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University Proximity and Residential Rental Values in Peri-Urban Dar es Salaam, Tanzania: Spatial Pricing Dynamics in Emerging African Housing Markets

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Abstract

While the influence of universities on surrounding housing markets is widely recognized, evidence from African cities remains scarce. This study investigates the effect of university proximity on residential rental values in peri-urban Dar es Salaam, Tanzania, focusing on neighborhoods around Ardhi University and the University of Dar es Salaam. Data were collected through structured questionnaires administered to landlords and tenants. Out of 150 targeted respondents, 107 valid questionnaires were completed, resulting in a response rate of 71.3%. The analysis employed a mixed-methods approach, combining a household survey with GIS data. A suite of spatial econometric techniques, including Geographically Weighted Regression (GWR), quantile regression, and kriging interpolation were applied to assess the spatial impact of proximity, property attributes, and local infrastructure on rental values for the year 2024. The findings indicate that proximity to university campuses leads to a significant rental premium, with rental values decreasing by approximately 25% per kilometer from Ardhi University. This trend reflects high demand from students, staff, and associated services. Additionally, property features such as dwelling type and utility availability significantly influence rental levels. However, affordability concerns and informal tenancy practices highlight ongoing challenges in urban housing governance. However, the cross-sectional design and potential for unobserved confounding factors suggest the findings represent a strong association rather than definitive causality. This study offers a novel empirical application of advanced spatial pricing models in peri-urban Tanzania, contributing to policy discussions on balancing rental market efficiency with affordability in rapidly urbanizing African cities.

Keywords: Rental values, University proximity, Hedonic pricing, Peri-urban housing, Tanzania

1.0 INTRODUCTION

Urban housing markets in the vicinity of universities reflect a nuanced relationship between locational advantage and rental formation. Proximity to higher education institutions often confers rental premiums, arising from concentrated demand and improved accessibility. While this relationship is well documented in developed economies, systematic empirical evidence from African cities remains sparse. Such contexts are shaped by extensive informal tenure arrangements, uneven infrastructure provision, and rapid peri-urban growth, conditions that may fundamentally alter established proximity–rent dynamics. Consequently, both the scale and spatial expression of university-related rental effects remain insufficiently understood in African peri-urban settings. The existing literature is particularly limited in studies that integrate temporal change with detailed spatial variation in rental patterns around university enclaves. This gap is both methodological and contextual, hindering rigorous housing market analysis and the development of informed policy interventions. In response, this study examines the effect of university proximity on residential rental values in peri-urban Dar es Salaam, Tanzania.

1.1 Relevance and Theoretical Foundations

This investigation is grounded in established real estate theories, which provide a framework for analyzing rental premiums. The value of university proximity is grounded in core real estate theories. Hedonic Pricing Theory underscores how rents reflect structural, environmental, and locational attributes (Rosen, 1974). Bid-Rent Theory similarly predicts higher land values near central or congested locations due to lower commuting costs (Alonso, 1964). Empirical studies from developed economies uphold these models, showing that proximity to institutions and amenities increases residential values (De Vor & de Groot, 2011; Aziz et al., 2023).

However, the applicability of these theories in emerging African contexts requires careful scrutiny, as they often present divergent spatial dynamics. However, emerging African contexts frequently exhibit divergent spatial dynamics. For example, studies in Ghana's Hohoe Municipality reveal that student inflows raise rental values (Kolamong & Olator, 2025). In Kenya, analyses of Nairobi's housing market suggest that proximity to amenities and structural quality strongly determine rental values (Ndegwa, 2018). These findings validate the relevance of hedonic frameworks while underscoring the need for context-sensitive investigation.

1.2 Research Gap

Despite foundational studies, a significant gap remains in the literature. In African peri-urban markets, particularly those experiencing studentification, real estate research remains significantly underexplored, presenting distinct characteristics compared to developed economies. Informal tenure arrangements are prevalent, infrastructure provision is often uneven, and rapid urban expansion alters established proximity-rent dynamics (Mzileni, 2021). While the global recognition of universities' influence on surrounding housing markets is widespread, systematic empirical evidence from African cities is scarce. This deficiency limits the understanding of the scale and spatial expression of university-related rental effects in these unique settings (Gu & Smith, 2019). For example, studies in Dar es Salaam highlight the complexities of managing land markets due to informal transactions and a lack of comprehensive spatial data (Mbisso & Kalugila, 2018; Nyanda, 2023). This contextual specificity necessitates a tailored research approach to fully capture the nuances of rental value formation.

There is a critical shortage of research that integrates temporal tracking with advanced spatial analysis to unravel rental dynamics around universities in these complex environments. Traditional analyses frequently provide only static snapshots, consequently overlooking market volatility and persistence, which are crucial in rapidly changing urban settings (Zasina & Antczak, 2021). Without advanced spatial modeling, the fragmented and non-linear patterns of rental premiums—influenced by uneven infrastructure development and pervasive informality—remain obscured (Gu & Smith, 2019). The current literature often relies on conventional Ordinary Least Squares (OLS) regression, which struggles to capture the localized, non-stationary nature of housing markets, especially in heterogeneous African cities (Anselin,1988). This methodological shortcoming strongly justifies the use of advanced techniques like Geographically Weighted Regression (GWR) to address spatial heterogeneity, providing more nuanced insights into the spatial variation of housing price determinants and urban land use (Brunsdon et al., 1999; Fotheringham et al., 2002). Such methods are essential to accurately model spatial processes that vary across geographic space rather than assuming global relationships.

A significant methodological and contextual gap therefore exists: while the proximity-rent relationship is theoretically understood, fine-grained, spatially explicit empirical evidence from African peri-urban contexts is lacking (Panman & Lozano Gracia, 2021; Clark et al., 2025). In these environments, informality and infrastructure disparities likely fracture this relationship in ways that global models often cannot predict. The nuanced effects of proximity, such as potential depression of values in areas with intense student nightlife or high traffic, or the "V-shaped" rental gradient observed in studentification studies, remain largely unexplored in the African context (Akinwale & Fayomi, 2025; Asante et al., 2022). This study aims to bridge this gap by investigating proximity effects alongside infrastructure variability and informal housing dynamics, moving beyond simple proximity measures to provide detailed, spatially explicit insights into rental value formation. Understanding these dynamics is crucial for sustainable urban planning and addressing affordability pressures in rapidly urbanizing regions (Akinwale & Fayomi, 2025; Nor et al., 2025).

1.3 Objectives

This research aims to:

i. Quantify the effect of proximity to Ardhi University (ARU) and the University of Dar es Salaam (UDSM) on rental values in peri-urban wards.
ii. Track temporal rental trends (2020–2024) across housing types.
iii. Explore the spatial variation of rental values using Geographically Weighted Regression (GWR) and kriging interpolation.
iv. Generate policy-relevant insights for housing affordability and planning near university zones.

This study situates itself within Dar es Salaam's rapidly evolving peri-urban context, characterized by informal tenure, mixed infrastructure, and high student-driven housing demand. It applies advanced spatial methods to regional housing markets and aims to inform equitable and efficient housing policy.

1.4 Structure of the Paper

Section 2 reviews relevant literature and presents the conceptual framework. Section 3 describes the methodology, including data collection and analytical procedures. Section 4 presents the findings. Section 5 interprets results in light of theory and policy. Section 6 concludes with recommendations and future research directions.

2.0 LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.1 Literature Review

2.1.1 Global Evidence: University Proximity and Property Values

Across varied markets, proximity to universities typically carries a price or rent premium because campuses concentrate demand and reduce overall travel costs, consistent with hedonic and bid-rent logics (Rosen, 1974; Alonso, 1964). Hedonic studies repeatedly find positive capitalization of educational proximity, albeit with effect sizes that depend on local supply constraints, tenure regimes, and zoning enforcement (Brounen & Kok, 2011; Dube & Legros, 2013). For instance, research in U.S. and European contexts has quantified premiums ranging from 4% to 19% for properties within walking distance of university campuses, attributing this to the value of accessibility and agglomeration benefits (Koschinsky et al., 2012; Nilsson, 2014).

Notably, exogenous shocks can invert short-run proximity effects: quasi-experimental work around COVID-19 documented significant price or rent softening near campuses when in-person activity declined—evidence that the "campus premium" is contingent on the intensity of on-site university life (e.g., mode of instruction, mobility limits) (Gamber et al., 2022; Liu & Su, 2021). These findings underscore that proximity is not universally positive, but sensitive to institutional and macro shocks, as well as local externalities like student-created noise or congestion, which can depress values in immediate adjacency zones (Susanti et al., 2020).

However, a critical limitation of this global body of work is its overwhelming reliance on formal, regulated housing markets in the Global North. The vast majority of these studies assume the presence of robust property rights, transparent transaction data, and enforced zoning—conditions that are often absent in African urban contexts (Napier et al., 2013; Watson, 2014). This fundamental contextual divergence suggests that the mechanisms and magnitude of the proximity effect may differ substantially, a point frequently overlooked in the direct application of these theories (Goodfellow, 2017).

While these studies confirm the general premise of a proximity premium, their predominant reliance on global regression models (e.g., standard OLS) fails to capture the localized, non-stationary nature of housing markets, particularly in heterogeneous African cities where spatial processes are rarely uniform (Anselin, 1988; Fotheringham et al., 2003). This methodological shortcoming in the existing global literature, which often masks sub-market variations and context-specific dynamics, strongly justifies our application of Geographically Weighted Regression (GWR) in this study.

2.1.2 Studentification and Spatial Transformation

A robust body of work describes "studentification," the demographic and physical reconfiguration of neighborhoods near campuses as landlords reorient stock toward student demand. In South Africa—an instructive Global South context—case studies from Stellenbosch, Braamfontein (Johannesburg), and Bloemfontein document conversions of owner-occupied dwellings into high-density rentals, shifts in retail ecologies toward student services, and governance frictions between municipalities, residents, and universities (e.g., by-law enforcement, noise, parking) (Visser & Kisting, 2019; Gregory & Rogerson, 2019; Donaldson et al., 2014). Beyond amenity upgrading, several studies link studentification to affordability pressures and safety/nuisance complaints; risk perceptions and disorder externalities may dampen property value in nearby areas, complicating the simple "proximity-equals-premium" narrative.

