials, iii) Room-to-person ratio iv) Access to piped water, v) Sanitation, vi) Refuse disposal, and vii) Energy source for lighting. Table A.1 in the Appendix outlines the housing quality indicators and their corresponding codes. To ensure a standardized measurement scale, each housing quality indicator state was coded in ascending order, from the lowest to the best condition possible. For instance, for sanitation, a code of 1 was attributed to the worst toilet system which in this case corresponds to no availability of a toilet, and the highest code was attached to the best available sanitation system i.e. a flush toilet. For roofing and wall material, characteristics were ordered based on the durability of the materials while sanitation, access to water and refuse system were coded based on the level of hygiene they provide. This ordinal ranking assists in providing an intuitive understanding of the housing quality indices, that is, a higher index score corresponds with higher housing quality and vice versa.

The variable measuring sufficiency of housing i.e. crowding is captured by number of rooms per capita. A household is deemed crowded if the rooms per capita is less than 0.5, that is, more than two people per room and vice versa. The housing quality index presented in this study is comprehensive in its efforts to capture all physical attributes of housing quality. However, there are non-tangible facets of housing that are tantamount to the wellbeing of a household. The OECD (2011) report identifies aspects such as indoor air quality, exposure to noise, access to green spaces and affordability as useful when measuring housing quality. These variables are often difficult to measure and are not included in the data at hand hence their exclusion.

Define a weighting scheme and aggregation into an index

Once the choice of indicators has been concluded, the next step involves aggregating them based on a weighting criterion. One of the obstacles that researchers face is the choice of an

appropriate weighting scheme. Different approaches are used in applying weights. One approach ascribes equal weights to each dimension, that is, sanitation will be deemed to contribute equally to the composite index as refuse disposal. The drawback in using this method is that it does not account for the relative importance of each indicator. An alternative assigns different weights to each dimension. This could be guided by the value the researcher ascribes to each indicator based on its contribution to the variable being measured. Although this method is an improvement from the first, it is prone to criticism because it requires subjectivity in the allocation of weights. Other scholars elect to aggregate the variables based on their relative percentage contribution towards an indicator to develop an index.

This study elects this last method due to mainly its objectivity when ascribing values to each weight. Technically, MCA entails using standard correspondence analysis on an indicator matrix, that is, a matrix which takes on the value of 0 and 1 (Njong & Ningaye, 2008). The MCA then extracts a first factor whose purpose is to retain maximum information from the matrix and extract the first eigenvalue ($\lambda 1$) and the associated eigenvectors. The resulting inertia matrix is called the Burt matrix. Compared to the indicator matrix, the Burt matrix is computationally easier, and the eigenvalue attained from its analysis offers a more detailed approximation of the inertia.

After weights have been identified for each indicator, the HQI index for each household i is calculated as follows (c.f. Njong and Ningaye, 2008):

$$HQI_i = \frac{1}{K}\sum_{k=1}^{K}\sum_{j_k=1}^{J_k} W_{j_k}^{k} I_{j_k i}^{k} \qquad (1)$$

where k denotes the number of housing quality variables, with $k = (1, 2, \ldots, K)$, j characterizes each possible state that a variable can take with $j = (1, 2, \ldots, J_k)$ and I is the binary indicator of each housing quality state. Each indicator contributes in one way or another to the quality of a household dwelling. W is the weight for each housing quality indicator and state. For consistency, the composite index should satisfy two assumptions. The first is the monotonicity axiom which states that the housing quality index should be an increasing function with respect to each primary indicator. This implies that, ceteris paribus, if a household improves on one of the housing quality indicators, for instance, access to water, then there should be improvement in the overall housing quality index. The second axiom is the First Axis Ordering Consistency (FAOC) property which requires a consistent ordering of categories for each indicator, either

in increasing or decreasing order. The resultant weights computed by the MCA can take either negative or positive values. Negative values pose a complication with respect to interpretation, so to counter this problem the weights are rescaled by using the Min-Max[9] method so that the resulting index falls between *0* (lowest quality) and *1* (highest quality). The analysis of housing quality by former homeland status is conducted at municipal rather than household level due to data constraints. Consequently, HQI_i is collapsed by calculating the average housing quality in each municipality $\overline{HQI}$.

Second step: Identification of former homeland area municipalities

Former homeland areas are identified in the 2011 South African geography using GIS techniques. Specifically, the homelands map is overlaid onto the 2011 South African map in ArcGIS. Since former homeland areas are fragmented and their boundaries are not perfectly aligned to the 2011 municipal boundaries, the share of former homeland area in each municipality is calculated. This ranges between 0 (no former homeland area) and 1 (pure former homeland area). Equipped with this information, municipalities are classified into former homeland status. Three definitions of former homeland areas will be used. The first specifies former homeland areas as a dummy variable; equal to 1 if proportion of a former homeland areas is greater than zero and 0 otherwise. This simple classification results in 143 municipalities classified as former homeland areas (FHA) and 91 as non-former homeland areas (NFHA). Notably, this simple definition masks heterogeneities in the size of former homeland areas since municipalities with a small and a large share of former homeland area are all lumped in one group. To unpack this, the second definition classifies municipalities by quintiles of former homeland area. The third definition is to use the proportion of former homeland area as a continuous variable.

[9] The housing quality index (HQI) is normalised (bounded between 0 and 1) using the min-max method as follows: $(HQI - HQI_{min})/(HQI_{max} - HQI_{min})$.

Third step: Estimation of housing quality function

To understand the determinants of housing quality and the magnitude of the housing quality differential between former and non-former homeland areas, I estimate the following municipal level housing quality function by OLS:

$$HQI = \beta_0 + \beta_1 GDR + \beta_{i2} INC + \beta_3 TNR + \beta_4 URB + \sum_{k=1}^{3} \sigma_k RCE_k + \sum_{j=1}^{8} \theta_j LCV_j + \gamma HS_i + e_i \quad (2)$$

Where HQI is the Housing Quality Index for a given municipality; GDR is the share of female-headed households; INC is the share of household with low income; TNR is the share of households that rent houses; URB is the share of urban households; RCE is the share of blacks, coloureds, Indians/Asians; LCV are provincial dummies and HS is a former homeland status variable of a given municipality and e_i is the usual error term. The coefficient γ measures the differential in housing quality between former and non-former homeland areas. A negative significant coefficient indicate that former homeland areas have lower housing quality relative to non-former homeland areas and vice versa. The other parameters indicate the extent of correlation of these factors with housing quality. Notably, the issue of spatial dependence in housing quality is not explicitly explored in this study. To account for possible spatial correlation and heteroscedasticity in housing quality, the study computes robust standard errors clustered by district.

