Beyond Informality: Housing Quality and Tenure Insecurity in Tanzania's Secondary Cities

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Abstract
Sub-Saharan Africa is experiencing high rates of urbanisation that have driven the housing deprivation problem into dense informal settlements, but the link between tenure status and housing quality is yet to be fully examined in secondary cities in Tanzania. This study examines the impact of tenure on housing quality and examines whether household wealth, education, and migration status moderate the relationship between tenure and housing quality. The analytical sample consists of 2,411 households from the Tanzania National Panel Survey (NPS) Wave 5 (2020-2022) in secondary cities. A standardised Housing Quality Index (HQI) was built using the seven structural and service indicators and ordinary least squares regression with cluster-robust standard errors and interaction terms. The results show that there is a significant difference between informal and formal owners in terms of the reduction in HQI (β = - 0.42, p = 0.003), which supports the tenure penalty hypothesis. On the other hand, the housing quality of households in other tenure arrangements (employer-provided or free accommodation) shows a significant positive value (β = 0.25, p = 0.027). Wealth and education have independent positive effects on housing quality, but there are interaction effects between wealth and informal tenure (β = 0.286, p = 0.008), and between education and informal tenure (β = 0.036, p = 0.058). Migration status does not have any significant interaction effects. Robustness checks (Ramsey RESET test, Cook's Distance, and VIFs) validate the model and confirm its reliability. The study concludes that tenure insecurity is a 'structural constraint' not easily mitigated by household resources, and calls for enhancing informal tenure recognition, increasing hybrid housing forms, and including the poor in terms of their wealth in informal housing in policy agendas at the secondary city level.

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1. Introduction

While urbanisation in sub-Saharan Africa is taking place at an unprecedented rate and density, a large proportion of this growth is happening beyond the planning and legal framework (Lutta & Schoonjans, 2025). There are one billion or more slum dwellers in the world, and the number of slum dwellers continues to rise by 25 million per year (UN-Habitat, 2022). The number of these residents in sub-Saharan Africa alone is 230 million, and about 62% of the region's urban population resides in slums (Amegah, 2021; UN-Habitat, 2022). First and foremost, two third of the region's urban population, or 121 million people, lack secure tenure rights (Prindex, 2020; Byamugisha & Dubosse, 2023). Africa is the most deeply impacted by the highest level of perceived and actual tenure insecurity globally (Byamugisha & Dubosse, 2023). The global survey conducted by Prindex found one in four Africans fear losing their home, and that people's perceptions of security are more influential on behaviour than possession of a legal document proving rights (Prindex, 2020). Housing outcomes are related to this behavioural constraint: households who are concerned about losing their tenancy are much less likely to invest in long-term or durable materials or sanitation (McDermott *et al*., 2021; Manara & Regan, 2024). This process is what this study analyses as the "tenure penalty" – even among households with assets and/or education, the quality of the housing they enjoy is diminished by an insecure tenure (Swope & Hernández, 2019; Joshi *et al*., 2023).

Tanzania is a good example of the same on the African continent. Although the majority of the population is now urban, the majority of urban residents live in informal house, occupying more than 70% of the urban population, and growing rapidly over recent decades (Magina *et al*., 2020; Zhang *et al*., 2020; UN-Habitat, 2020). The areas are estimated to make up 40–80% of built-up spaces, and recent research indicates that approximately two-thirds of the residential zone in Tanzania is unplanned (Magina *et al*., 2020; Zhang *et al*., 2020). In fact, two-thirds of neighbourhoods do not fall under formal planning and legal procedures. The settlements' growth rate is increasing relative to formal housing supply and has been seen for at least the past 40 years (Andreasen *et al*., 2020; World Bank, 2017). The land is generally less valuable and less secure in informal settlements than in the formal sector because most of those living in informal settlements are not landowners (Magina *et al*., 2020; Payne, 2012). Attempts to utilize even government programs, like Certificates of Right of Occupancy and short-term Residential Licences, have received limited uptake, and renewal, and have outdated records (Manara & Pani, 2023). Administrative systems are finding it hard to meet

the challenge on the scale that is being faced (Ministry of Lands, 2025; Manara & Pani, 2023; Nuhu *et al*., 2023).

These figures are the reality of households that illustrate the effects of tenure insecurity on investment in housing. For example, in Kigamboni, Dar es Salaam, more than 200 families lost their houses, crops, and savings for a housing project in 2013 after being long-term occupants of the land and having invested in permanent structures without compensation (Katiba Institute, 2015; Kombe, 2010). These contexts provide an illustration of households with perceived and actual tenure insecurity being treated equally, with the same disincentives to durable housing investments, regardless of socioeconomic resources (McDermott *et al*., 2021; Andreasen *et al*., 2020). They also point to the effects as non-structural, such as on livelihood, education, and mental health, as evidenced by the links between tenure insecurity and lower wellbeing and limited upgrading in informal settlements (Weimann & Oni, 2019; Richards *et al*., 2007). This is in line with findings from the literature which show that financial resources and education do not replace tenure security, which is the institutional protection of tenure (Payne, 2012; Swope & Hernández, 2019; Joshi *et al*., 2023).

However, research on urban housing is heavily skewed towards the two largest cities of Tanzania, namely Dar es Salaam and Mwanza, while secondary cities like Arusha, Mbeya, Tanga, and Dodoma, with rapidly growing populations, are under-examined in Tanzania (Magina *et al*., 2020; Zhang *et al*., 2020; Kolowa *et al*., 2024). As the share of recent urban growth increases in these cities (NBS, 2022), they suffer from low institutional capabilities, a combination of tenure forms and highly uneven housing and infrastructure (Zhang *et al*., 2020; Kolowa *et al*., 2024). Although comparative studies suggest that informal self-built houses are well connected to household wealth accumulation as well as to long-term security (Andreasen *et al*., 2020), and that formal titles are not always accompanied by a premium in terms of quality or price when informal tenure is strong (Panman & Lozano Gracia, 2021), very few existing studies split up these impacts by the different tenure categories. In addition, while the effects of perceived tenure insecurity (as opposed to legal insecurity) have not been extensively studied in the secondary cities of Tanzania, a growing body of evidence in other African contexts indicates that tenure type and perceived insecurity have complex effects on investments, access to services, and disaster risk (McDermott *et al*., 2021; Joshi *et al*., 2023; Urbanization without Belonging, 2025).

This study fills these gaps by creating a standardised Housing Quality Index (HQI) and examining the impact of tenure status on housing quality in secondary cities of Tanzania using NPS Wave 5 data. The study also considers socioeconomic factors and interaction effects of wealth, education, and migration, to capture how institutional constraints and household resources jointly determine housing outcomes (Andreasen *et al*., 2020; Manara & Regan, 2024). The statistics, the behavioural evidence and the documented tenure penalty all tell the same story: without secure tenure, household wealth and education are not enough to replace the protections provided by institutions that enable continuous investment in housing quality (Byamugisha & Dubosse, 2023; Payne, 2012; Swope & Hernández, 2019). The findings therefore point to an urgent need to reform policies to enhance tenure security and promote inclusive, resilient urban development in Tanzania's secondary cities (Magina *et al*., 2020; Manara & Pani, 2023; Nuhu *et al*., 2023).