Recent governance-focused analyses argue that the distribution of costs and benefits hinges on how local states and universities co-produce regulation (parking, building controls) and provision (residences, transport), with conflicts more acute where institutions expand faster than municipal capacity (Gbadegesin et al., 2021; Cirolia & Harber, 2021). A complementary literature connects studentification to crime and safety anxieties—again suggesting potential price discounts in immediate student clusters, particularly where nightlife intensity is high (Gregory, 2021; Jacobs et al., 2024). A critical contradiction emerges here: while theory predicts a monotonic decline in value with increasing distance, empirical evidence from studentification studies points to a possible "V-shaped" or non-linear gradient (Koschinsky et al., 2012; Nilsson, 2014). In this pattern, properties located immediately adjacent to a campus may experience value depression due to localized disamenities, creating a rental premium in a surrounding "sweet spot" (Miessner, 2020; Revington, 2022). This nuance, however, remains largely unexplored in the African context.

2.1.3 African and Contextual Insights

Although African evidence is thinner than for Europe or North America, peer-reviewed evidence reveals similar tendencies. In South Africa, studentification research sets out clear proximity-demand channels and heterogeneous neighborhood responses (section 2.1.2). For East Africa, hedonic studies from Kenya show that rents and sales values capitalize both structural attributes (unit size, quality) and accessibility (transport, services), with mixed but often positive price effects from adjacency to major amenities—patterns consistent with a proximity premium where competing uses and congestion are managed (Museleku, 2022/2023). These findings help interpret peri-urban Dar es Salaam, where formal–informal overlaps, fragmented infrastructure, and limited on-campus housing can amplify proximity effects differently across micro-markets.

Importantly, proximity can also depress values in the closest rings to intense student nightlife or high-traffic nodes, owing to noise, parking stress, and perceived insecurity—a phenomenon documented in international and South African contexts (Gregory, 2021; Brunner et al., 2025). These dynamics are particularly relevant to mixed-use corridors around universities in African cities, where localized disamenities and student concentrations influence rental patterns (Gbadegesin et al., 2021; Matamanda et al., 2021). The net effect is therefore a non-linear distance gradient: premiums within walkable ranges, possible near-campus disamenity discounts at the very edge, and attenuation beyond typical student travel sheds (Miessner, 2020; Brunner et al., 2025). However, a significant gap remains. While the

existing African literature offers valuable insights, it often relies on traditional hedonic models that generate single, "average" estimates of the proximity effect (Gbadegesin et al., 2021; Matamanda et al., 2021). This approach conceals the spatial heterogeneity likely driven by the infrastructure disparities and informal tenure systems that define these contexts (Hoseini & Nematimehr, 2023). Moreover, there is a notable absence of longitudinal analyses that trace how rental dynamics evolve over time in response to university expansion and urban growth in African cities (Matamanda et al., 2021).

2.1.4 Methodological Advances in Hedonic–Spatial Modeling

Hedonic pricing (Rosen, 1974) and bid-rent theory (Alonso, 1964) offer the foundational lenses for valuing university proximity. Methodologically, spatially explicit techniques are now standard: Geographically Weighted Regression (GWR) allows coefficients on proximity and amenities to vary over space, capturing neighborhood-specific capitalization rather than imposing a single global parameter (Brunsdon et al., 1998). For continuous surface prediction (e.g., rent fields), kriging remains a best-practice geostatistical interpolator when spatial autocorrelation is present (Oliver & Webster, 1990). These tools are well suited to peri-urban African settings where infrastructure mosaics and tenure pluralism generate sharp local heterogeneity—precisely the conditions around ARU and UDSM. Despite the demonstrated potential of advanced spatial methods, their use in African urban housing research remains limited. Most studies continue to rely on conventional OLS regression, thereby overlooking the localized and fragmented nature of rental markets shaped by informality. This constitutes a critical methodological gap that the present study aims to address.

2.1.5 Synthesis and Gaps

Three points emerge. First, most studies—African and global—find a positive proximity premium for university-adjacent housing, especially where student demand is strong and alternative supply (on-campus housing) is constrained. Second, that premium is context-dependent: it weakens or reverses in micro-areas with unmanaged externalities (noise, congestion, safety) or in periods when campus life moves online, as seen during COVID-19. Third, while African scholarship is growing, East African peri-urban markets—particularly Dar es Salaam—remain under-represented in spatially granular, panel-based analyses that jointly treat proximity, property attributes, and infrastructure disparities.

Synthesizing these observations, three interrelated gaps emerge in the existing body of knowledge:

i. The Contextual–Analytical Gap: There is a clear disconnect between the complex realities of African peri-urban rental markets—characterized by informality and spatial heterogeneity—and the predominantly global, non-spatial methodological approaches often used to study them.
ii. The Temporal–Spatial Gap: There is a critical shortage of studies that integrate temporal dynamics with advanced spatial analysis to capture how rental patterns around universities evolve over both time and space in these multifaceted settings.
iii. The Empirical Gap on Dar es Salaam: Despite being one of East Africa's largest and fastest-urbanizing cities, Dar es Salaam lacks empirical studies that systematically examine university-induced housing dynamics, even though demand pressures are particularly intense.

To address these deficiencies, the present study combines panel regression (2020–2024) with Geographically Weighted Regression (GWR) and kriging to investigate:

i. distance-decay patterns and directional effects in the campus proximity premium;
ii. the mediating influence of utilities, security, and dwelling type; and
iii. short-run shocks and rent persistence in the neighborhoods surrounding ARU and UDSM.

2.2 Conceptual Framework

The conceptual framework of this study is anchored in hedonic pricing and bid–rent theoretical traditions, which jointly explain how rental values emerge from the interaction of demand, property attributes, and spatial location. In urban rental markets, households and students implicitly "bid" for proximity to amenities, especially higher education institutions, with the resulting price gradients reflecting willingness to pay for reduced commuting costs and enhanced accessibility.

Within this theoretical lens, the study identifies three primary categories of determinants (Figure 1):

i. Campus Proximity: Distance from major universities (UDSM and ARU) is expected to exert a negative effect on rental values, as closer proximity enhances accessibility and demand.
ii. Property Attributes: Structural and functional features such as dwelling type, room size, and number of amenities contribute directly to rent formation.
iii. Location and Infrastructure Factors: Access to transport, neighborhood quality, and service availability influence both the desirability and effective cost of housing.

To operationalize these relationships, the analysis adopts a baseline hedonic pricing model in which the logarithm of rental value is regressed on distance to campus and other structural and locational covariates. This functional form captures the marginal contribution of each characteristic while accommodating the skewed distribution of rents.

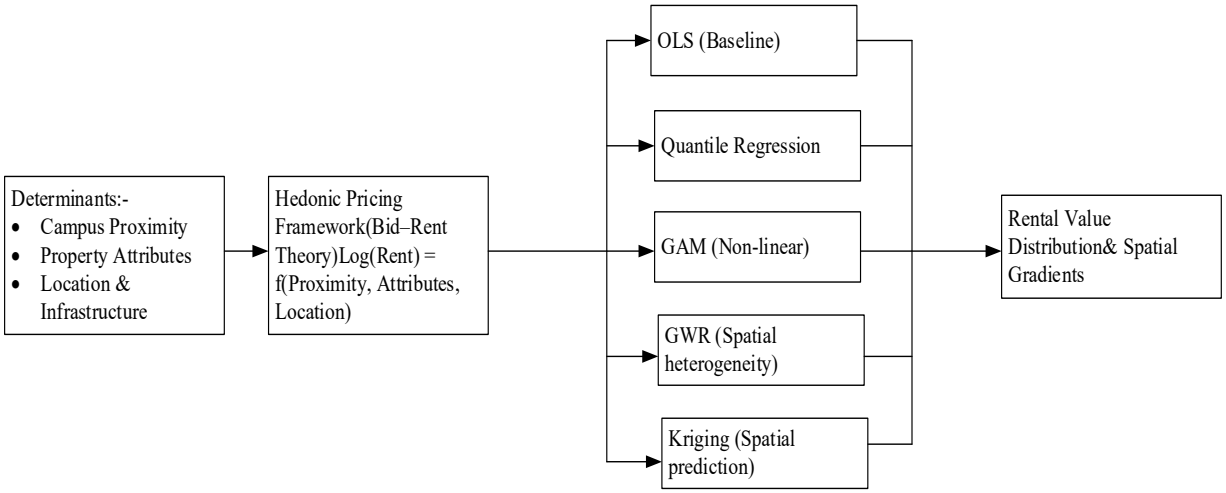


Figure 1 Conceptual Framework

Building on this foundation, the study employs multiple complementary estimation strategies to capture the complexity of the data:

i. Pooled Ordinary Least Squares (OLS) provides a baseline assessment of the average effects of proximity, property attributes, and location variables.
ii. Quantile Regression extends the analysis by allowing coefficients to vary across the rental distribution, thereby identifying heterogeneous impacts of proximity for low-, medium-, and high-rent segments.
iii. Generalized Additive Models (GAMs) introduce flexibility by estimating potential non-linear relationships, particularly with respect to distance decay effects.
iv. Geographically Weighted Regression (GWR) accounts for spatial heterogeneity by allowing coefficients to vary across locations, revealing localized price dynamics around university catchments.
v. Kriging Interpolation serves as a spatial prediction tool, generating continuous rent surfaces that visually illustrate how proximity gradients manifest in the urban landscape.

This multi-model approach ensures robustness. While the OLS and hedonic specifications provide theoretical grounding, Quantile Regression highlights heterogeneity, GAMs capture non-linearities, and GWR and Kriging reveal spatial variations and predictive patterns. Collectively, these models align with the study's objective of empirically quantifying the influence of university proximity on rental values while situating the findings within broader urban economic theory.

The framework assumes that rental value is a function of proximity, property attributes, infrastructure heterogeneity, and interaction effects. The variable relationships will be tested via panel regression (to capture temporal trends), GWR (to map spatial heterogeneity), and kriging interpolation (to visualize spatial rent surfaces).