4. Descriptive statistics

4.1. Housing characteristics and weights from MCA

Table 1 presents descriptive statistics of the housing indicators used in this study i.e. codes, share of households in each indicator category and the weight obtained from MCA.

Table 1: Housing quality indicator variables, South Africa, 2011

Capability and Indicators	Score	% Share	Weight
Roof Materials			
Are the main materials used to construct the roof adequate?			
Inadequate	1	0.061	-2.542
Moderately Inadequate	2	0.584	-0.420
Adequate	3	0.113	0.872
More Adequate	4	0.242	1.243
Wall Materials			
Are the main materials used to construct the wall sustainable?			
Unsustainable	1	0.033	-1.257
Sustainable	2	0.181	-1.631
Highly Sustainable	3	0.785	0.430
Room-to-person Ratio			
How many persons occupy a room in a household?			
Crowded < 0.5	1	0.163	-0.743
Not Crowded > 0.5	2	0.837	0.144
Access to Piped Water			
How accessible is piped water to the household?			
No access	1	0.073	-2.348
Community Yard	2	0.171	-2.002
Inside Yard	3	0.281	-0.221
Inside Dwelling	4	0.475	1.212
Sanitation			
What kind of toilet facility is available to the household?			
No Toilet	1	0.050	-2.463
Pit Latrine	2	0.289	-1.585
Flush Toilet	3	0.661	0.879
Refuse			
What kind of refuse collection system is available to the household?			
No Disposal	1	0.048	-2.074
Own Refuse Disposal	2	0.256	-1.511
Communal Refuse	3	0.020	-1.237
Local Authority	4	0.676	0.757
Lighting			
What source of lighting does the household use?			
Candles	1	0.111	-2.124
Paraffin	2	0.030	-1.872
Gas / Solar	3	0.006	-0.764
Electricity	4	0.854	0.345

Statistics in Table 1 show that 58% of dwellings have roofs that are made of moderately inadequate materials such as corrugated iron or zinc. 11% have adequate roofing (asbestos and wood) whilst less than half of households (24%) are built with durable roof materials. The data shows that 3% of households have walls made of unsustainable materials. These include walls constructed with inadequate materials such as cardboard, wood, plastic or thatch. A considerable share of households (16%) live in crowded environments, defined as households with a room-to-person ration less than 0.5. Households without access to piped water constitute 7% whilst most of them (75%) either access water from their yard or inside the dwelling. Majority of households use flush toilets[10] (66%) with 34% exposed to poor sanitary conditions, either with no toilet or having a pit latrine[11]. 68% of households have local authorities collecting their refuse, while 85% of them have access to electricity as a lighting source. Overall, the weights attached to each indicator category satisfy the monotonicity axiom i.e. weights generally increase with the quality of a given housing indicator. This will result in an intuitive index which monotonically increases as house quality increases.

Applying these weights, HQI is constructed as in equation (1). Next, the reliability of the index is assessed. This was conducted by employing Cronbach's alpha which is a measure of internal consistency, that is, how intercorrelated the index variables are. Cronbach's alpha takes on a value between 0 and 1, with internal consistency increasing as the value approaches 1. Arias and Devos (1996) in their study recommend that an Alpha of 0.60 to 0.65 is objectionable, 0.65 to 0.70 is minimally acceptable, while values of 0.70 to 0.80 are reputable, and values above this are considered ideal. The Cronbach's alpha for the housing index is 0.78 which confirms its consistency as an index.

4.2 HQI statistics by homeland status

Table 2 shows that when former homeland status is defined as a dummy variable, 80% of households in NFHA have dwellings that have adequate quality dwellings and only 57% in former homelands. The majority of households (143 municipalities) are located in FHA. When homeland status is broken down into categories, results show that there are 141 municipalities

[10] The category for flush toilets includes, flush toilet (connected to sewerage system), flush toilet (with septic tank), and chemical toilet

[11] In the pit latrine category, the following are included based on their sanitary hygiene (i) pit latrine with ventilation, (ii) pit latrine without ventilation and (iii) bucket latrine

that have a lower share of former homeland areas (0 – 15%). By definition, these municipalities consist mostly of NFHA and enjoy higher housing quality (76%). As the share of FHA increases, the housing quality of the dwellings depreciate. For instance, when the share of FHA is between 15 – 39%, 55% of households have good housing quality and when the share is at its highest (75 – 100%), only 41% of households reside in adequate quality housing.