1.2. Specific objectives

1. To examine the effect of tenure status (formal, informal, and others) on housing quality in Tanzania's secondary cities.
2. To assess whether household wealth moderates the relationship between tenure status and housing quality through tenure × wealth interaction effects.
3. To determine whether the educational attainment of the household head alters the impact of tenure status on housing quality.

To determine whether migration status influences the housing outcomes associated with different tenure arrangements.

2. Literature Review

Rapid urbanisation in sub-Saharan Africa has pushed debates on housing far beyond a simple formal–informal divide, towards questions of how different tenure arrangements, governance systems, and household characteristics shape housing quality, especially in secondary and peri-urban cities. The importance of secure land tenure as a public service is well established, and it has significant impacts on agricultural production, urban land values, and welfare in the region (Byamugisha & Dubosse, 2023). Cost–benefit analyses demonstrate that programmes that enhance tenure security can boost urban property values by approximately 25% on average and yield a wide social dividend, such as improved schooling, nutrition, and investment capacity (Byamugisha & Dubosse, 2023). Concurrently,

land administration continues to be plagued by corruption, elite capture, and weak institutional capacity, resulting in a huge proportion of land is not formally registered in urban areas (Byamugisha & Dubosse, 2023).

Other studies, more specific to the context, relate insecure tenure to poor dwellings. Lack of legal recognition and protection from eviction, coupled with community rights that are based entirely on informal sources, go hand in hand with the proliferation of shantytowns, slum-like structures, and regular demolition of their homes, whereas legal access to land and protection from arbitrary eviction have been linked to more sustainable housing production (Ekpodessi & Nakamura, 2023). Poor housing conditions in the case of Bamenda, Cameroon, are driven by the high proportion of informal land ownership (75%) or customary land ownership (75%) and rapid rural-urban migration (Akenji & Neba, 2025). Insecurity of tenure is itself a key aspect of deprivation in informal settlements, not simply a background legal status, through a detailed survey of informal settlements in Asaba, Nigeria, which reveals the three latent "housing deficits", that is, public service, structural habitability, and tenure security deficit (Onyemenam *et al*., 2025). This is corroborated by related studies which have been conducted in the peri-urban Lagos-Ibadan corridor and in Enugu in Nigeria that show how low rents and employment opportunities draw households into dilapidated settlements characterised by overcrowding, inadequate service provisions, and weak tenure security (Tajudeen *et al*., 2025; Jiburum *et al*., 2024; Ogbonna *et al*., 2024).

More recent large-scale spatial analyses extend this picture, quantifying infrastructure deficits and informality at street block level. Bettencourt and Marchio (2023) demonstrate that physical indicators of informality (such as limited street access, difficulty in extending services, and fragmented built form) systematically correlate with several indicators of human deprivation in all of sub-Saharan Africa using building footprint data. In urban areas, infrastructure is generally of higher quality in the core areas than it is in the surrounding peri-urban and rural regions, but within cities there is a well-defined continuum of quality of local development that is strongly correlated with informal settlements (Bettencourt & Marchio, 2025; Bettencourt & Marchio, 2023). This is evident in case evidence from Bonaberi, Douala, Cameroon where housing is rudimentary and overcrowded, sanitation is poor, waste is openly dumped, and drainage is blocked, resulting in severe socio-environmental and health risks, though there are some upgrading opportunities (Adamu *et al*., 2025). Few studies are found in the slums of Enugu where the inhabitants share living space, have only one room, poor sanitation

conditions with no adequate toilets, and a high burden of malaria and other diseases (Ogbonna *et al*., 2024).

Furthermore, research on the Residential Licence in Dar es Salaam finds that there is significant institutional drift, including waning uptake and renewal of Residential Licences, poor record keeping, and many landholders favour other forms of de facto or de jure proof of ownership (Manara & Pani, 2023). Household wealth is associated with acquiring and maintaining these licences, with higher income and multi-plot owners more likely to have access to them and obtain housing benefits from them (Manara & Pani, 2023). More homogeneous and cohesive neighbourhoods in urban Tanzania, with stronger informal systems have lower individual titling rates, and newcomers, women, and marginalised landholders rely more on statutory rights (Manara, 2025). However, survey and vignette evidence indicate that many residents believe that formalisation will result in increased tenure security and improved public goods, even if informal tenure offers some security of tenure. A related study explicitly separates tenure security into its various components, and demonstrates through willingness to pay experiments how the landholder values the various attributes of property rights versus informal tenure (Manara & Regan, 2024). In sum, these studies indicate that "formal" and "informal" tenure are not synonymous, and that while the perception of security may influence the demand for titles, social relations and affordability also help to determine households' actual experience of security.

The link between tenure and housing is further mediated by governance and policy frameworks. In peri-urban Tanzania, local stakeholders point to the slow pace or failure of regularisation schemes due to the complex dynamics among stakeholders, their weak accountability and opaque practices, which demoralise landholders and hinder housebuilding and infrastructure development in anticipation of regularisation. (Nuhu *et al*., 2023). A review of the literature on informal settlements in peri-urban SSA reveals that the conditions of informality are maintained by socioeconomic exclusion, dual land governance (customary and statutory), and weak institutional coordination, while environmental risks like sanitation and waste management are not adequately addressed (Olaniran & Aule, 2025). Importantly, the review does not mention design and planning-led upgrading strategies that can integrate informal areas into the formal city without displacing residents, but with the aim of improving housing quality (Olaniran & Aule, 2025). The comparative analysis of informal settlement upgrading strategies revealed that state-led projects have the ability to provide for large-scale infrastructure

but have been shown to be non-participatory, and can even lead to gentrification, while community led projects increase local empowerment and accessibility but have been linked to resource constraints and limited official recognition (Dinye *et al*., 2025). Meanwhile, the work from Nairobi demonstrates that non-compliant or 'informal' middle-class developments, despite not being subject to planning regulations, can be used to achieve quality housing and address key market failures (Mwangi, 2024). Recent syntheses on jugaad urbanism in SSA further highlight that dwelling in slums and shantytowns is characterised by creative, circular and resilient practices (reuse of materials, self-provision of infrastructure, etc.) that help to build more sustainable and inclusive cities, despite precarious tenure security (Azunre *et al*., 2025).