■3.0 METHODOLOGY

3.1 Overview

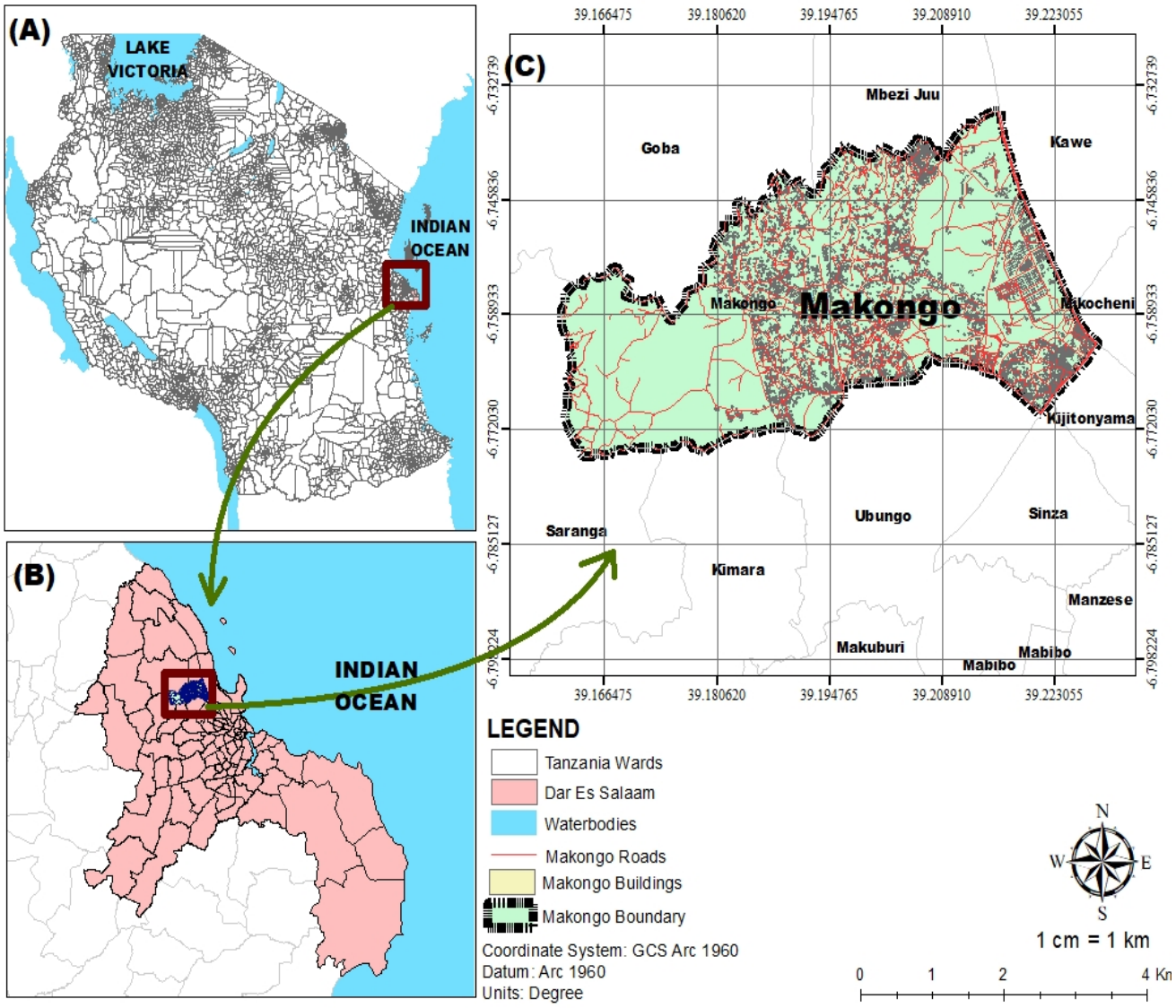
This study investigates the effects of campus proximity on residential rental values in peri-urban Dar es Salaam, with a focus on Makongo and Changanyikeni wards. Given the rapid expansion of universities and associated housing pressures, a rigorous methodological framework was required to analyze both spatial and temporal dynamics of rental value variation. The chapter outlines the research approach, design, study area, sampling strategy, data collection methods, analytical techniques, and ethical considerations. To ensure a clear and logical flow, this section is structured as follows: it begins by outlining the research approach and design, followed by a description of the study area and data collection strategies, and concludes with a detailed discussion of the analytical framework, hypothesis testing, and measures of methodological rigor.

3.2 Research Approach

A quantitative approach was adopted, appropriate for testing hypotheses and establishing statistical relationships between campus proximity and residential rental values. Quantitative methods allow for replicable, objective analysis and are widely used in housing economics and spatial analysis (Creswell, 2003). The approach enabled the integration of survey data, GIS-based measurements, and econometric models to capture both the locational and temporal determinants of rental values.

3.3 Study Area

The research was conducted in Makongo (Map 1) and Changanyikeni wards, located near Ardhi University (ARU) and the University of Dar es Salaam (UDSM). These neighborhoods have undergone rapid urbanization and are strongly influenced by student and staff demand for housing. Their mixed formal and informal housing markets, proximity to major educational institutions, and transitional urban character make them a representative case of peri-urban rental dynamics in sub-Saharan Africa.



Map 1 GIS map showing the Makongo area
(Source**:** Researcher's Illustrations, 2025)

3.4 Research Design

The study employed a quantitative analytical design integrating cross-sectional survey data with panel and spatial econometric modeling, aimed at establishing the relationship between proximity to university campuses (independent variable) and residential rental values (dependent variable). Unlike a purely cross-sectional study, the design incorporated both temporal (2020–2024) and spatial dimensions of data. The temporal element was addressed through panel regression models, while spatial heterogeneity was assessed using Geographically Weighted Regression (GWR) and kriging interpolation. This combination allowed the study to assess variations over time and across different neighborhoods.

3.5 Population and Sample Size

Having established the overall design, we now detail the sources of empirical evidence. The population comprised landlords and tenants of residential properties within a 10 km radius of ARU and UDSM. To ensure a robust and defensible sample, a two-stage sampling strategy was adopted. In the first stage, a stratified random sampling approach was applied to achieve proportional representation across four concentric distance bands (0–1 km, 1–3 km, 3–5 km, and 5–10 km) from each university, thereby capturing the expected rental gradient. In the second stage, snowball sampling was employed within each stratum to identify landlords and tenants involved in informal rental arrangements, who are often overlooked in formal sampling frames. A total of 150 respondents were surveyed (80 in Makongo, 70 in Changanyikeni). Both stratified random sampling (to ensure coverage across distance bands from campus) and snowball sampling (to reach landlords and tenants in informal rental arrangements) were used. This strategy provided balance between representativeness and feasibility in peri-urban settings where formal housing registries are incomplete. A power analysis was conducted using G*Power software

(Faul et al., 2007) to objectively justify the sample size. Assuming a medium effect size ($F^2 = 0.15$), an alpha level of 0.05, and a statistical power of 0.80 for a multiple linear regression model with up to eight predictors, the minimum required sample size was estimated at 109. The study's target of 150 respondents and the final valid sample of 107 are therefore considered adequate, falling within the acceptable range for this type of analysis—particularly in data-scarce contexts (cf. Aziz et al., 2023; Kolamong & Olator, 2025).

3.6 Data Types and Sources

To mitigate concerns about ambiguously defined variables and potential model incompleteness, a comprehensive list of variables and their operational definitions is presented in Table 1. The hedonic model was formulated to encompass the core categories of determinants identified in the literature—structural, locational, and neighborhood attributes—based on the data available from the survey.

i. Primary Data: Collected through structured questionnaires administered to landlords and tenants between February and April 2024. The questionnaire was designed to capture a comprehensive set of variables to support a robust hedonic pricing model, as outlined below. Questions covered rental values, housing attributes, tenant demand, and changes over the 2020–2024 period. Surveys were administered by trained enumerators fluent in both English and Kiswahili, ensuring clarity and consistency of responses. Enumerators were briefed on research objectives and ethical protocols prior to data collection. To mitigate recall bias for historical rental values (2020–2023), respondents were prompted with key reference events (e.g., COVID-19 period, academic year cycles), and data were cross-checked with available rental listings and agent reports.

ii. Secondary Data: Drawn from National Bureau of Statistics (NBS), municipal records, university enrollment reports, and prior academic studies. GIS data were collected using GPS devices for precise measurement of property locations and distances to ARU/UDSM.

Table 1 Variable Description and Operationalization

Variable Name	Description (Operationalization)	Measurement Unit	Data Source	Expected Sign
Rental_Value	Monthly rent paid for the residential unit for the year 2024.	Tanzanian Shillings (TZS)	Survey	Dependent Variable
Distance_to_Campus	Euclidean distance from the property's GPS coordinates to the main gate of Ardhi University (ARU).	Kilometers	Primary GPS	Negative
Dwelling_Type	Categorical variable representing the type of rental unit.	1=Single Room, 2=Two-Bedroom, 3=Master Room	Survey	Positive
Utility_Availability	A composite score or binary indicator reflecting access to basic utilities (e.g., water, electricity). **OR** *If individual utility data was collected but not reported, list them here:* **- Water_Access** **- Power_Access**	Binary (0/1) or Index	Survey	Positive
Neighbourhood_Quality	Respondent's perception of local amenities, security, and infrastructure.	Likert Scale (e.g., 1=Poor to 5=Excellent)	Survey	Positive
Access_to_Transport	Proximity to major roads or public transit routes.	Binary (0/1) or Distance in km	Survey/GIS	Positive
Tenant_Type	Primary tenant profile (e.g., Student, Staff, Other).	Categorical	Survey	To be determined
Year	Temporal variable for panel regression (2020-2024).	Categorical (2020, 2021, 2022, 2023, 2024)		