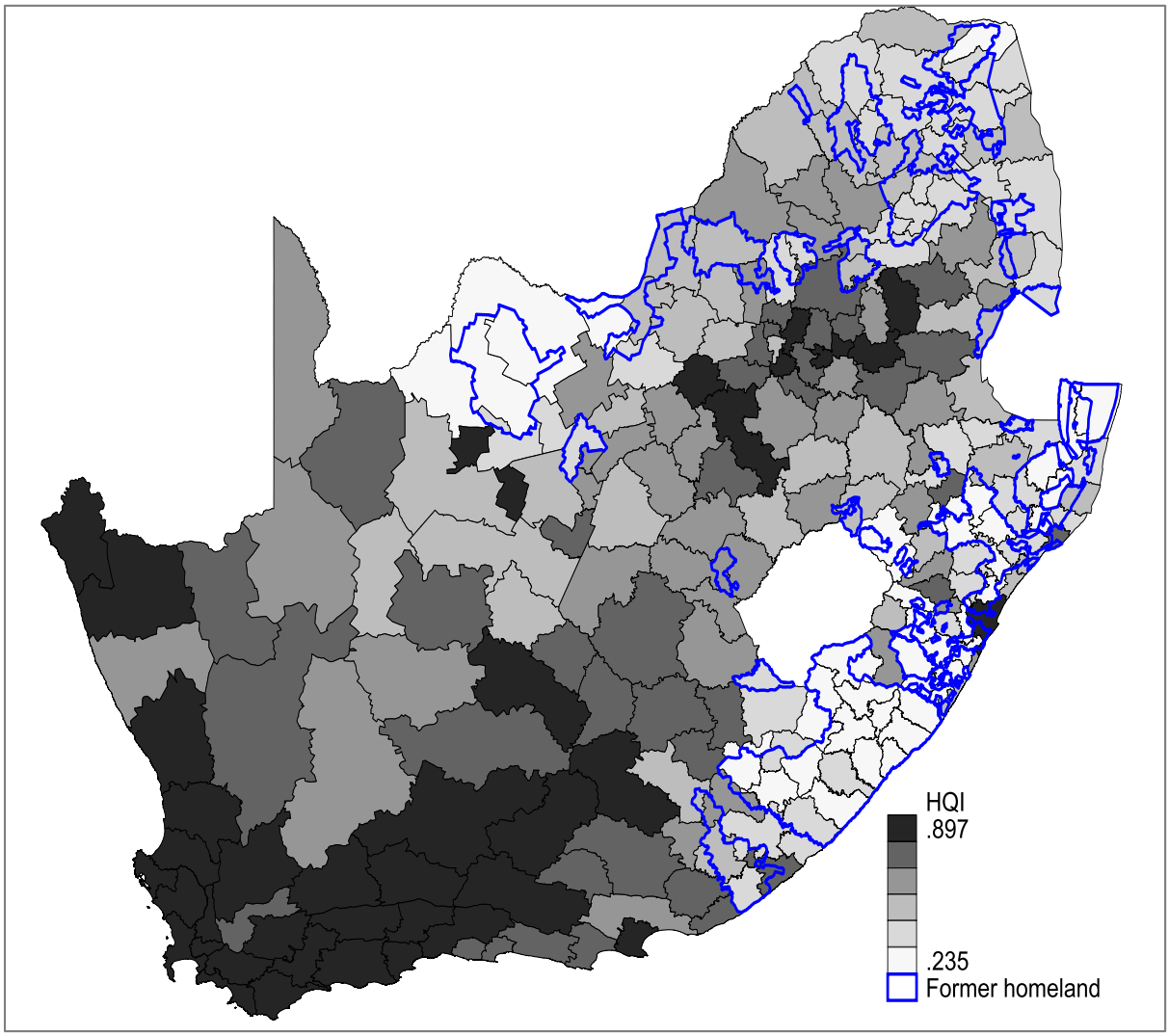
Table 2: HQI statistics by Homeland Status

	Dummy		**FHA classification by share of FHA**				
	HS = 0	**HS = 1**	**I**	**II**	**III**	**IV**	**V**
HQI	0.795	0.571	0.761	0.546	0.536	0.449	0.412
N	91	143	141	33	22	8	24

Notes: Municipalities are classified as follows depending on share of former homeland areas: group I: 0 - 15%; group II: 15 – 39%, group III: 40 – 64%, group IV: 64 – 74%, group V: 75 – 100%

Figure 2 present a visual description of the spatial distribution of housing quality across South Africa's municipalities which are overlaid with a former homeland area map (blue boundaries). The map shows great heterogeneity in housing quality across South Africa's Municipalities. It is observed that that FHA have a lower HQI compared to NFHAs. Municipalities that do not incorporate former homeland areas have considerably higher housing quality compared to those that have former homeland areas. A typical example being municipalities in the Western Cape province, south-west of the country, that enjoy very high levels of housing quality.

Figure 2: Housing Quality Index by Municipality & Former Homeland Areas (2011)



To understand these differences in HQI, Table A.1 in the Appendix presents summary statistics of housing quality indicators by FHA and NFHAs. Sanitary conditions are worse in FHA, with only 39% of households having access to flush toilets compared to 80% in NFHA. A similar trend is observed in terms of access to piped water; a higher share (17%) of households in FHA have no access to piped water. The room-to-person ratio, indicates that 19% of households in FHA reside in crowded spaces whilst in NFHA the corresponding share is 15%. Wall and roof materials are also relatively less adequate in FHA. A considerable share (77%) of households in FHA have access to electricity, with 33% of them having their refuse collected by authorities. Electricity availability increases in NFHA by 10% points and authority refuse collections are 47% points higher than in NFHA.

4.3 Other municipal level characteristics

Table 3 provides a summary of municipal level characteristics that will be used as control variables in the housing function. The majority of households in FHA reside in non-urban areas (farms and traditional regions) with the remaining 37% in urban zones. The opposite is true in NFHA, with 86% of households being urbanized. The share of female heads is higher in FHAs (47%) compared to (34%) in NFHAs. Consistent with the former homeland areas policy which sought to locate blacks in FHA, the statistics show 94% of FHAs residents are blacks while only 4% are white. In NFHAs blacks account for 52% of the population while whites are 12%. Non-former homelands have lower unemployment rates (16%) compared to FHAs (23%). Low income families constitute 55% of the total households in FHA, these are families with an annual household income ranging from R1 to R 19, 200. Less than half of households in South Africa do not own their dwellings, 27% and 38% rent houses in FHA and NFHA, respectively[12].

Table 3: Housing Quality Covariates by Homeland Status

	Former Homeland Areas			Non-Former Homeland Areas		
Variable	N	Mean	SD.	N	Mean	SD.
Municipal share:						
Urban	143	0.373	0.322	91	0.857	0.101
Female	143	0.472	0.090	91	0.339	0.043
Low income	143	0.549	0.125	91	0.379	0.076
Middle income	143	0.419	0.123	91	0.527	0.071
Upper income	143	0.032	0.131	91	0.094	0.081
Rent house	143	0.269	0.131	91	0.377	0.114
Own house	143	0.731	0.131	91	0.623	0.114
Black	143	0.935	0.075	91	0.515	0.318
Coloured	143	0.019	0.041	91	0.362	0.312
Indian	143	0.011	0.025	91	0.006	0.005
White	143	0.035	0.039	91	0.117	0.051
Unemployed	143	0.225	0.055	91	0.159	0.050
Age15-25	143	0.121	0.025	91	0.094	0.027
Age 26-35	143	0.260	0.042	91	0.274	0.037
Age 36-45	143	0.304	0.020	91	0.330	0.028
Age ≥ 46	143	0.315	0.053	91	0.301	0.039
No Schooling	143	0.119	0.070	91	0.064	0.044
Less than Matric	143	0.571	0.083	91	0.594	0.076
Matric	143	0.261	0.075	91	0.286	0.068
More than Matric	143	0.050	0.027	91	0.056	0.026

[12] Included in the rented category are households that own their dwelling but have not yet paid it off.