Collectively, this literature creates several important points on which this study focuses. In general, secure tenure, either formal or de facto, is linked to greater investment and higher quality housing, but informal tenure and hybrid arrangements can facilitate significant upgrading where residents feel they have little risk of eviction (Byamugisha & Dubosse, 2023; Ekpodessi & Nakamura, 2023; Akenji & Neba, 2025; Onyemenam *et al*., 2025; Manara & Pani, 2023; Manara, 2025; Manara & Regan, 2024). Second, housing quality in informal and peri-urban areas is influenced by factors beyond the tenure labels, infrastructure deficits, spatial form, and socio-environmental conditions, which can vary significantly across and within cities (Tajudeen *et al*., 2025; Bettencourt & Marchio, 2025; Bettencourt & Marchio, 2023; Adamu *et al*., 2025; Jiburum *et al*., 2024; Ogbonna *et al*., 2024; Olaniran & Aule, 2025). Third, household-level factors affect both the likelihood of having more secure tenure (e.g. Residential Licences) and the ability to make tangible housing improvements to any tenure status (Akenji & Neba, 2025; Tajudeen *et al*., 2025; Jiburum *et al*., 2024; Manara & Pani, 2023; Manara, 2025). However, despite the detailed research on tenure security, informality, and upgrading, there is still little empirical evidence available from Tanzania's secondary cities that simultaneously considers the association between different tenure categories (formal, informal, and others) and measures of housing quality, the mediating effect of household wealth and education levels on this relationship, and the link between migration status and housing outcomes across different tenure categories.

This study fills an identified gap in the literature by including secondary cities in Tanzania and explicitly modelling the relationships between tenure status, household wealth, education of the household head, and migration status. It goes beyond a formal–informal dichotomy and contributes to a more sophisticated

understanding of how tenure insecurity and social inequality intersect to yield a variety of housing outcomes in an under-researched and fast-urbanising urban context.

3. Research Methodology

3.1. Data source

The research is based on Tanzania National Panel Survey (NPS), which is a nationally representative household survey conducted by the National Bureau of Statistics (NBS) as part of the Living Standards Measurement Study-Integrated Surveys on Agriculture (LSMS-ISA). The NPS uses a multi-stage stratified cluster sampling design and ensures it is representative on national, zonal, and urban-rural levels. The latest Wave 5 (2020-2022) has been used in the analysis and includes 23,592 households in all 31 regions of Tanzania Mainland and Zanzibar. Among these, 14,168 households (60.1%) are residing in rural areas and 9,424 (39.9%) in urban areas which covers the various settlement patterns in the country in a comprehensively. In the context of this research, the sample will be limited to secondary cities, which are urban areas not in the centre of the main economic activity in Dar es Salaam and Mwanza. Using this criterion results in the final analytical sample of 2,411 households who have full details of housing characteristics, tenure arrangement, and household demographics.

3.2 .Variable's description

3.2.1. Housing Quality Index

The dependent variable here is a standardized Housing Quality Index (HQI) which is created through the principal component analysis (PCA) of seven binary variables of structural quality and basic services. This is done through recognized asset index methodologies that are common in development and housing studies (Filmer & Pritchett, 2001; Vyas & Kumaranayake, 2006), and enable the index to represent the multidimensional nature of housing conditions better than any individual variable.

The seven elements are finished floor, finished walls, finished roof, refined toilet, refined water source, accessibility of electricity, and clean cooking fuel. All indicators take the values 1 when the household has the improved standard and 0 when it does not. Before PCA is performed all mentioned variables are made equal. As shown in Figure 1, the PCA outcomes indicate that the first principal component has an eigenvalue of 2.47, and it explains 35.3% of all the variance which is significantly greater than any other component. Such a significant decrease in the number of

eigenvalues proves that the first element represents the majority of the common variation among the housing indicators, and thus it is reasonable to use it as the HQI.

Table 1 PCA results

Component	Eigen value	Difference	Proportion	Cumulative
Comp1	2.46936	1.4603	0.3528	0.3528
Comp2	1.00909	0.1037	0.1442	0.4969
Comp3	0.99872	0.2046	0.1427	0.6396
Comp4	0.79411	0.7079	0.1134	0.7530
Comp5	0.72332	0.2022	0.1033	0.8564
Comp6	0.52110	0.0368	0.0744	0.9308
Comp7	0.48428		0.0692	1.0000

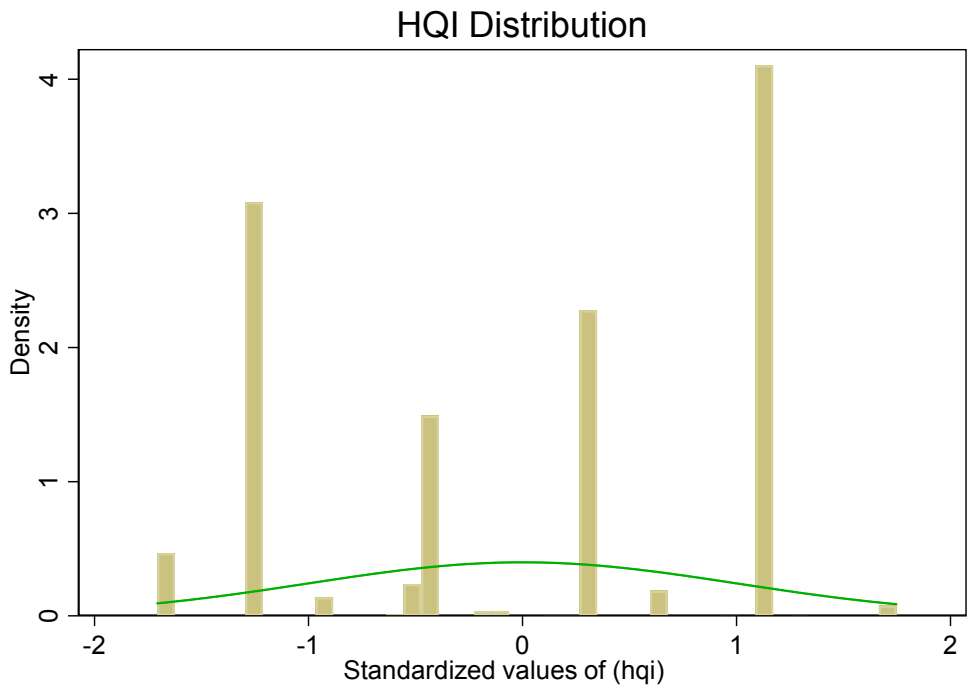

Figure 1. Distribution of the Housing Quality Index (HQI)

All the seven indicators have positive loadings on the first component with loadings ranging between 0.31 (improved water source) and 0.49 (finished floor). These consistent and equal positive loadings show that HQI represents a general underlying construct of housing quality and is not a product of a single dimension.

Higher-order factors may only represent differences in finer detail between particular facilities and not the underlying latent structure, which is one more reason why it is better to retain the first component. The resultant HQI is standardized with mean equal to zero and variance equal to one to obtain meaningful results and to be within the range of approximately -2.5 to 3.2 in the sample of analysis. As shown in the figure 1, it demonstrates that the distribution of the HQI is almost a normal value and therefore can be used in the linear regression models.