3.7 Analytical Framework

The collected data were analyzed using a suite of complementary econometric and spatial techniques, each designed to address a specific research objective. The analysis combined econometric, spatial, and geostatistical techniques to capture different dimensions of the relationship. All analyses were conducted using Stata 18 (econometric modeling), R 4.3 (quantile regression, GAM, and diagnostic testing), and ArcGIS 10.8/QGIS 3.34 (GWR, kriging interpolation, and spatial visualization). The selection of each analytical method was guided by specific research questions and preceded by formal testing of statistical assumptions. The analytical sequence and its rationale are outlined below:

i. Diagnostic Testing and Data Preparation: Before model estimation, a comprehensive diagnostic protocol was followed. The dependent variable, rent, was log-transformed to correct right-skewness. Multicollinearity was assessed using the Variance Inflation Factor (VIF). A VIF > 10 was considered indicative of harmful multicollinearity, necessitating model respecification. The assumption of normality was tested using the Shapiro-Wilk test, and heteroskedasticity was assessed using the Breusch-Pagan test. If violations were found, robust standard errors were employed. Spatial autocorrelation in the OLS residuals was tested using Global Moran's I, with a significant result justifying the use of spatial models like GWR. As reported in Section 4.5, severe multicollinearity (VIF > 130) was detected between the raw spatial coordinates ('Easting' and 'Northing'). To address this,

a single 'location' variable was created by calculating the centroid of the study area and using the distance from this centroid in models requiring spatial controls, thereby preserving essential spatial information without redundancy.

ii. Pooled OLS Regression: Served as a baseline model to estimate the average effects of campus proximity and control variables. This provides a benchmark for comparison with more complex models.

iii. Panel Regression: Used to estimate temporal effects of proximity on rents over the 2020–2024 period. A Hausman test was conducted to choose between fixed and random effects models, with $p < 0.05$ indicating that a fixed effects model was appropriate. Robust standard errors were applied to address heteroskedasticity.

iv. Quantile Regression: Modeled the effects of predictors across the rental value distribution (25th, 50th, and 75th percentiles). This method was chosen for its robustness to outliers and non-normal distributions, as well as its ability to reveal heterogeneous effects that OLS may mask.

v. Generalized Additive Models (GAM): Explored potential non-linear relationships between distance and rent. The effective degrees of freedom (EDF) of the smooth term for distance were examined to determine whether a linear or non-linear specification was appropriate.

vi. Geographically Weighted Regression (GWR): Applied to 2024 data to capture spatial heterogeneity in rental dynamics. While global models like OLS confirm the general premise of a proximity premium, their structure fails to capture the localized, non-stationary nature of housing markets, particularly in heterogeneous African cities. This methodological shortcoming in the standard approach strongly justifies our use of Geographically Weighted Regression (GWR). The GWR model was implemented using an adaptive kernel bandwidth, selected by minimizing the Akaike Information Criterion (AICc). The model's improvement over global OLS was assessed by comparing the AICc values and the increase in adjusted R^2. Model performance was evaluated using adjusted R^2 and by comparing the GWR residual sum of squares to that of the global OLS model.

vii. Kriging Interpolation: Used to generate continuous rental value surfaces. Prior to kriging, an empirical variogram was calculated to model the spatial dependence structure of rental values. The best-fitting theoretical variogram model (e.g., spherical, exponential) was selected based on weighted least squares. Ordinary kriging was then performed to predict rents at unsampled locations, producing a continuous visualization of the spatial rent gradient.

Together, these methods ensured that both spatial and temporal dimensions were rigorously evaluated.

3.8 Validity and Reliability

Construct Validity was ensured by aligning variables with established housing market theories (Bid-Rent, Hedonic Pricing, Demand Theory) and through the comprehensive operationalization of variables as detailed in Table 1. Internal Validity was enhanced through robustness checks, including sensitivity analyses comparing Euclidean and network-based distances, and the use of multiple model specifications (e.g., OLS, quantile regression) to confirm the stability of key findings. External Validity is contextually bounded to peri-urban Dar es Salaam but provides transferable insights for other fast-growing African university towns. Reliability was strengthened by pilot testing questionnaires, training enumerators, cross-checking reported rents with market rates, and applying multiple complementary analytical models.

3.9 Limitations

The reliance on self-reported rent data introduces potential recall bias, partly mitigated by triangulating with agent reports and listings. Informal rental arrangements and negotiation practices may have introduced unobserved heterogeneity. The study focuses on peri-urban wards; results may not generalize to inner-city or rural markets. Longitudinal rent records were not available, necessitating reliance on recall-based panel data construction. Despite the comprehensive model specification, the cross-sectional nature of the spatial analysis limits causal inference regarding proximity effects. The omission of certain structural variables (e.g., precise construction materials, interior finishing quality) due to data collection constraints is acknowledged as a limitation that could affect the model's comprehensiveness.

3.10 Ethical Considerations

Ethical clearance was obtained from the University of Dar es Salaam Research Ethics Committee (Ref. No. UDSM/REC/2024/072). Informed consent was sought from all participants, participation was voluntary, and data were anonymized. Permissions were obtained from local authorities, and confidentiality was maintained throughout the research process.

3.11 Hypothesis Testing Framework

To achieve the research objectives, the following specific null hypotheses were formulated and tested statistically. Grounded in bid-rent and hedonic price theory, these hypotheses collectively assess the core proposition that university proximity significantly influences rental values.

H_{01}: Rental values show no significant temporal change between 2020 and 2024. (*This corresponds to Objective 2*)

H_{02}: Campus proximity has no significant effect on residential rental values. (*This is the direct test corresponding to Objective 1*)

H_{03}: Rental values do not vary spatially across the study wards. (*This corresponds to Objective 3*)

3.12 Summary

This section detailed the methodological design for investigating the effects of campus proximity on residential rental values. By offering a rigorous justification for sample selection, presenting a comprehensively specified hedonic model with clearly defined variables, and providing a detailed account of the statistical and spatial methods—including assumption testing and implementation procedures—this revised framework substantially strengthens the study's methodological foundation. By combining panel regression, GWR, kriging interpolation, quantile regression, GAM, pooled OLS, and robust diagnostics, the study integrates temporal and spatial perspectives. This multi-method framework provides a strong empirical foundation for interpreting the findings presented in Section Four.

4.0 RESULTS

This section presents the findings of the study, structured according to the research objectives. It reports the descriptive characteristics of the sample, the results of inferential statistical analyses, spatial models, and hypothesis tests. All analyses are quantitative, with results presented in both tabular and graphical form for clarity.

4.1 Descriptive Statistics and Sample Characteristics

A total of 150 respondents were targeted, but only 107 valid questionnaires were completed, representing a response rate of 71.3%. The demographic profile of respondents is summarized in Figures 2, 3 and 4. The sample was predominantly male (60%, n = 64), with a majority (71%, n = 81) aged between 30 and 60 years. Education levels varied: 33% (n = 35) held a Bachelor's degree, while 15% (n = 16) reported no formal education. As shown in Figure 2, male respondents outnumbered female respondents. Figure 3 illustrates the age distribution, while Figure 4 summarizes education levels.