In FHA most households are headed by individuals older than 46 years (31%) while the age group between 36 and 45 years head most households in NHFA. There are no large differences in the share of youth (15 and 35 years) headed households across FHA and NFHAs. Statistics show that education achievements are lower among FHA heads compared to NFHAs heads, although the differences are small.

5. Results

The descriptive statistics outlined in the last section confirmed the initial hypothesis that housing quality is better in NFHA than in FHA. However, the identified 'raw' HQI disparities between FHAs and NFHAs are likely to be confounded by differences in demographic composition and other endowment across municipalities (e.g. race, geography, income and level of education). To account for these factors, a HQI function is estimated by OLS. Results are presented in Table 3 where three definitions of former homeland status are used i.e. dummy variable, proportion of former homeland area in a municipality and a categorical definition that classifies municipality by size of FHA. Three stepwise specifications are used. Model I only controls for former homeland status of municipality. Specification II adds in the model demographic covariates i.e. race, gender and age. Specification III adds controls on human capital composition of municipalities together with income level and type of housing tenure. The last specification IV adds a measure of the degree of urbanisation and province fixed effects.

Table 4: OLS Estimates of the HQI function

	Dummy				Proportion				Categories by share of FHA			
	I	**II**	**III**	**IV**	**I**	**II**	**III**	**IV**	**I**	**II**	**III**	**IV**
Homeland Status dummy	-0,224***	-0,033	-0,044*	0,003								
	(0,020)	(0,018)	(0,017)	0,012								
% Proportion of HS					-0,390***	-0,140***	-0,171***	-0,108***				
					(0,030)	(0,028)	(0,023)	(0,019)				
Share of FHA category												
1: 15 – 39%									-21.530***	-8.090***	-9.010***	-2.278
									(2.205)	(2.228)	(1.606)	(1.437)
2: 40 – 64%									-22.551***	-7.300*	-9.778***	-3.649*
									(3.382)	(2.872)	(2.099)	(1.784)
3: 65 – 74%									-31.287***	-13.084**	-12.424***	-6.676***
									(4.178)	(3.891)	(2.456)	(1.688)
4: 75 – 100%									-34.965***	-14.719***	-17.880***	-10.285***
									(3.123)	(2.936)	(2.437)	(2.066)
Race - Black		-0,123**	-0,096*	-0,141***		-0,126**	-0,118***	-0,129***		-0.116**	-0.118***	-0.136****
		(0,041)	(0,037)	(0,038)		(0,039)	(0,032)	(0,031)		(0.039)	(0.031)	(0.032)
Gender - Female		-0,870***	-0,421**	-0,098		-0,702***	-0,299*	0,036		-0.663***	-0.281*	0.035
		(0,134)	(0,154)	(0,113)		(0,104)	(0,126)	(0,101)		(0,104)	(0.118)	(0.101)
Age 15 - 26		-0,454	-0,393	-0,261		-0,417	-0,361	-0,333		-0.288	-0.188	-0.258
		(0,327)	(0,303)	(0,231)		(0,275)	(0,226)	(0,202)		(0,291)	(0.241)	(0.210)
Age 26 -35		0,696**	0,143	-0,102		0,467*	-0,082	-0,140		0,399	-0.133	-0.156
		(0,214)	(0,213)	(0,165)		(0,214)	(0,179)	(0,150)		(0,225)	(0.187)	(0.155)
Age 36 - 45		0,040	-0,015	0,015		-0,090	-0,117	-0,080		-0,157	-0.001	-0.049
		(0,285)	(0,267)	(0,237)		(0,303)	(0,255)	(0,222)		(0,284)	(0.254)	(0.238)
No School			-0,587**	-0,045**			-0,752***	-0,102			-0.629***	-0.007
			(0,181)	(0,195)			(0,134)	(0,178)			(0.153)	(0.199)
Less Matric			-0,291	0,023			-0,383*	-0,006			-0.288	0.081
			(0,197)	(0,150)			(0,160)	(0,141)			(0.167)	(0.156)
Matric			0,212	0,586**			0,180	0,664**			0.323	0.755**
			(0,236)	(0,213)			(0,183)	(0,212)			(0.191)	(0.234)
Low Income			-0,238*	-0,247*			-0,095	-0,222*			-0.064	-0.212*
			(0,100)	(0,095)			(0,094)	(0,084)			(0.094)	(0.084)
Tenure - Rented				-0,132*				-0,107*				-0.104*
				(0,050)				(0,046)				(0.049)
Urban				0,243***				0,176***				0.187***
				(0,023)				(0,016)				(0.016)
Province fixed effects				Yes				Yes				Yes

*Notes: Robust standard errors in parentheses clustered by district. All models include a constant. * p≤.05; ** p≤.01; *** p≤.001.*

5.1 Housing quality differentials between FHA and NFHAs

Results indicate that when using the dummy variable definition for former homeland status, results show that there is a 0.22%-point difference in housing quality between FHA and NFHAs, the former being disadvantaged. Accounting for demographic composition of municipalities reduces the gap substantially to 0.003%-points and it becomes statistically insignificant. Further controlling for human capital, income, urbanisation and province fixed effects wipes out the housing quality differential in specification IV. The disappearance of the housing quality differential between FHA and NFHAs appears to be sensitivity of the analysis to definition used of former homeland status.