3.2.2. Independent Variables

The primary independent variable is tenure status, developed based on both tenure type and documentation status from the NPS. Like traditional approaches in the tenure-security literature, and drawing on the empirical evidence from the secondary cities in Tanzania, households are divided into three analytically relevant groups: formal owners, informal owners, and those in alternative tenure arrangements. Formal owners are households with legal titles, e.g., title deeds, certificates of occupancy, or residential licences, and who own their housing. Informal ownership is not registered or documented, but depends on customary rights, unregistered land-sale agreements, or informal inheritance, and without legal instruments, it is still subject to tenure insecurity and may have limitations on housing investment. The third group are the non-owner, non-renter households, including those in free accommodation, employer-provided housing, or nomadic housing, which encompass a range of informal and sometimes ad hoc forms of housing. This three-part classification not only reflects the legal status of tenures but also their practical situation, allowing for the proper analysis of the effect of tenure security on housing quality in secondary cities.

Household wealth is included as a central independent variable since economic resources have a strong influence on housing outcomes; it is coded by asset quintiles as done in the Demographic and Health Survey methodology, and thus gives a consistent measure of long-term welfare. The study examines the impact of economic endowment on the disadvantages of institutional insecurity, by testing whether the "tenure penalty" exists at the highest levels of economic endowment, and whether the effects of insecure tenure diminish or disappear once households are wealthier. Total years of completed schooling of the household head is the operationalization of human capital, bargaining power, and the capacity to deal with formal housing markets. The study looks at how the disadvantages of informal ownership are offset by the advantages of education, in the context of tenure status, to understand whether education can alleviate structural disadvantage or

whether the disadvantages of informal housing persist beyond the advantages of education. Last, the migration status of the household head is presented as a binary variable that indicates whether the household head is not living in the region where they were born. Migration can have an impact on housing outcomes in a number of ways, such as potential loss of social networks, loss of access to information or selective settlement patterns, either migrants may be disadvantaged in terms of secure housing, or they may bring new resources and opportunities to the home. The study examines whether migration affects housing outcomes by tenure as well as the effects of migration in concert with tenure status, to determine whether the tenure penalty persists even after migration, or whether migration changes the pattern of the tenure penalty.

3.3. Multiple Linear Regression Model

This study uses a multiple regression analysis of the ordinary least squares (OLS) type for the analysis of the relationship between tenure status and housing quality in secondary cities in Tanzania. The dependent variable is the Housing Quality Index (HQI), which is a standardised continuous index based on the principal component analysis of seven indicators of structural quality and basic services. Given that HQI is approximately normally distributed, the OLS method is a suitable estimation method for identifying the average difference in housing quality between households. Tenure status is the key independent variable, which is divided into formal owners, informal owners, and other tenure arrangements. To meet the research goals, the analysis includes interaction terms between tenure status and the household's wealth status, education, and migration status. Interaction effects enable the study to explore the possibility that the effect of tenure insecurity is moderated or changed by socioeconomic resources. The full model is specified as follows:

$$\begin{aligned}\mathrm{HQI} = {} & \beta_0 + \beta_1 \mathrm{TenureStatus} + \beta_2 \mathrm{Wealth} + \beta_3 \mathrm{Education} + \beta_4\, \mathrm{MigrationStatus} \\ & + \beta_5(\mathrm{TenureStatus} \times \mathrm{Wealth}) + \beta_6(\mathrm{TenureStatus} \times \mathrm{Education}) + \beta_7(\mathrm{TenureStatus} \times \mathrm{MigrationStatus}) \\ & + \beta_8 \mathrm{X} + \epsilon_i\end{aligned}$$

where Formal-Owner is the omitted reference category; InformalOwner and Other-Tenure are dummy variables for the two non-formal tenure categories; Wealth, Education, and Migrant represent household wealth quintiles, years of schooling of the household head, and migration status respectively; the interaction terms (×) capture whether the effect of tenure status on housing quality varies by these socioeconomic characteristics; X is a vector of control variables including age and gender of the household head, household size, and dependency ratio; and ε

is the error term. The errors are not independent, meaning that failure to account for this clustering could lead to underestimation of the standard errors, and to an overestimate of the statistical significance (Cameron & Miller, 2015). Thus, the analysis uses cluster-robust standard errors at the enumeration-area level, where the intra-cluster correlation (Cameron & Miller, 2015) and heteroskedasticity are accounted for while the errors within the cluster are correlated but not between different clusters. Fixed neighbourhood-level effects are included at the same level, accounting for unobserved neighbourhood characteristics like the infrastructure, local housing markets, and regulations (Lee & Pustejovsky, 2024), and survey sampling weights are used to ensure the representativeness of the secondary city population.

3.3.1. Addressing the Potential Endogeneity of Tenure Status

One of the econometric issues of interest in this context is the potential endogeneity of tenure status. Tenure is partially a household choice, and may be correlated with unobserved characteristics that also affect housing quality (e.g., preferences, risk attitudes, unmeasured wealth, or local institutional quality) that violate the OLS condition of uncorrelatedness between regressors and error terms and that could influence the estimated tenure coefficients (Ullah *et al*., 2021; Bascle, 2008; van Gelder & Luciano, 2015). This may be tackled using instrumental variable or endogenous switching regression methods, as done in recent land tenure formalisation works in Tanzania (Msangi *et al*., 2022), or in tenure–investment models (Dong & Hui, 2022; Spencer *et al*., 2023). The NPS data for the secondary cities, however, lacks strong and credible instruments that are clearly related to urban tenure status but presumably not included in measures of housing quality, and methodological studies demonstrate that weak instruments or instruments that are not credible can result in estimates that are more biased and less precise than more conventional OLS methods (Ullah *et al*., 2021; Eckert & Hohberger, 2022; Bascle, 2008). To account for these data limitations, the analysis proceeds along common lines in large cross-sectional studies, using OLS with rich household controls, cluster-robust standard errors and interpreting the coefficients on tenure as conditional associations rather than fully causal effects, and recognising that there may be some residual selection bias (van Gelder & Luciano, 2015; Msangi *et al*., 2022; Spencer *et al*., 2023). Moreover, diagnostic checks revolve around the hypotheses of the assumptions applicable to an unbiased OLS estimation: no multicollinearity (as measured by VIFs), appropriate functional form (Ramsey RESET test), no influential observations (Cook's distance), and linearity (partial regression plots). Since cluster-robust standard errors can already account

for heteroskedasticity and non-normal residuals and intra-cluster correlation, inferential validity does not need a formal test of homoskedasticity and normality (Cameron & Miller, 2015; Zhang & Lai, 2024). This modelling framework strikes a trade-off between econometric rigour and the actualities of cross-sectional survey data where unobserved variables inevitably come into play in determining housing outcomes.

4. Results and Discussion

4.1. Descriptive Result

Figure 2 below shows that the descriptive statistics of housing quality and tenure types in the secondary cities display significant differences in housing quality. The median housing quality is the highest among formal owners, and the interquartile range is rather small, which means that the formal owners are likely to have more stable sufficient housing conditions. Informal owners, on the other hand have the lowest median HQI and the most dispersed values indicating poorer average conditions together with more heterogeneity in this group. This tendency can be interpreted as structural insecurity of undocumented ownership which might restrict the investments in durable materials and the fundamental services.