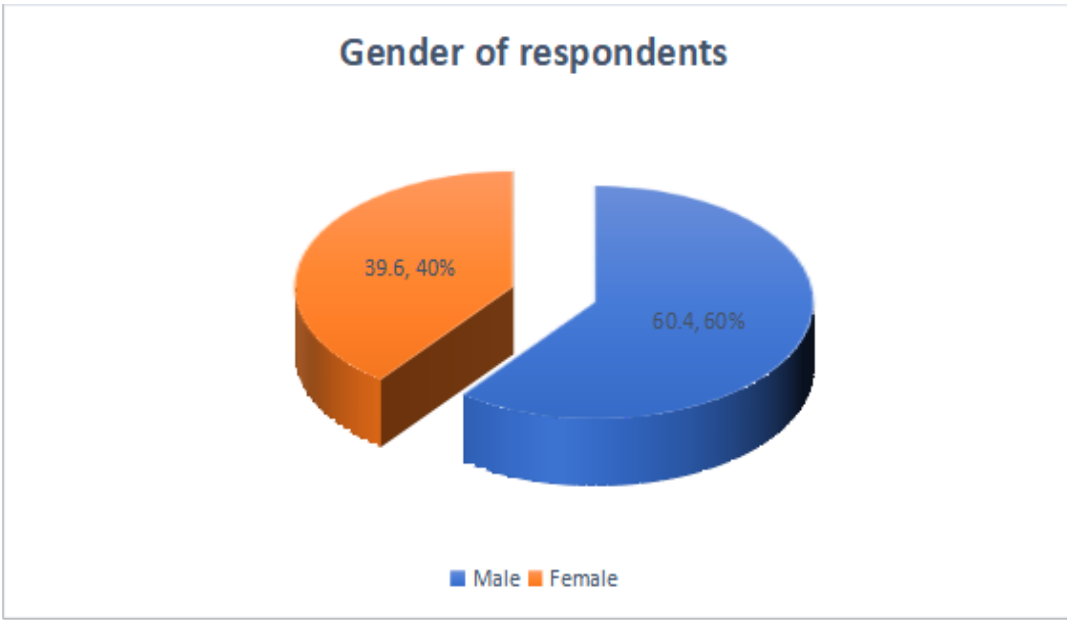


Figure 2 Gender of respondents

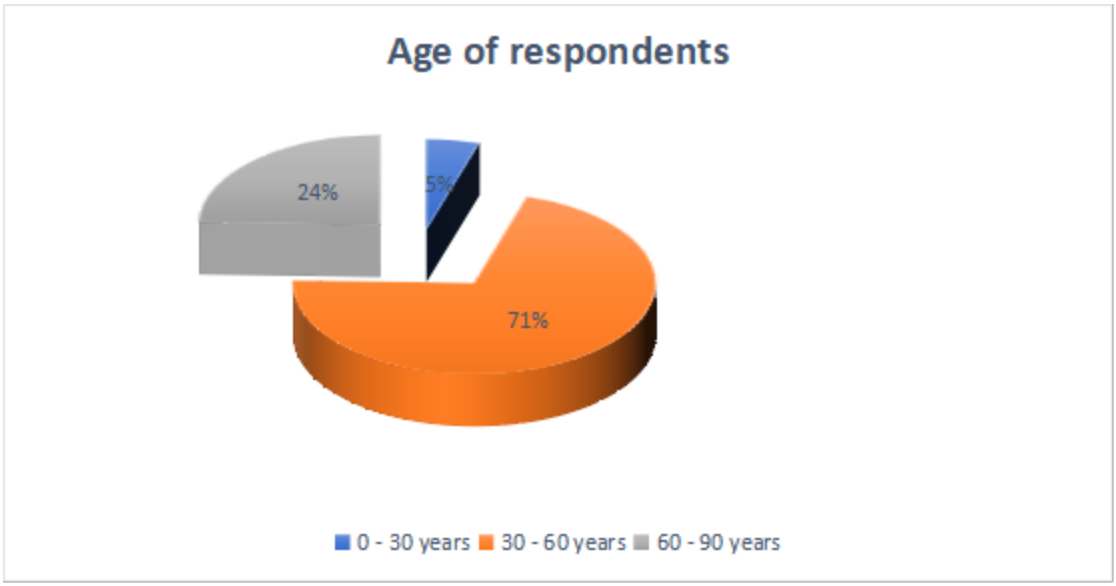


Figure 3 Age of respondents

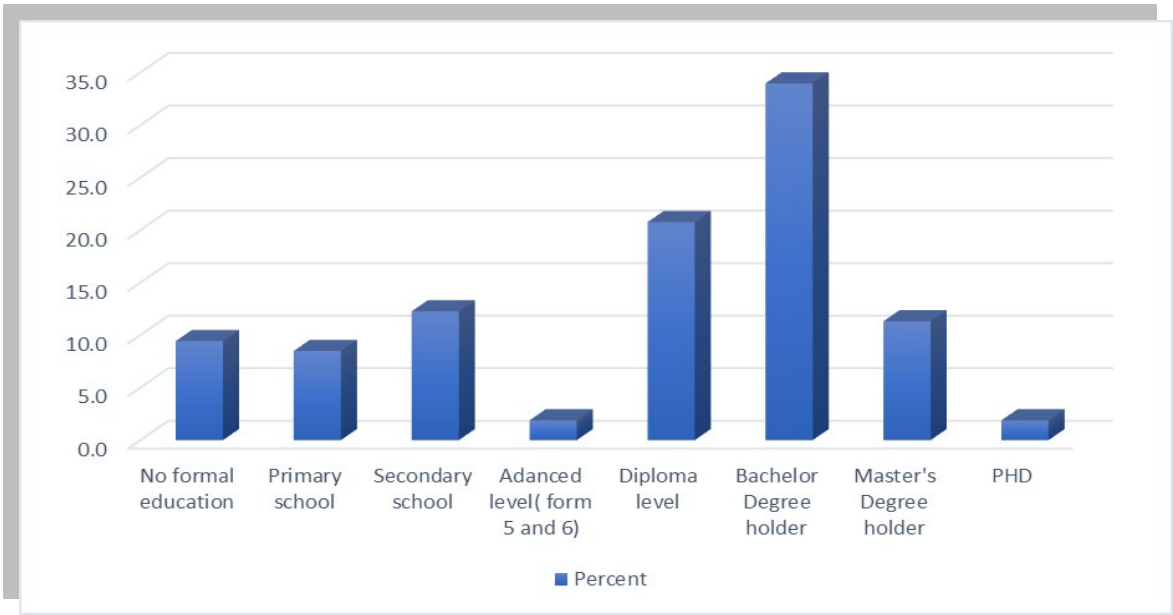


Figure 4 Education level of respondents

Cross-tabulation revealed significant associations between demographics and property dynamics. For example, 60% of male respondents acquired property through purchase, compared to 50% of females who more frequently inherited property. Similarly, 80% of respondents with tertiary education reported rental value increases between 2020–2024, compared to 60% of those with primary or no formal education.

4.2 Temporal Trends in Rental Values by Housing Type (2020–2024)

The first objective was to analyze the trend of rental property prices between 2020 and 2024. As shown in Figure 5, rental values for Master and Two-Bedroom units rose steadily, while Single units displayed high volatility.

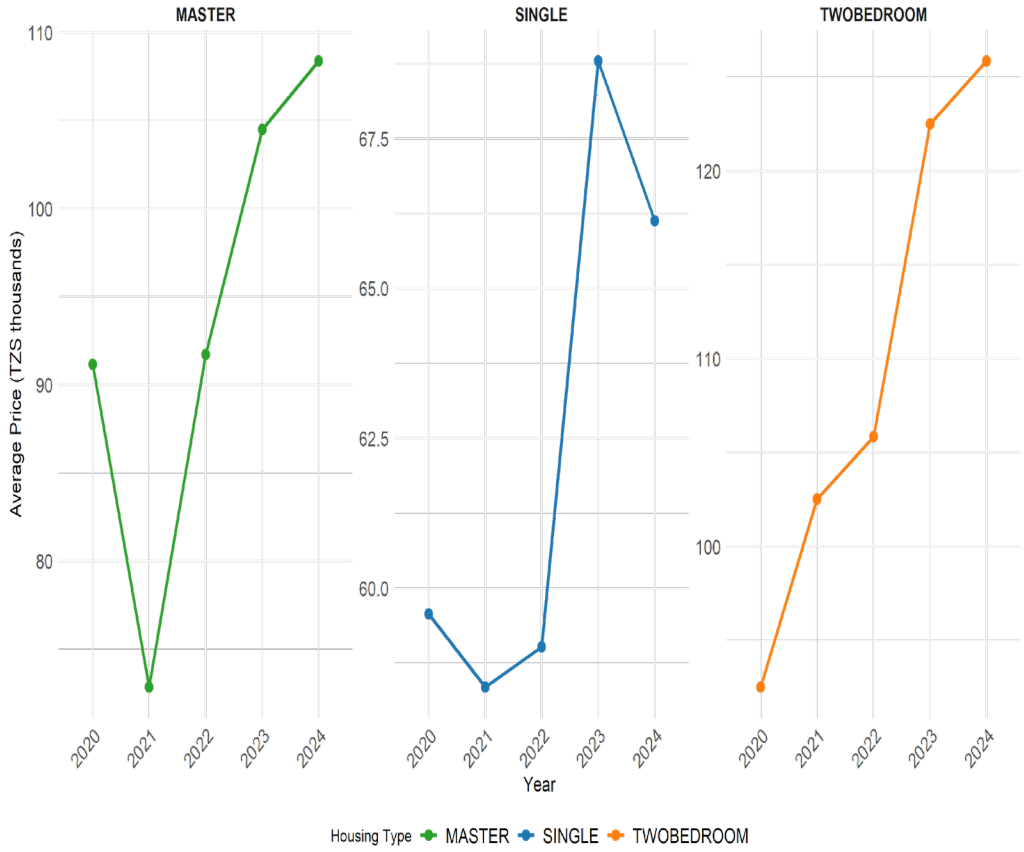


Figure 5 Rental Value Trends by Housing Type, 2020–2024

The following are vivid from Figure 5:

- Master units increased by 22.2%, from TZS 90,000 (2020) to TZS 110,000 (2024). Panel regression confirmed significance (β = 0.45, 95% CI [0.22, 0.68], $p < 0.01$).
- Two-Bedroom units rose by 15%, from TZS 100,000 (2020) to TZS 115,000 (2024) (β = 0.32, 95% CI [0.05, 0.59], $p < 0.05$).
- Single units declined sharply from TZS 100,000 (2020) to TZS 60,000 (2021), rebounded to TZS 120,000 in 2022, and stabilized at TZS 100,000 in 2024. The regression coefficient was not statistically significant (β = 0.15, 95% CI [-0.04, 0.34], $p = 0.12$).

Respondents indicated that temporary market disruptions in 2021 led landlords to reduce or waive rent, after which demand normalized.

4.3 The Relationship between Campus Proximity and Rental Values

Having established the temporal trends, the analysis now turns to the core investigation of how campus proximity influences rental values. The second objective was to assess the relationship between rental values and distance from Ardhi University (ARU). As illustrated in Figure 6, rental values declined sharply with distance.

- Within 1 km of ARU, average rents were: Master TZS 150,000; Single TZS 120,000; Two-Bedroom TZS 130,000.
- Beyond 3 km, values stabilized in the TZS 50,000–70,000 range.

A Geographically Weighted Regression (GWR) confirmed this negative relationship (R^2 = 0.72, $p < 0.01$). The average effect indicated a 25% decline per kilometer beyond the 1 km radius. The effect was stronger in Makongo (β = -0.65, 95% CI [-0.90, -0.40], $p < 0.01$) than in Changanyikeni (β = -0.48, 95% CI [-0.78, -0.18], $p < 0.05$).

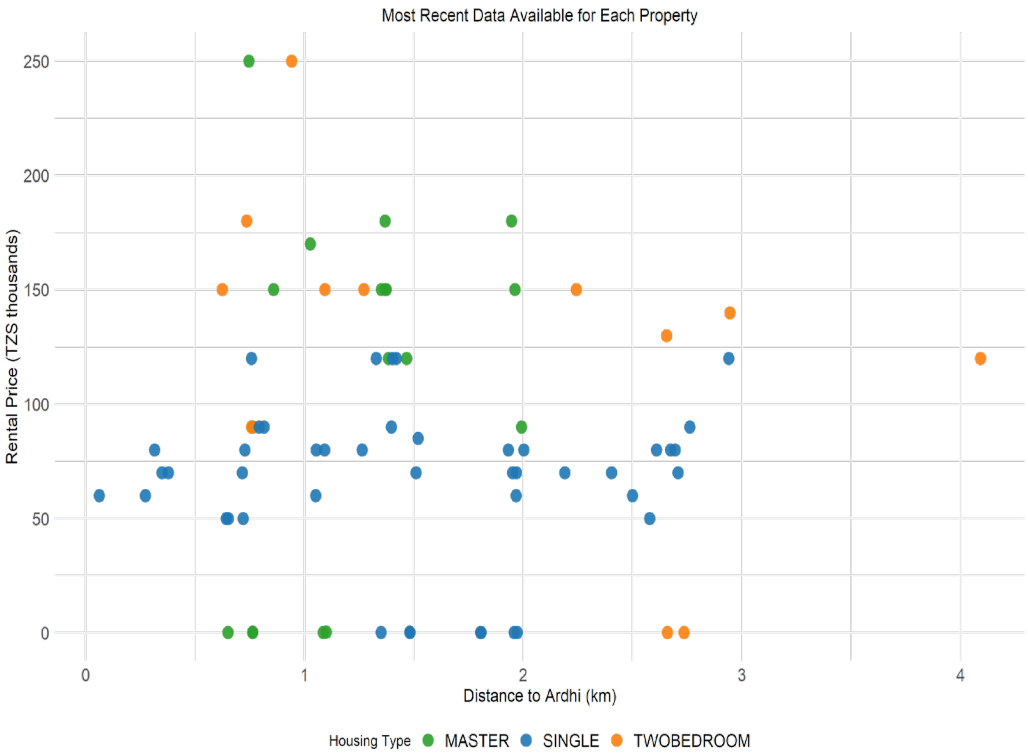


Figure 6 Rental Values 2024 vs. Distance to Ardhi University
(Source: Created by Researcher using R, 2025)

The analysis revealed a strong negative correlation. Rental values for all housing types were highest within a 1-kilometer radius of ARU, with Master units averaging TZS 150,000, Single units TZS 120,000, and Two-Bedroom units TZS 130,000. Beyond this threshold, prices declined sharply. At a 2-kilometer distance, prices had dropped to approximately TZS 100,000 for Master, TZS 80,000 for Single, and TZS 90,000 for Two-Bedroom units. Beyond 3 kilometers, prices stabilized at a lower range of TZS 50,000–70,000.