In the specifications that use the proportion of former homeland areas in a municipality, results of a housing quality penalty in former homeland areas is persistent across all specifications. Specifically, when no controls are included in the model, results indicate that a one percentage point increase in share of former homeland area in a municipality is associated with a decrease in housing quality of 0.39% points. Adding various controls reduces the magnitude of the differential to 0.11% points and it remains statistically significant. These results clearly indicate that housing quality is much lower for municipalities that incorporate large shares of former homeland areas compared to those that do not. To clearly see this, the study uses a third definition of former homeland status which classifies municipalities into five groups by size of former homeland area. The reference group consists of municipalities with a share of former homeland areas between 0 and 15%. Results based on this categorical variable clearly indicate that relative to non-former homeland area municipalities, the housing quality penalty increases as the size of former homeland area increases. In the full specification (model IV), municipalities that have 15 - 39% FHA have housing quality which is lower by 2.28% points while those with the highest share 75 - 100% have a penalty of 10.29% points. Based on these findings it is clear that FHAs are characterised by lower housing quality compared to NFHAs and the disadvantage increase with share of former homeland area.

5.2 Determinants of housing quality across South Africa's Municipalities

Now considering the relationship between housing quality and other municipal characteristics, results show that as the share of blacks increase in a municipality housing quality tends to decrease. This result is statistically significant and robust across all specifications and definitions used of former homeland area. Thus, this study finds a strong racial element in

housing quality in South Africa. This is not surprising given the country's history and its continued struggle to redress past injustices. Apartheid relegated the black population to living like second class citizens marginalized from economic opportunities and subjected to wide-spread housing poverty. Ever since the dawn of democracy in 1994, the housing conditions for black people has improved but apartheid and colonial spatial patterns persist.

The results further confirm that female headed municipal households are likely to experience poor housing quality compared to male-headed households. These outcomes are significant in specification II and III when former homeland status is used as a dummy and as a proportion. When homeland status is defined in terms of municipal categories, gender is only significant in specification II. The results obtained from this study are in line with those of Goebel & Dodson (2011) that gender plays a significant role in explaining housing quality differences. This could be explained by the fact that female-headed households have lower incomes. StatsSA (2011) estimates that male households out earn female households by 23%.[13]

The younger youth aged between 15 and 26 do not exhibit a significant effect on housing quality. This is to be expected because these are individuals either in the schooling system or at the entrance level of their careers hence they only constitute a small portion of household heads. As the share of household heads aged between 26 and 35 increases in a municipality, housing quality also improves significantly for specification II across all the definitions used for FHA. Hence, age is not a strong contributor to differentials in housing quality in South Africa.

Lack of schooling by the household head was found to impact negatively on the quality of the dwelling. The effect is significant at the 10 percent level for specification III and IV when homeland status is a dummy. It is also significant for specification III for models when homeland status is defined as categories and proportions. This is plausible because the possession of an education qualification affords an individual such things as an increased income, and the appreciation of the benefits of investing in a dwelling. Without access to these privileges, a household is prone to suffer from lack of quality housing structures. As a result, households with some form of qualification, less than a matric and/or a matric qualification show improvements in their housing conditions.

[13] Statistics South Africa find that men earned a median income of R3,500 per month while women earned R2,700 per month in 2011.

Similarly, low income has a negative effect on housing quality. The outcome is in line with Fiadzo, et al. (2001) who find that for higher income quartile households in Ghana the odds of living in low quality households is reduced by 72%. Rosenbaum (1996) further argues that the lack of income remains the main stumbling block to many families accessing adequate housing.

Tenure is also a significant factor in all specifications when explaining housing quality. An increase in the share of rented households is associated with a decrease in the housing quality in a municipality. This could be as a result of lack of incentives from tenants to invest in a dwelling that they do not have ownership of. Also, the owners could be renting the dwellings for profit with little or no interest in the condition of the housing structure. Finally, the degree of urbanisation is associated with an increase in housing quality across municipalities. This is consistent with the fact that urban zones have long been recipients of government and private sector development.

5.3 Robustness Checks

In the baseline specification, a municipality is considered as a former homeland if its share of FHA is greater than zero. However, by definition, areas that are partially former homelands are likely to enjoy some liberties of NFHA - this is likely going to dampen the results. To address this problem, municipalities that are in Gauteng (10) and the Western Cape (25) – provinces that had little or no former homeland areas - are omitted from the sample. The housing quality function is re-estimated and results on the former homeland status variable are presented in Table A.2 in the Appendix.

The second robustness check is a stricter definition of FHA and removes from the sample the Gauteng and Western Cape Provinces as well as all other metropolitan areas. Since metropolitan municipalities are typically developing cities and former homeland areas are predominantly rural, including metropolitan areas in the analysis is likely to distort the results; overestimation of the housing quality differential. Estimates of this second check are presented in Table A.3 in the Appendix.

The first robustness check results remain consistent with those of the baseline model. The first specification model when homeland status is defined as a dummy reveals that housing quality differentials between FHA and NFHA decrease from 0.22% to 0.20% points. This reflects an improvement in housing quality for FHA. However, the removal of municipalities with a higher share of NFHA is expected to reduce housing quality further since they account for a significant percentage of households with high quality housing. This is confirmed by the remaining specifications. Compared with the baseline model, when homeland status is defined as categories and the share of FHA is between 15 – 39% in specification 3, housing quality worsens from 9.01% to 9.28%. The gap widens even further when the share of FHA increases to 75 – 100%, with poor housing quality increasing from 17.88% to 18.02%. The second robustness check remains in line with the initial regression results. Because a further share of non-former homelands has been removed housing quality compounds even further. Using model 3 as reference group for areas with a share of former homelands between 15 – 34% housing quality goes up from 9.01% to 9.85%. Likewise, for the category 75 – 100%, the percentage increases from 17.88 to 18.57%. Overall, the results of this study are robust to different definitions of housing quality

Discussion

This study has established that South Africa is characterised by significant spatial heterogeneity in housing quality. In particular, municipalities that incorporate FHA have lower housing quality compared those that do not. The housing quality penalty increases with the size of former homeland area within a municipality. While the mechanisms underpinning this differential are difficult to establish within this study's context, what is clear is that housing quality in previously disadvantaged areas remains behind that of non-previously disadvantaged areas. This is despite government's extensive investments into building the country's housing infrastructure.