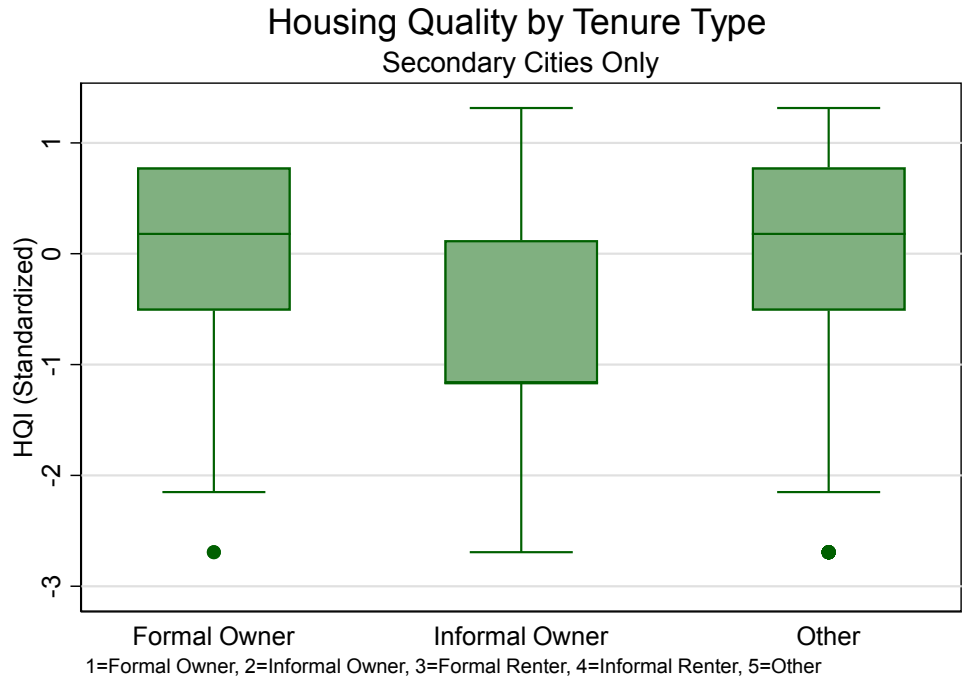

Figure 2. Housing Quality by Tenure Type

The category of household in the "other category", namely the households in free accommodation, provided by the employer, and other non-owner-based housing, demonstrates a similar median HQI with wider distribution, meaning that on the one hand, there are households with comparatively good housing, and on the other, there are households with significantly poorer housing. That outliers exist in all categories shows the variety of the housing conditions in the secondary city, yet, the general tendency indicates the existence of the tenure gradient: formal ownership is associated with higher and less fluctuate housing quality, and informal ownership is related to systematically worse results.

4.2. Model Results

4.2.1. Impact of Informal Ownership on Housing Quality Index

As seen in the table 2 below, the regression outcomes show that there is a significant disadvantage for households owned informally in terms of housing quality relative to those owned formally. The coefficient for informal tenure is −0.42 ($p = 0.003$), which means that HQI is significantly lower when tunure are not held formally. This reaffirms the existence of a tenure penalty – that those without legal documentation are less likely to invest in the quality of the durable housing materials and improved services. This finding aligns with earlier research that has focused on the structural elements of tenure insecurity. For instance, the authors of the McDermott *et al*. (2021) & Swope & Hernández (2019) studies have found that households with insecure tenures do not invest in their housing because they fear eviction or demolition. In the same way, Payne (2012) has suggested that institutional tenure security is not replaceable by financial resources or education. This finding is consistent with findings from Dar es Salaam, Tanzania, that informal households did not have a higher probability of upgrading housing even if they possessed assets (Katiba Institute, 2015; Kombe, 2010). This negative and significant relationship between informal ownership and HQI thus indicates that tenure insecurity is a structural constraint that impacts housing quality, and further illustrates why secure tenure is necessary for inclusive urban development.

4.2.2. Impact of Other type of tenure on HQI

The results show that households living in other housing arrangements, like those with free accommodation, those provided by employers, or those in hybrid arrangements live with a positive and significant impact on housing quality, compared to formal owners ($\beta = +0.25$, $p = 0.027$). This implies that the semi-formal/ hybrid forms of ownership may sometimes offer better access to infrastructure and services than traditional formal ownership. This discovery is important in

two ways: it contradicts the well-established belief that formal tenure is the key to better housing results, and it is particularly striking because the research was conducted in an area where informal tenure is generally common. It is possible that people in the other tenure categories could obtain institutional or organizational assistance in the form of a scheme of employer housing or access to services within the community without the involvement of formal documentation. This is consistent with the findings of Manara and Pani (2023), who noted that, despite weak institutional uptake, hybrid tenure forms such as residential licences can have practical benefits. Likewise, Akenji and Neba (2025) reported that service access in the context of employer-linked housing arrangements in Cameroon was better than insecure informal housing.

The wealth interaction plot (Figure 5) also shows that having other tenure is positively associated, in every quintile, with both having formal and informal tenure. This implies that those households in these arrangements might use institutional/infrastructural resources that are not solely reliant on wealth. The interaction between other tenure and wealth, however, is statistically insignificant ($\beta = -0.009$, $p = 0.903$), and suggests that the impact of wealth is not significant for these households. Likewise, the interaction effect with education is negligible and insignificant ($\beta = 0.023$, $p = 0.151$), which further supports the argument that the advantages of other tenures are more institutional than personal. In summary, the results show that other tenure arrangements can outperform formal ownership in certain contexts, highlighting the importance of recognizing hybrid and semi-formal housing systems in policy debates. This resonates with the wider literature on the need to move beyond informality to consider the variety of housing tenures that influences housing outcomes in African cities (Ekpodessi & Nakamura, 2023; Onyemenam *et al*., 2025).

4.2.3. Impact of Wealth on HQI and Its Interaction with Tenure

Results indicate that household wealth is positively related, and significantly related to housing quality ($\beta = 0.16$; $p = 0.000$). This means that the HQI will continuously increase as households move up to higher income quintiles. This is in line with the findings of Andreasen *et al*. (2020) and Byamugisha and Dubosse (2023) that demonstrate how economic resources influence housing outcomes in African cities. But the interaction terms suggest that inequalities based on tenure are not completely alleviated in wealthier contexts. Wealth has a positive and significant relationship with informal ownership ($\beta = 0.286$, $p = 0.008$), which indicates that the informal owner's wealth helps to enhance the quality of the

house. But the tenure penalty is clear: the poorest informal households do not have the same quality of housing as the middle-income formal owner households.