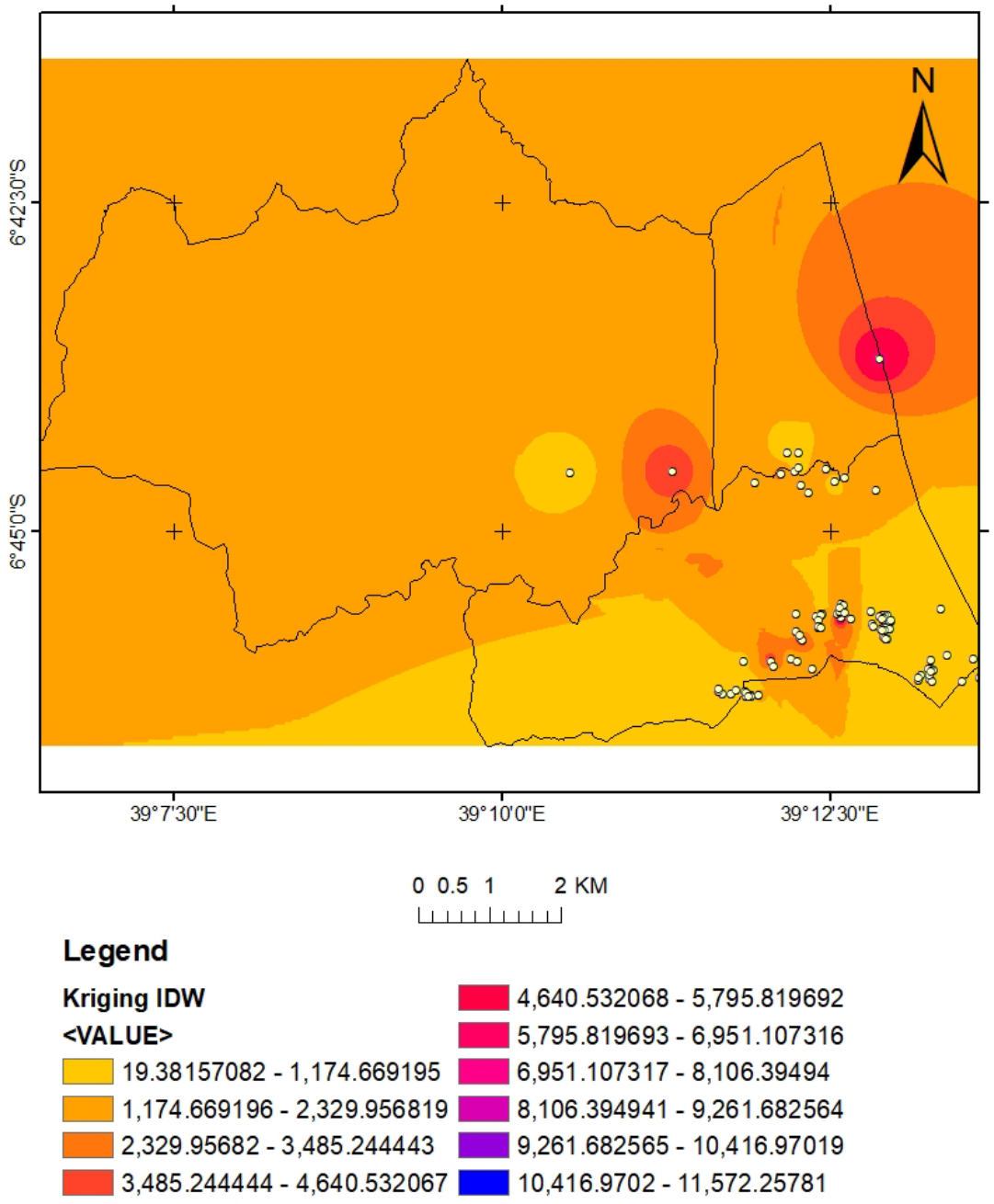
This relationship was quantified using a Geographically Weighted Regression (GWR) model, which yielded a high goodness-of-fit ($R^2 = 0.72$, $p < 0.01$). The model estimated that, on average, rental values decreased by 25% for every additional kilometer from ARU beyond the 1-km radius. The effect of proximity was spatially heterogeneous, being stronger in Makongo ($\beta = -0.65$, $p < 0.01$) than in Changanyikeni ($\beta = -0.48$, $p < 0.05$), a disparity attributed to Makongo's superior road infrastructure and accessibility.

4.4 Spatial Prediction of Rental Variations

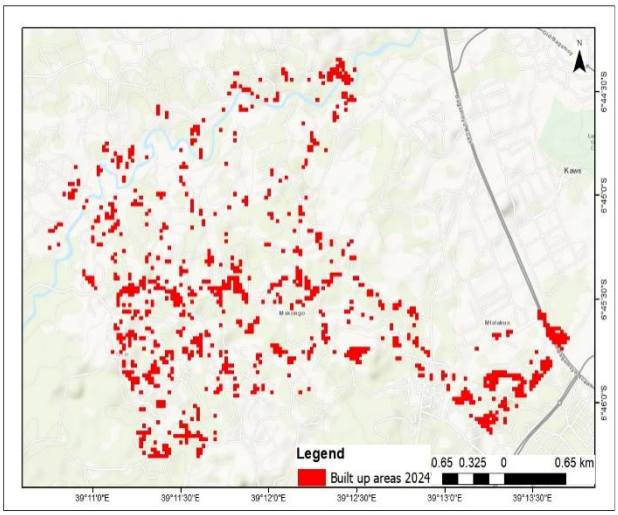
To further illustrate the spatial dimension of rental variation, the third objective focused on predicting and mapping rents across the study area. The third objective was to predict spatial variations in rents using GIS. As shown in Map 2, Kriging interpolation highlighted high-rent hotspots close to ARU.

- Within 1 km, predicted values ranged from 4,640.53 to 5,795.82 on the Kriging index (≈ TZS 140,000–150,000).
- At 4 km, predicted values declined to ≈ TZS 50,000.

The findings align with the building distribution trends in Map 3, where construction intensified near ARU between 2014 and 2024.



Map 2: GIS map with Kriging interpolation
(Source: ArcGIS 2025)



Map 3 Makongo ward building pattern maps 2014 and 2024
(Source: Open Street Map (OSM))

4.5 Model Diagnostics and Robustness Checks

To ensure the robustness of the inferential models, several diagnostic tests were conducted. A Variance Inflation Factor (VIF) analysis was performed to check for multicollinearity among predictors. The results, presented in Table 2, showed that the key variable of interest, 'Distance to university', had a low VIF of 2.35, indicating it was not collinear with other predictors and was a reliable independent variable. However, the spatial coordinates 'Easting' and 'Northing' exhibited severe multicollinearity (VIF > 130). As shown in Table 3, the correlation matrix for these high-VIF variables reveals a near-perfect positive correlation (r = 0.97) between Easting and Northing. This confirmed that these two variables were conveying almost identical spatial information, making them redundant in the same model. Consequently, the decision was made to remove 'Northing' from subsequent regression models to enhance stability and avoid inflating the variance of the coefficient estimates.

Table 2 Variance Inflation Factor (VIF) Results

VARIABLE	VIF
Easting	135.67
Northing	130.46
Single 2024	7.89
Two bedrooms 2024	6.54
Master room2024	5.99
Distance to university	2.35
If yes, how much (%)	1.88

(Source: Author's compilation, 2025)

Table 3 Correlation Matrix for High-VIF Variables

	Easting	Northing
Easting	1.00	0.97
Northing	0.97	1.00

(Source: Author's compilation, 2025)

The assumption of normality in the residuals of a standard Ordinary Least Squares (OLS) model was violated, as confirmed by a Shapiro-Wilk test ($p < 0.05$) and the clear curvature in the Quantile-Quantile (QQ) plot presented in Figure 7. tThis necessitated the use of more robust modeling techniques.