From this study's findings, it is clear that housing policy should be geared towards improving the quality of dwelling units particularly in former homelands to ensure decent and quality housing. Households in former homelands are subject to low incomes and higher unemployment rates. This restricts their savings capacity and their propensity to invest in housing. Research shows that most recipients of RDP houses elect to sell their homes and move back to their old informal dwellings (Charlton, 2004). This strongly suggests that housing

cannot be effectively provided without cultivating an active economic climate that allows recipients to maintain and invest in their household units. Therefore, policies that seek to invigorate the economy and stimulate employment and growth are necessarily remedies to solving the housing quality problems.

Additional results on other covariates in the estimations show a strong racial, gender, human capital and urbanisation footprint in the distribution of housing quality. The racial effect is the strongest. The results reveal that although physical components of a dwelling contribute to the quality of housing, race still plays a poignant role in explaining these differences. More importantly, race becomes a proxy for income, with black people forming the majority of the poor. This is concerning and calls for policies that are non-discriminatory and serve to narrow the current gender, racial and spatial disparities. The lack of formal schooling is also flagged as a stumbling block towards the attainment of quality housing. Education is a crucial production factor that contributes to the accumulation of human capital and consequently, economic growth. Thus, the access of quality education should be one of the key factors to be considered when developing housing initiatives.

Conclusion

This paper uses the 2011 South African population census (10% household sample) data to explore the differentials in housing quality between FHA and NFHA in South Africa. The measure for housing quality was derived using MCA to develop a consistent housing quality index. Following from which, a cartographic map was used to identify FHA and NFHA. The study then estimated a housing quality function using OLS to evaluate the magnitude of housing quality index differentials between the two areas. The results show that despite substantial efforts by the South African government to reduce gender, racial and spatial inequalities by investing in housing initiatives, the gap in housing quality between former homelands and non-former homelands remains a concern. These results are robust to different model specifications and definitions of municipal former homeland status. The analysis also shows that the key factors affecting housing quality are race, gender, age, education, tenure and urbanisation.

The main findings of this study suggest that municipalities that have a higher share of former homeland areas are subjected to deficient housing quality. Furthermore, the housing quality

decreases as the share of blacks and woman increases and when the household hold lacks formal schooling. Better housing quality is also observed as the share of households who reside in urban areas increases and for households with security of tenure. Based on these findings, this study recommended policy initiatives that looks to improve the socio-economic conditions of the households in former homeland areas.

This study has some limitations. The use of cross-sectional data in this study limits the ability to study the housing quality dynamics over time for the various households; the results could reveal transitory dynamics if we had access to longitudinal data, however, our present data does not allow this to be explored. The study also does not account for unobserved heterogeneity which would be possible with longitudinal data. Furthermore, the housing quality index used in this study excludes non-physical characteristics such as air quality and access to facilities which are critical in improving the quality of a household dwelling. Future research can explore these additional avenues in its contribution to housing quality literature.

References

Abdi, H., Williams, L. J. & Valentin, D., 2013. Multiple factor analysis: principal component analysis for multitable and multiblock data sets. *Wiley Periodicals*, 5 March, pp. 149-177.

Abel, M., 2016. Long-run Effects of Forced Resettlement: Evidence from Apartheid South Africa. *The Journal of Economic History*, 79(4), pp. 915-953.

Aigbavboa, C. & Thwala, W., 2012. *An Assessment of Occupant's Expectations in the Delivery of Low-Income Housing in South Africa*. Edinburgh, UK, Association of Researchers in Construction Management.

Arias, E. & Devos, S., 1996. Using Housing items to Indicate Socioeconomic Status: Latin America. *Journal of Socioeconomic Status,* Volume 38, pp. 53-60.

Bah, E.-H. M., Faye, I. & Geh, Z. F., 2018. *Housing Market Dynamics in Africa*. Abidjan: Palgrave Macmillan.

Bob, U., 2001. The Intersection of Gender, Race and Class: The Socio-Economic and Spatial Implications of Differentiation in the Former Homelands of South Africa. *South African Geograhical Jornal,* 83(3), pp. 190-197.

Bradley, R. & Putnick, D., 2012. Housing quality and access to material and learning resources within the home environment in developing countries.. *Society for Research in Child Development,* 83(1), pp. 76-91.

Charlton, S., 2004. *An Overview of the Housing Policy and Debates, Particularly in Relation to Women (or Vulnerable Groupings),* Johannesburg: Centre for the Study of Violence and Reconciliation.

Cook, C. C. & Bruin, M. J., 1994. Determinants of Housing Quality: A Comparison of White, African-American, and Hispanic Single-Parent Women. *Journal of Family and Economic Issues,* 15(4), pp. 329-347.

Fiadzo, E. D., Houston, J. E. & Godwin, D. H., 2001. Estimating Housing Quality For Poverty and Development Policy Analysis: CWIQ in Ghana. *Social Indicators Research,* Volume 53, pp. 137-162.

Filali, R., 2012. Housing conditions in Tunisia: the quantity-quality mismatch. *Journal of Housing and the Built Environment,* 27(3), pp. 317-347.

Gifford, R. & Lacombe, C., 2006. Housing Quality and Children's Socioemotional Health. *Journal of Housing and the Built Environment,* Volume 21, pp. 177-189.

Goebel, A., 2007. Sustainable urban development? Low-cost housing challenges in South Africa. *Habitat International,* Volume 31, pp. 291-302.

Goebel, A. & Dodson, B., 2011. Housing and Marginality for Female-Headed Households: Observations from Msunduzi Municipality (Pietermaritzburg, South Africa). *Canadian Journal of African Studies,* 45(2), pp. 240-272.

Goodman, J. L., 1978. Causes and Indicators of Housing Quality. *Social Indicators Research,* 5(2), pp. 195-210.

Govender, T., Barnes, J. M. & Pieper, C. H., 2011. Contribution of Water Pollution From Inadequate Sanitation and Housing Quality to Diarrheal Disease in Low-Cost Housing Settlements of Cape Town, South Africa. *American Journal of Public Health,* 101(7), pp. 1-9.