This is confirmed visually with the wealth housing quality gradient (Figure 5) as the informal tenure lines are consistently below the formal tenure lines and the informal lines are increasing with wealth. It supports Payne (2012) and Swope and Hernández (2019). By contrast, the interaction between other tenure and wealth is negligible and statistically insignificant ($\beta = -0.009$, $p = 0.903$). This indicates that the wealth of households in hybrid and employer-provided housing conditions does not account for much of the difference in outcomes between the two types of housing. These may already experience institutional/infrastructural access that is not heavily reliant on economic status, similar to what Manara and Pani (2023) observed about the possibility of semi-formal tenure arrangements to deliver housing benefits irrespective of the economic status of the household. To summarise, although wealth is an important factor in shaping housing quality, the analysis indicates that the impact of tenure on housing quality is not eliminated by wealth. This further supports the claim that tenure insecurity is a structural problem and is not entirely compensated for by household resources.

4.2.4. Impact of Education on HQI and Its Interaction with Tenure

The effect of education is positive and significant with a value of $\beta = 0.11$, $p = 0.000$, which means that education has a positive impact on housing quality. This means that one more year of schooling for the head of household boosts the HQI, which is a measure of the importance of human capital in facilitating households to move in the housing market, to access information, and to make more investment choices. This study is in line with some studies that highlight the role of education in improving household capacity for improving their housing, such as those conducted by (Andreasen *et al*., 2020) and (Manara and Regan, 2024). This relationship between informal tenure and education is, however, of limited significance ($\beta = 0.036$, $p = 0.058$). This means that although the education of informal owners may have positive effects on their housing conditions, it is not enough to compensate for their structural disadvantage due to insecure tenure. This can be seen visually in the education-housing quality gradient in Figure 6; the informal owners are always at the bottom of the scale, regardless of the level of education. This aligns with Onyemenam *et al*. (2025), who stated that tenure insecurity is an aspect of deprivation that cannot be removed through education.

In other tenure types, the effect on education is small and statistically not significant ($\beta = 0.023$, $p = 0.151$). This suggests that the impact of education is

not significant in hybrid or employer-provided housing environments, where the institutional or infrastructural availability may be more important than the individual's level of education. Manara (2025) also reported a similar result: the management of semi-formal tenure is largely based on a collective or institutionalized approach, not on individual resources. To summarise, education is a significant factor in determining the quality of housing, but it is education's interaction effect that demonstrates that education alone cannot replace secure tenancy. Despite improvements in household capacity through education, the continuity of the tenure penalty indicates that institutional tenure security is key to equitable housing outcomes of secondary cities in Tanzania.

4.2.5. Impact of Migration on HQI and Its Interaction with Tenure

Migration status has a non-significant positive effect on housing quality ($\beta = 0.06$, $p = 0.214$). This indicates that migrants might have access to favourable opportunity structures and/or networks in secondary cities, but this does not result in statistically significant improvements in their housing. The interaction between informal tenure and migration is negative, but not significant ($\beta = -0.279$, $p = 0.559$); the interaction between other tenure and migration is negative, but not significant ($\beta = -0.314$, $p = 0.289$). These findings suggest that migration does not have a significant impact on the tenure-housing relationship. In other words, a disadvantage from the informal tenure on migration persists as informal owners are disadvantaged relative to formal owners, and hybrid tenure on migration does not offer much benefit.

This conclusion is supported by the results of the migration housing quality graph (Figure 7), in which the lines of migrants and non-migrants are parallel, and the confidence intervals for the two groups are overlapping. The lack of change in tenure inequality for both groups suggests that migration does not redefine the structural boundaries of insecure tenure. This is in line with findings from Urbanization without Belonging (2025), which found that there is no trade-off between mobility and institutional tenure security. To sum up, the relationship between migration and housing quality is relatively small and the relationship between migration and tenure is not significant. The findings confirm that tenure is a key determinant of housing outcomes and that migration is a limited housing equality instrument in secondary cities in Tanzania.

4.2.6. Impact of Control Variables on Housing Quality Index

Moreover, household-level control variables are play a significant role in housing quality. Both dependency ratio ($\beta = -0.10$, $p = 0.005$) and household size ($\beta = -0.08$,

p = 0.005) have significant negative effects on HQI. This suggests that there is a low endowment ceiling for households with greater dependency ratios or larger household sizes that diminishes their capacity for investment in durable housing and services. This is in line with other studies including Weimann and Oni (2019), which found that increased dependency is associated with reduced wellbeing and a smaller upgrading potential within informal settlements, and Richards *et al*. (2007) which also, found that increased dependency is associated with reduced wellbeing.

Table 2 Models results

Variable		Coefficient	P-Value
Tenure Status (Ref: Formal)			
Informal owner	−0.42	0.003	
Other tenure	0.25		0.027
Main effect			
Wealth	0.16	0.000	
Education	0.11		0.000
Migration	0.06	0.214	
Interaction Effect			
Informal Owner × Wealth	0.286		0.008
Other Tenure × Wealth	-0.009		0.903
Informal Owner × Education	0.036		0.058
Other Tenure × Education	0.023		0.151
Informal Owner × Migration	-0.279		0.559
Other Tenure × Migration	-0.314		0.289
Control Effect			
Age	-0.001		0.842
Male	-0.148		0.273
Dependency Ratio	−0.10	0.005	
Household size	−0.08	0.005	

In contrast, the age of a household head and the headship of a male are not significant predictors of housing quality (β = −0.001, p = 0.842 and β = −0.148, p = 0.273, respectively). This indicates that demographic factors (age, gender) have a restricted impact, as opposed to structural factors (tenure status, socioeconomic resources). Andreasen *et al*. (2020) arrived at similar findings in their study of housing outcomes in the urban areas of Tanzania, which concluded that institutional and economic factors have more impact than demographic factors. Therefore, the study concludes that the control variables reinforce the broader narrative: structural

and institutional factors dominate housing quality outcomes, while demographic characteristics have weaker or negligible effects. Higher dependency ratios, and larger household sizes, play a significant role in making housing more difficult, but tenure security and the socioeconomic resources of households are the most important factors.

4.3. Key Findings Visualisation

4.3.1. Key Insight from the Wealth Interaction Plot

The regression results are also supported by the wealth–housing quality gradient (Figure 5). The lines show that there is a positive linear relationship between wealth and housing quality for all tenures. The sizes and duration of the gaps between the lines, however, reveal the structural nature of the inequality of tenure. Formal owner homes have consistently higher quality than informal owner homes at all income levels, with even the wealthiest informal households not achieving the quality of the middle-income formal households. This visual evidence provides support for the regression result that the informal tenure had a significant negative impact (β = −0.42, p = 0.003), while the interaction of informal tenure and wealth had a positive impact, though not fully compensated (β = 0.286, p = 0.008).