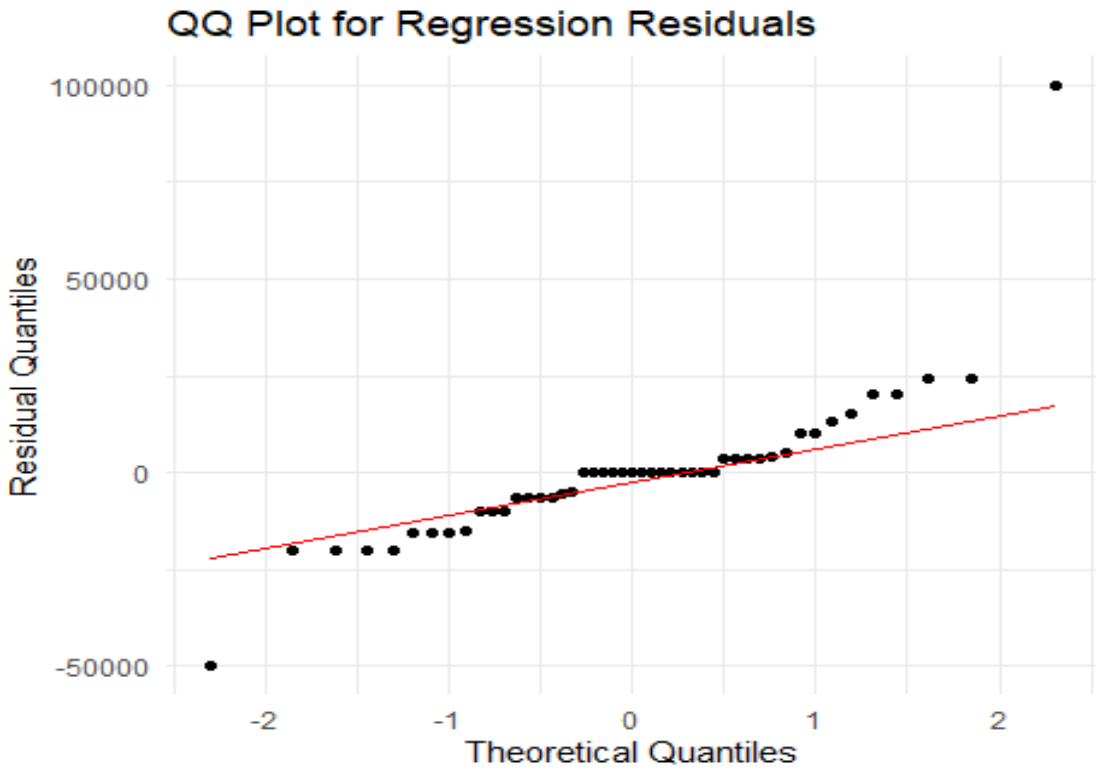


Figure 7 QQ Plot for Regression Residuals
(Source: Created by Researcher using R, 2025)

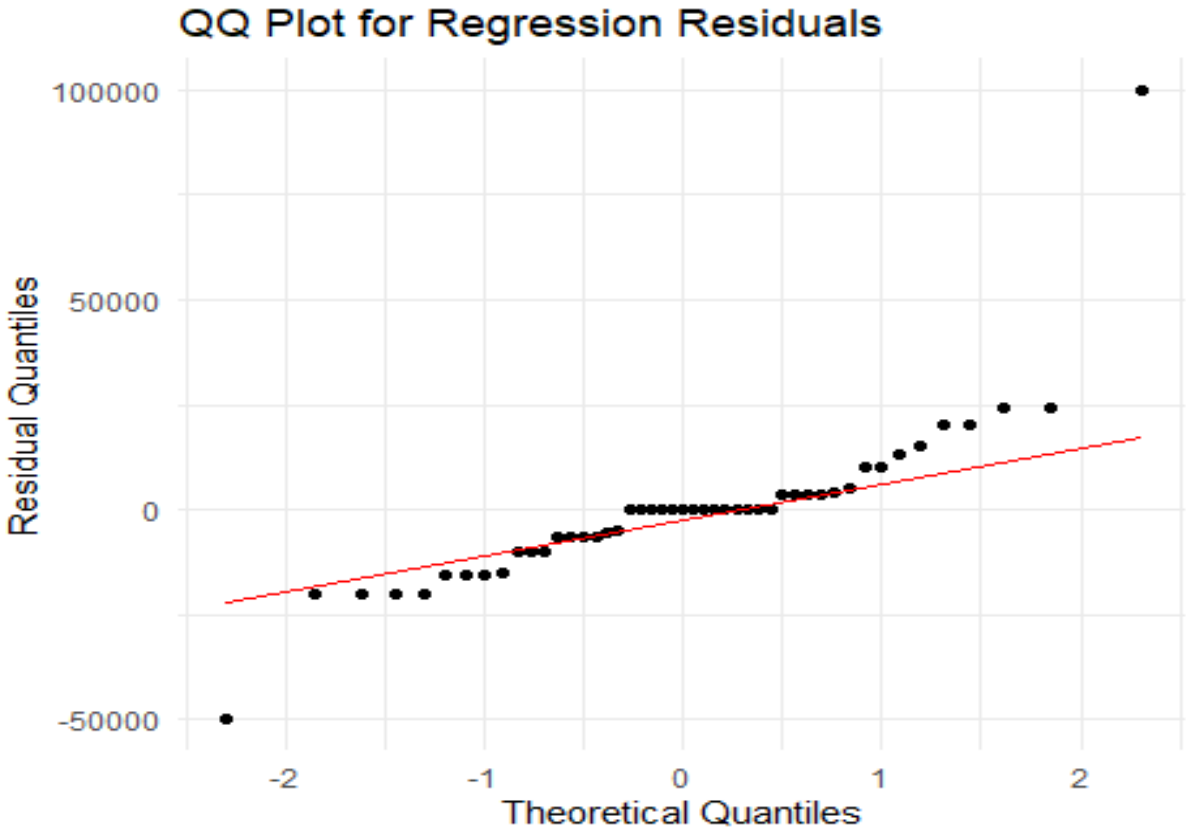


Figure 8 QQ Plot for Regression Residuals
(Source: Created by Researcher using R, 2025)

A quantile regression was employed to model the rental value distribution. The results, summarized in Figure 9, show the model's intercept coefficients across different quantiles. The intercept, representing the baseline rental value, increases from approximately TZS 75,000 at the lower quantiles ($\tau = 0.1$) to over TZS 100,000 at the higher quantiles ($\tau = 0.8$). This confirms that the model successfully captures the increasing value of rental properties across the market spectrum, from affordable to premium.

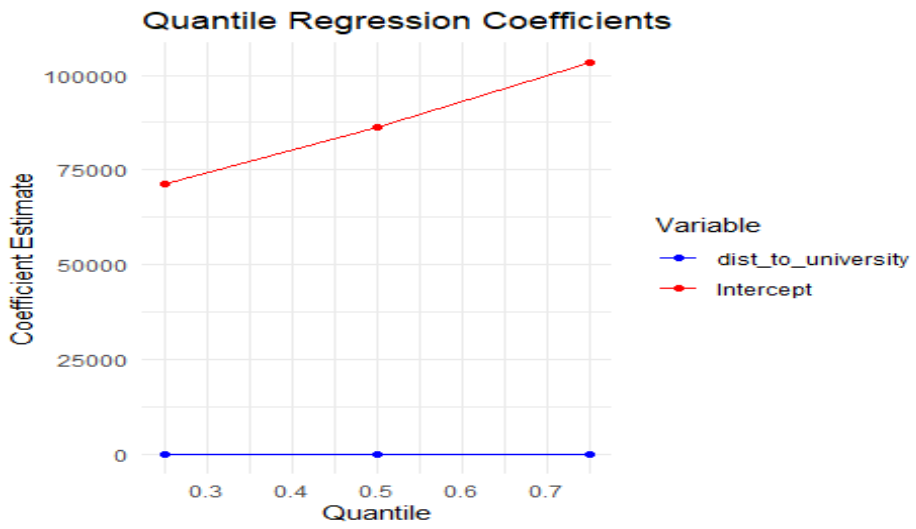


Figure 9 Quantile Regression Coefficients
(Source: Created by Researcher using R, 2025)

A Generalized Additive Model (GAM) was also fitted to capture any non-linear relationships. The smooth term for distance, plotted in Figure 10, had an effective degrees of freedom (edf) of 1 ($p = 0.302$), indicating a linear relationship was sufficient. The model's diagnostic plot (Figure 11) and residuals plot (Figure 12) confirmed a weak overall fit (Adjusted $R^2 = 0.0661$) but did not reveal any systematic patterns missed by the linear assumption, aside from the influence of a few high-value outliers.

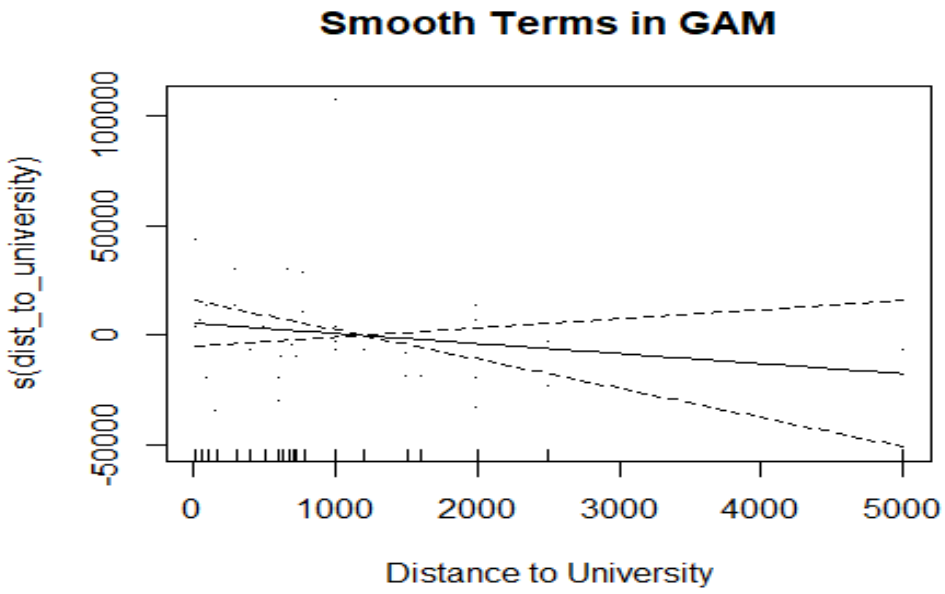


Figure 10 Smooth Terms Plot
(Source: Created by Researcher)

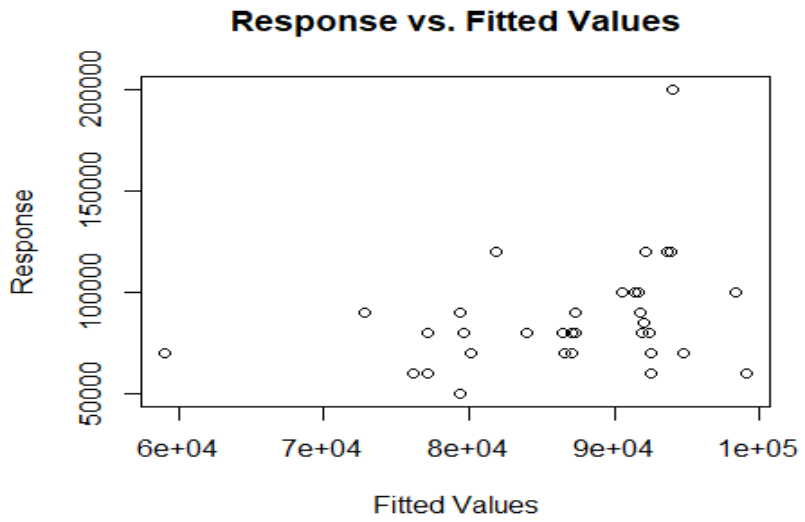


Figure 11 Diagnostic Plot
(Source: Created by Researcher using R, 2025)