Govender, T., Barnes, J. M. & Pieper, C. H., 2011. Housing conditions, sanitation status and associated health risks in selected subsidized low-cost housing settlements in Cape Town, South Africa. *Habitat International,* Volume 35, pp. 335-342.

Haque, I., Rana, J. & Patel, P. P., 2020. Location matters: Unravelling the spatial dimensions of neighbourhood level housing quality in Kolkata, India. *Habitat International,* Issue 99, pp. 1-20.

Leibbrandt, M., Woolard, C. & Woolard, I., 1996. The Contribution of Income Components to Income Inequality in the Rural Former Homelands of South Africa: a Decomposable Gini Analysis. *Journal of African Economies,* 9(1), pp. 79-99.

Lejeune, Z., Xhignesse, G., Kryvobokov, M. & Teller, J., 2016. Housing Quality as Environmental Inequality: The Case of Wallonia, Belgium. *Journal of Housing and the Built Environment,* Volume 31, pp. 495-512.

Manomano, T. & Tanga, P. T., 2018. Housing Needs: The Quality and Quantity of Housing Provided by the Government for the Poor in the Eastern Cape Province in South Africa. *Social Work/Maatskaplike Werk,* 54(2), pp. 19-32.

Marais, L. & Cloete, J., 2014. "Dying to get a house?" The health outcomes of the South African low-income housing programme. *Habitat International,* pp. 48-60.

Marr, W. L. & McGready, D. J., 1997. Housing quality and Affordability among Female Households in Canada. *Genus,* 53(3), pp. 215-241.

Meng, G. & Hall, B. G., 2006. Assessing housing quality in metropolitan Lima, Peru. *Journal of Housing and the Built Environment,* Volume 21, pp. 413-439.

Meyer, D. R., 1973. Interurban Differences in Black Housing Quality. *Annals of the Association of American Geographers,* 63(3), pp. 347-352.

Moolla, R., Kotze, N. & Block, L., 2011. Housing satisfaction and quality of life in RDP houses in Braamfischerville, Soweto: A South African case study. *Urban Planning Institute of the Republic of Slovenia,* 22(1), pp. 138-143.

Muoghalu, L. N., 1991. Measuring Housing and Environmental Quality as Indicator of Quality of Urban Life: A Case of Traditional City of Benin, Nigeria. *Social Indicators Research*, 25(1), pp. 63-98.

National Treasury, 2019. *2019 Budget: Estimates of National Expenditure - Vote 38 Human Settlements*, Pretoria: National Treasury.

Njong, A. M. & Ningaye, P., 2008. Characterizing weights in the measurement of multidimensional poverty: An application of data-driven approaches to Cameroonian data. *OPHI Working Paper*, Volume 21, pp. 1-37.

OECD, 2011. *How's Life? Measuring Well-being*, Paris: OECD Publishing.

Rashid, J., Hussain, I. & Syed, S. H., 2016. Poverty and the Quality of the Housing: Construction of Index Using FFDP Approach. *Forman Journal of Economic Studies*, Volume 12, pp. 89-101.

Rose, B. W., 1965. Bantu Education as a Facet of South African Policy. *Comparative Education Review*, 9(2), pp. 208-212.

Rosenbaum, E., 1996. Racial/Ethnic Differences in Home Ownership and Housing Quality, 1991. *Social Problems*, 43(4), pp. 403-426.

Seekings, J., 2010. Race, class and inequality in the South African city. In: J. Seekings, ed. *The Blackwell Companion to the City*. Cape Town: Centre for Social Science Research, pp. 1-15.

Statistics New Zealand, 2015. *Measuring housing quality: Potential ways to improve data collection on housing quality in New Zealand*, Wellington: Available from www.stats.govt.nz..

Statistics South Africa, 2011. *Census 2011: Geography Metadata*, Pretoria: Statistics South Africa.

StatsSA, 2011. The South Africa I know, The Home I understand. *Census 2011*.

Tissington, K., 2011. *A Resource Guide to Housing in South Africa 1994-2010: Legislation, Policy, Programmes and Practice*, Johannesburg: Socio-Economic Rights Institute of South Africa.

Twitchell, A. A., 1948. An appraisal method for measuring the quality of housing. *American Sociological Review*, Volume 13, pp. 278-287.

World Bank, 2018. *Overcoming Poverty and Inequality in South Africa: An Assessment of Drivers, Constraints and Opportunities*, Washington DC: World Bank Publications.

World Health Organization, 2018. *WHO Housing and Health Guidelines: Recommendations to promote healthy housing for a sustainable and equitable future*, Geneva: World Health Organization.

Yong, A. G. & Pearce, S., 2013. A Beginner's Guide to Factor Analysis: Focusing on Exploratory Factor Analysis. *Tutorials in Quantitative Methods for Psychology*, 9(2), pp. 79-94.

Zey-Ferrell, M., Kelley, E. & Bertrand, A., 1977. Consumer preferences and selected socioeconomic variables related to physical adequacy of housing. *Home Economsics Research Journal*, 5(4), pp. 232-243.

Zunguzane, N., Smallwood, J. & Emuze, F., 2012. Perceptions of the quality of low-income houses in South Africa: Defects and their causes. *Acta Structilia: Peer reviewed*, 19(1), pp. 19-38.