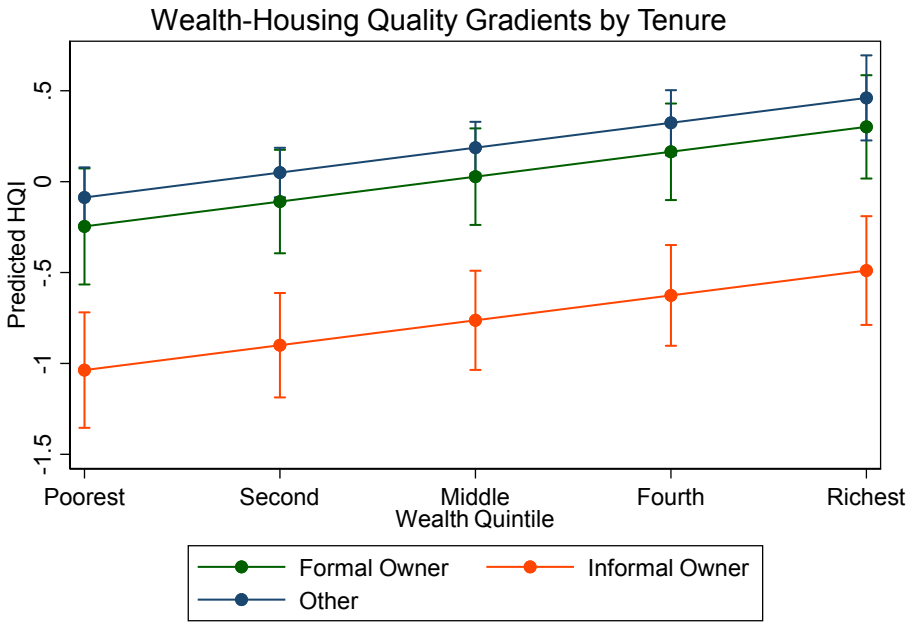

Figure 3. Wealth-Housing Quality Gradients by Tenure

The positive coefficient for other tenure (β = +0.25, p = 0.027) is reflected in the

ranking of the "other tenure" line above both formal and informal owners in every wealth quintile. This implies that the services or infrastructure may be available more easily to the population in hybrid or employer provided housing arrangements, regardless of their wealth. The lack of overlap of the lines supports the finding that in a certain sense, the tenure penalty cannot be offset by socioeconomic resources, even when these are measured visually. This is in line with the theoretical argument of Payne (2012) and Byamugisha and Dubosse (2023) that institutional tenure security (not just household wealth) is necessary to achieve equity in housing outcomes in African cities.

4.3.2. Key Insight from the Education Interaction Plot

The education–housing quality gradient (Figure 6) is clear in the visualization. Education makes a strong positive difference to housing quality (β = 0.11, p = 0.000) as there is a consistent positive relationship across different tenures. The fact that the gaps between the lines are persisting nevertheless, however, shows the structural constraints of education in addressing tenure insecurity. Formal owners have an edge in predicting housing quality at all levels of education, and even informal owners with at least as many years of education are disadvantaged. Although this result is very marginal (β = 0.036, p = 0.058), it is directly confirmed by this visual evidence. Housing outcomes for informal owners are also better the more one is educated, and the gap will never match those of formal owners.

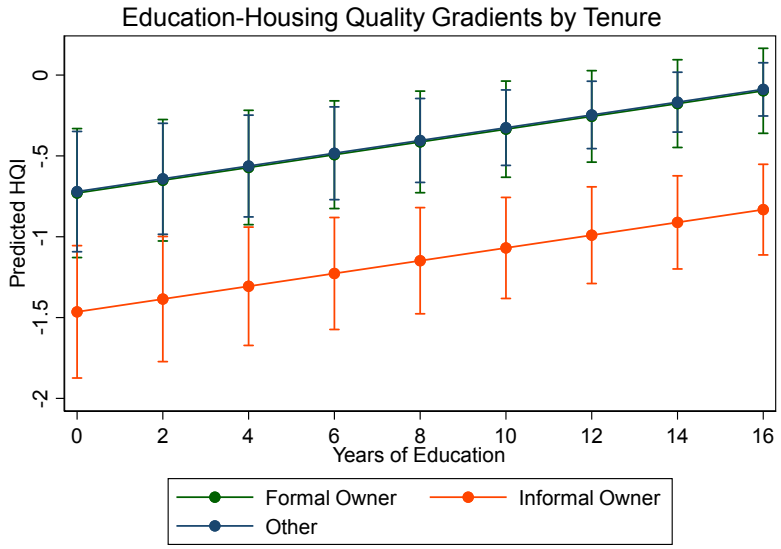

Figure 4 presents Education-Housing Quality Gradients by Tenure

Continued line separation is a testament to the fact that insecure tenure cannot

be fully compensated for by schooling. This aligns with Onyemenam *et al*. (2025), who view tenure insecurity as a form of deprivation that can't be eliminated through education. Finally, the conclusion that education improves household capacities is reinforced by the visualization, but has little ability to counteract insecure tenure institutionalization. There is a structural housing inequality in the secondary cities of Tanzania, where having secure tenure is the key determinant of outcomes.

4.3.3. Key Insight from the Migration Interaction Plot

The migration – housing quality gradient (Figure 7) indicates that in each tenure category migrants on average have slightly higher predicted housing quality than non-migrants. The differences between the groups, however, are small, non-significant, and within overlapping 95% confidence intervals. The result of the regression is supported by this visual evidence, migration only has a minor, non-significant positive effect (β = 0.06, p = 0.214). One of its most striking features is the fact that the inequality of the tenure of position is not affected by migration. Households that are informal owners are materially disadvantaged compared to formal owners, formal non migrants, and migrants. The parallel form of the lines is proof that migration does not mitigate the cost of insecure tenure. This is similar to the regression interaction terms, which were negative and not significant (informal × migration: β = −0.279, p = 0.559; other × migration: β = −0.314, p = 0.289).

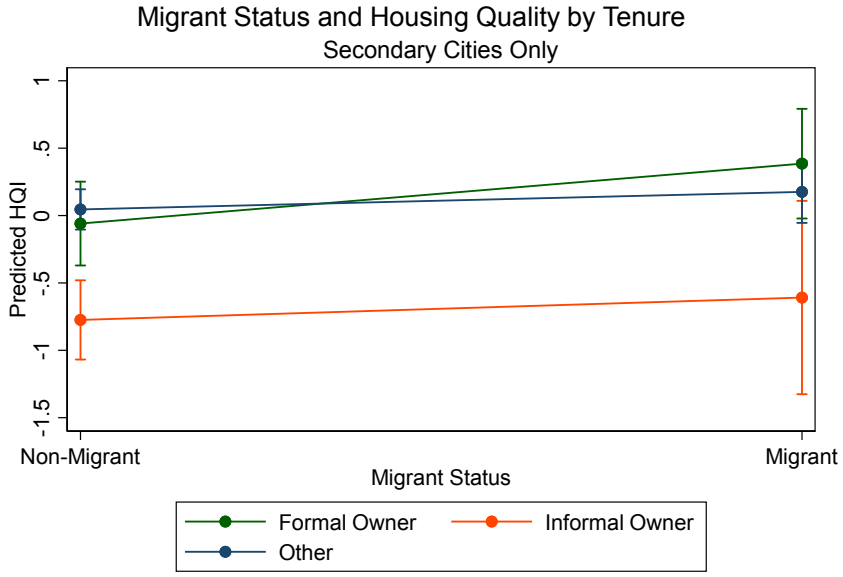

Figure 5. Migration Status and Housing Quality by Tenure

Based on these findings, it appears that whilst migration can offer selective

mobility, support urban networks, or access to opportunity structures, it does not in itself change the tenure-housing relationship. This is in line with the findings of the Urbanization without Belonging report (2025), which states that mobility and relocation can not replace institutional tenure security. To conclude, the visualization highlights the finding that migration does contribute to improving a home's quality but is not enough to alter the structural determinants of tenure insecurity.