Appendix

Table A.1: Housing Quality Characteristics by Homeland Status

	Former Homeland Areas			Non-Former Homeland Areas		
	N	Mean	SD.	N	Mean	SD.
Sanitation						
No Toilet	143	0.102	0.086	91	0.052	0.043
Pit Latrine	143	0.510	0.237	91	0.145	0.118
Flush Toilet	143	0.388	0.257	91	0.803	0.135
Access to Water						
No Access	143	0.170	0.160	91	0.020	0.021
Communal Access	143	0.283	0.179	91	0.089	0.068
Inside Yard	143	0.304	0.157	91	0.333	0.155
Inside Dwelling	143	0.242	0.162	91	0.559	0.176
Room to Person Ratio						
Crowded	143	0.189	0.080	91	0.152	0.060
Not Crowded	143	0.811	0.080	91	0.848	0.060
Wall Material						
Unsustainable	143	0.020	0.032	91	0.033	0.060
Sustainable	143	0.237	0.174	91	0.136	0.106
Highly Sustainable	143	0.743	0.176	91	0.830	0.102
Roof Materials						
Inadequate	143	0.180	0.198	91	0.016	0.027
Moderately Inadequate	143	0.638	0.211	91	0.700	0.198
Adequate	143	0.072	0.081	91	0.179	0.172
More Adequate	143	0.110	0.084	91	0.105	0.101
Lighting Source						
Candles	143	0.199	0.153	91	0.093	0.065
Paraffin	143	0.028	0.045	91	0.021	0.028
Gas / Solar	143	0.008	0.010	91	0.009	0.014
Electricity	143	0.765	0.161	91	0.877	0.073
Refuse System						
No Disposal	143	0.093	0.063	91	0.034	0.033
Own Refuse	143	0.548	0.249	91	0.143	0.088
Communal Refuse	143	0.019	0.013	91	0.022	0.016
Authorities	143	0.340	0.278	91	0.800	0.112

Table A2: Robustness check – Excluding Gauteng and Western Cape

	Dummy				Proportion				Categories			
	I	II	III	IV	I	II	III	IV	I	II	III	IV
Homeland Status dummy	-0.200***	-0.037*	-0.053**	0.007								
	(0.019)	(0.018)	(0.018)	(0.013)								
% Proportion of HS					-0.353***	-0.140***	-0.171***	-0.108***				
					(0.030)	(0.029)	(0.022)	(0.019)				
Category: 1: 15 – 39%									-19.047***	-8.200**	-9.283***	-2.168
									(2.202)	(2.322)	(1.642)	(1.383)
2: 40 – 64%									-20.068***	-7.369*	-10.181***	-3.634*
									(3.425)	(2.961)	(2.124)	(1.743)
3: 65 – 74%									-28.804***	-13.233**	-12.652***	-6.789***
									(4.163)	(3.953)	(2.397)	(1.666)
4: 75 – 100%									-32.481***	-14.823***	-18.015***	-10.234***
									(3.127)	(3.018)	(2.437)	(1.970)
Provincial effects				Yes				Yes				Yes

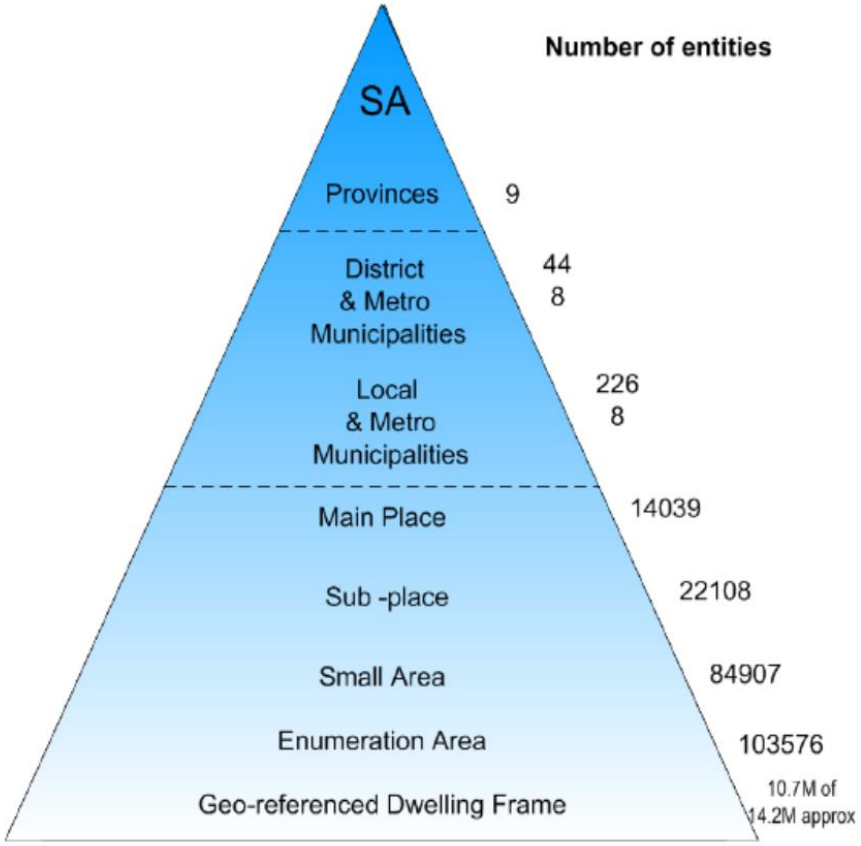
*Notes: Robust standard errors in parentheses clustered by district. All models include a constant. * p≤.05; ** p≤.01; *** p≤.001.*
Model specifications are the same as in the baseline models.

Table A3: Robustness check – Excluding Gauteng, Western Cape and Metropolitan Areas

	Dummy				Proportion				Categories			
	I	II	III	IV	I	II	III	IV	I	II	III	IV
Homeland Status dummy	-0.203***	-0.041*	-0.053**	0.011								
	(0.019)	(0.018)	(0.018)	(0.014)								
% Proportion of HS					-0.354***	-0.149***	-0.173***	-0.112***				
					(0.030)	(0.029)	(0.022)	(0.019)				
Category: 1: 15 – 39%									-19.609***	-9.555***	-9.848***	-2.269
									(2.163)	(2.276)	(1.748)	(1.510)
2: 40 – 64%									-22.627***	-10.211***	-11.380***	-4.261*
									(3.117)	(2.816)	(2.248)	(1.974)
3: 65 – 74%									-28.671***	-14.536***	-13.320***	-7.083***
									(4.169)	(3.994)	(2.509)	(1.729)
4: 75 – 100%									-32.349***	-16.322***	-18.571***	-10.607***
									(3.135)	(3.063)	(2.548)	(2.028)
Provincial effects				Yes				Yes				Yes

*Notes: Robust standard errors in parentheses clustered by district. All models include a constant. * p≤.05; ** p≤.01; *** p≤.001.*
Model specifications are the same as in the baseline models.

Figure A.1: Nested hierarchy for the South African Census 2011



Source: 2011 Census metadata