4.3. Model Specification Checks:

4.3.1. Ramsey RESET Test

A Ramsey RESET test was performed to determine if the model has omitted variable bias or incorrect functional form. The null-hypothesis is that the model is correctly specified. The test result gives an F-statistic of 1.41 with a corresponding p-value of 0.243. The p value is larger than the commonly accepted significance value of 0.05, therefore, the null hypothesis is not rejected. This means that there is no evidence of omitted nonlinear combinations of predictors and/or inappropriate functional form as a result of the statistical analysis. Hence, the basic model is properly specified and the regression estimates are considered valid.

4.3.2. Cook's Distance (Influential Observations)

Cook's distance was computed to determine if any one observation has an undue influence on the regression coefficients. The numerical results show that the highest Cook's Distance is 0.134 for the sample, and the other Cook's distance values decrease: 0.072, 0.045, 0.040, and 0.037. All values are significantly lower than the traditional limit of 1.0, suggesting that none of the individual observations is so powerful that it could influence the model coefficients significantly. The Cook's distance plot visually confirms this (also, nearly all observations are near 0, and only a few have somewhat larger but still reasonably acceptable distances). There is no evidence of outliers or high-leverage points in the graph that might be affecting the results of the regression. To provide an additional robustness check, the model was refitted without the observation with the largest Cook's distance (0.134), and the resulting coefficients were almost the same. It verifies the reliability and robustness of the results.

4.3.4. Multicollinearity Test Result

The Variance Inflation Factors (VIFs) were used to detect multicollinearity among the explanatory variables. Since all of the VIF values were well below the commonly accepted value of 10 and the more strict value of 5, there was no evidence of problematic multicollinearity. Informal ownership (1.59), household size (1.74) and other tenure had the highest VIF value (1.89). Other variables (wealth quintile,

education, migrant status, age, gender and dependency ratio) were close to the VIF value of one. The overall VIF values ranged from 1.02 to 1.89, which had a low mean VIF value, indicating very little multicollinearity overall. The slightly higher VIF for other tenure might be due to a slight correlation with household size and informal ownership arrangements – households in informal tenure arrangements may also be larger. However, none of the VIF values exceed 5, which means that the high multicollinearity is not likely to stress the standard errors enough to impact on the coefficient estimates. Thus, the predictors reflect somewhat different aspects of the outcome, and the magnitudes of the coefficients are likely to be stable and easily interpreted.

4.3.5. Implications of Robustness Checks for Model Validity and Reliability

Overall, the robustness checks lend support to the validity and reliability of the overall model. The Ramsey RESET test is used to ensure internal validity by eliminating omitted variable bias and to verify the appropriateness of the linear functional form of the equation. The Cook's Distance analysis is used to assess reliability by showing that the results of the Cook's distance are not due to extreme observations or outliers, and that the results are consistent when removing the largest observation. Combined, these tests establish that the regression coefficients are reliable, consistent and generalizable, and the model is interpretable.

5. Conclusion

This paper explored the link between tenure status and housing quality in the secondary cities of Tanzania using Tanzania's National Population Survey Wave 5, and specifically investigated if household wealth, education, and migration status are moderators of this link. The results show that informal ownership is correlated with a considerable and substantial reduction in housing quality, despite the fact that the difference in household socioeconomic resources is accounted for. The penalty for tenure remains constant across all levels of wealth and education, thus indicating that tenure security in institutions cannot be traded for assets of a household or human capital. Notably, households in other types of tenure arrangements (e.g. employer-provided housing, free housing) also have relatively high levels of housing quality outcomes, indicating that the hybrid and semi-formal housing arrangements may sometimes offer institutional and infrastructural benefits that do not require formal documentation. Although both wealth and education alone have a positive effect on the quality of housing, their interaction indicates other important constraints: wealth has a strong effect on the housing

quality of the informal owner; Education has a marginal and weak effect for the informal owner. The process of migration, however, does not affect housing quality or the tenure-housing relationship, suggesting that migration does not replace secure tenure. The study suggests that to make meaningful strides in improving tenure security in Tanzania's secondary cities, the government should focus on interventions beyond the simple provision of formal documentation, such as recognising informal tenure without displacement, extend and enhance hybrid tenure arrangements that have proven effective (like employer-based housing schemes that have access to services), and focus on the most disadvantaged informal household groups: those with low incomes. Furthermore, tenure security should not be the subject of a separate legal debate, but be embedded within the framework of housing quality improvement policies and strategies, and efforts to improve economic growth or education should not be used as the primary solution to housing inequalities. Future interventions should also gather disaggregated information on the specific ways in which the housing benefits are being realised in "other tenure" arrangements in order to facilitate replication and scaling up at the level of secondary cities.

5.1. Limitation of the Study

There are several limitations of this study that need to be noted. First, the cross-sectional design of the NPS data means that causal inference is not possible; the analysis has a large number of household and neighbourhood variables but other unobserved factors such as household risk preferences, historical land claims, or local institutional quality could also impact the estimated relationships between tenure type and housing quality. Second, for the secondary cities sample, there were no credible IVs available, so the present study cannot fully account for the possible endogeneity of the tenure, and results should be interpreted as a conditional association rather than a causal effect. Third, although the HQI is multi-dimensional, it is constrained by the indicators available in the NPS and does not reflect important dimensions such as proximity to services (schools, health facilities), structural safety or exposure to environmental hazards, or overcrowding. Fourth, the group of other tenure is diverse, comprising persons living in free accommodation, among employer-provided housing, and other non-owner tenures, with the analysis not distinguishing between them in determining the nature of the positive association with housing quality, and hence reducing the robustness of the policy recommendations. Fifth, the study focuses only on secondary cities, and the results might not be generalizable to primary cities that have varying land markets and

institutions as well as tenure structures. Lastly, the study does not have longitudinal information to allow an examination of whether the security of tenure over time has an impact on housing quality improvements or downgrading, which would have been useful in understanding the dynamic relationship between tenure security and investment behaviour. Future research should address these limitations by undertaking needs-oriented research that follows these arrangements over time and that is qualitative in nature, which can shed light on the mechanisms involved in "other tenure" arrangements, as well as by creating context-specific tools to better capture causal effects in secondary city contexts.

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