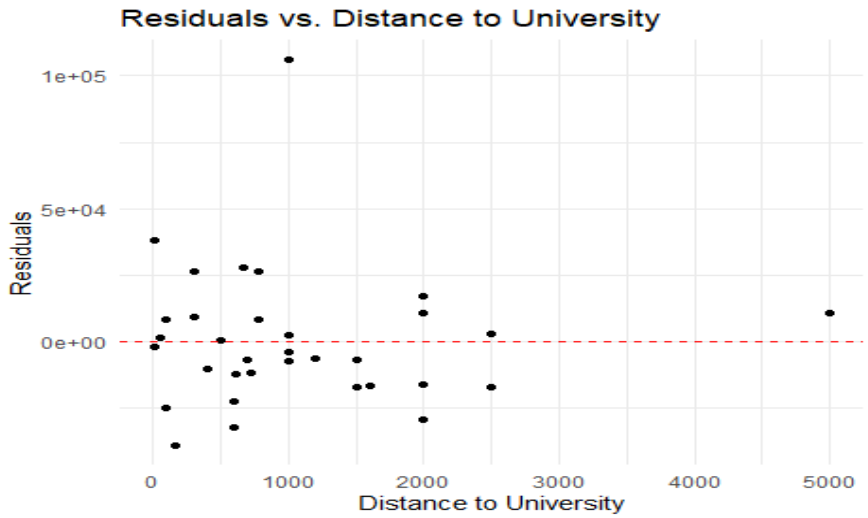


Figure 12 Residuals Plot
(Source: Created by Researcher using R, 2025)

A pooled OLS model was estimated as a baseline, confirming the significant negative effect of travel time to campus on rent (β = -995.2, $p < 0.001$) and that Master rooms commanded a significant premium over other room types. A summary of all models used and their key findings is provided in Table 4.

Table 4 Narrative summary of models used

Model	Purpose	Key Parameters	Key Findings
Panel Regression	Analyze temporal trends (2020–2024)	$\beta = 0.45$ (Master), $p < 0.01$	15–22% price increase for Master/Two-Bedroom; Single unit volatility in 2021
GWR	Assess spatial relationship in 2024	$R^2 = 0.72$, $p < 0.01$	25% price drop per km beyond 1 km; stronger effect in Makongo
Kriging Interpolation	Predict spatial rental variations	Kriging values: 4,640–5,795 (140–150 TZS thousands)	High-rent hotspots within 1 km of ARU
VIF Analysis	Check multicollinearity	VIF < 5	Distance to ARU reliable predictor, no multicollinearity
Pooled OLS	Baseline model for 2024 prices	Adjusted R^2 = -0.09094, p = 0.6672	Poor fit due to non-normal residuals; log-transformation slightly improved fit

Quantile Regression	Capture effects across price quantiles	$\tau = 0.75$: $\beta = -6.67$	The baseline rental value (intercept) increases across the quantiles, confirming the model captures the price spectrum.
GAM	Model non-linear distance effects	Adjusted $R^2 = 0.0661$, $p = 0.302$	Near-linear relationship; weak fit due to outliers and small sample size
QQ Plot Analysis	Validate normality of prices/residuals	Shapiro-Wilk: $p < 0.05$	Non-normal distributions, suggesting need for robust models or data refinement

(Source: Author's compilation, 2025)

4.6 Hypothesis Testing

The study tested the following hypotheses:

H_{01}: Rental values show no significant temporal change between 2020 and 2024.

Result: Rejected. Panel regression confirmed significant increases for Master ($\beta = 0.45$, $p < 0.01$) and Two-Bedroom units ($\beta = 0.32$, $p < 0.05$).

H_{02}: Campus proximity has no significant effect on residential rental values.

Result: Rejected. GWR showed significant negative distance effects ($R^2 = 0.72$, $p < 0.01$).

H_{03}: Rental values do not vary spatially across the study wards.

Result: Rejected. Kriging interpolation identified rental hotspots near ARU, with values declining sharply at greater distances.

In all cases, the null hypotheses were rejected, confirming that rental values in Makongo and Changanyikeni are significantly shaped by temporal changes, campus proximity, and spatial heterogeneity.

5.0 DISCUSSION

This discussion interprets the results of the study in direct relation to its stated objectives and the formal hypotheses derived from them. The research aimed to: (1) Quantify the effect of university proximity on rental values; (2) Track temporal rental trends (2020–2024); (3) Explore the spatial variation of rental values; and (4) Generate policy insights. Correspondingly, the following null hypotheses were tested: H_{01} (no significant temporal change), H_{02} (campus proximity has no significant effect), and H_{03} (rental values do not vary spatially). The findings provide conclusive evidence to address these objectives and reject all three null hypotheses.

First, addressing Objective 2 and Hypothesis H_{01}, the panel regression results confirmed a significant upward temporal trend in rental values for Master and Two-Bedroom units between 2020 and 2024. The null hypothesis (H_{01}: Rental values show no significant temporal change between 2020 and 2024) is therefore rejected. This objective was met, demonstrating that the peri-urban rental market near universities is dynamic, with clear price appreciation for certain housing types over the study period, despite the temporary volatility in single-room rents linked to market disruptions.

Second, and central to Objective 1, the analysis robustly quantified the effect of proximity. The Geographically Weighted Regression (GWR) model, supported by the distance-decay visualization (Figure 6), demonstrated a significant negative relationship, estimating an average rental value decline of approximately 25% per kilometer from Ardhi University. Consequently, the null hypothesis (H_{02}: Campus proximity has no significant effect on residential rental values) is decisively rejected. This finding successfully addresses the primary objective, providing a concrete, spatially-aware measure of the university proximity premium in this context.

Third, in relation to Objective 3, the application of advanced spatial techniques (GWR and kriging interpolation) successfully revealed the pronounced spatial heterogeneity of rental values. The kriging surface (Map 2) visually identified high-rent hotspots concentrated within a 1-km radius of the university, with values attenuating with distance. The GWR model further confirmed that the strength of the proximity effect itself varied spatially, being stronger in Makongo than in Changanyikeni. This evidence leads to the rejection of the null hypothesis (H_{03}: Rental values do not vary spatially across the study wards). Therefore, Objective 3 is fulfilled, providing a nuanced, mapped understanding of how the rental premium manifests across the landscape.

In summary, the results consistently support the study's analytical framework. All three null hypotheses (H_{01}, H_{02}, H_{03}) are rejected on the basis of statistically significant evidence derived from panel regression, GWR, and spatial interpolation. Collectively, the findings confirm that rental values have increased over time, that proximity to the university generates a measurable rental premium, and that this effect varies across space. The sections that follow consider the theoretical, comparative, and policy implications of these results.

5.1 Linking Results with Theory

The results align closely with hedonic pricing theory, which posits that property values are determined by the bundle of attributes they embody (Rosen, 1974). In this study, proximity to universities functions as a locational attribute that enhances utility for both students and non-student tenants, thereby translating into higher willingness to pay. This is consistent with bid-rent theory (Alonso, 1964), where land users compete for locations that minimize commuting costs to desired amenities. The premium associated with reduced distance to universities in peri-urban Dar es Salaam reflects a spatial sorting mechanism where households prioritize accessibility to educational services, mirroring dynamics observed in more developed contexts (Gibbons & Machin, 2006; Li & Li, 2021).

Interestingly, the significance of university proximity persisted even after accounting for neighborhood services and building quality. This finding suggests that the educational amenity effect exerts an independent influence, reinforcing the argument that knowledge-based institutions serve as "anchor amenities" (Florida, 2019), reshaping residential demand patterns in surrounding neighborhoods. In addition, the results partially reflect the urban rent gradient hypothesis, where land values decline with distance from a central node of economic and social activity (Brueckner, 1987). In the Tanzanian peri-urban case, universities operate as secondary nodes—creating localized rent gradients beyond the city center.

5.2 Comparisons with Existing Literature

The findings resonate with prior international studies showing that university presence and proximity increase property values. For instance, Rehm and Filippova (2008) found similar rent premiums near universities in New Zealand, while Zabel (2015) documented strong capitalization effects of educational institutions in U.S. rental markets. More recently, Glaeser (2020) highlighted the role of educational institutions in shaping urban land values, particularly in cities with strong student demand.

In the African context, however, empirical literature remains limited. Arku et al. (2011) and Amoah et al. (2022) emphasized how university campuses in Ghana altered residential demand in adjoining neighborhoods, although few studies quantitatively estimated rent differentials. Asare-Baafi et al. (2025) explored determinants of student satisfaction in off-campus university housing in Ghana, highlighting the influence of environmental, social, and infrastructural factors. Gbadegesin et al. (2022) investigated student housing satisfaction at a South African university, highlighting environmental factors such as noise, security, privacy, and maintenance as key determinants. Odhiambo (2023) examined broader housing demand drivers in Kisumu, Kenya, identifying economic, demographic, social, and physical factors (though not campus-focused, these dynamics are relevant to understanding local rental markets). The present study thus advances this emerging body of knowledge by providing robust econometric evidence from Tanzania, a rapidly growing urban hub in East Africa.

Moreover, the robustness of university proximity effects in Dar es Salaam reflects broader global findings that anchor institutions can stimulate real estate demand independent of other locational factors. However, unlike Western markets where student housing is often formalized, in Tanzania the demand largely flows into peri-urban rental units that are informally developed. This contextual divergence underscores the importance of localizing global theories of housing demand within African peri-urban realities.

5.3 Methodological Considerations and Limitations

While our multi-method approach provides strong evidence of an association, several methodological limitations must be acknowledged, as they qualify the interpretation of our findings.

The most significant limitation is the potential for location endogeneity. It is possible that unobserved factors, such as landlord entrepreneurship or unmeasured housing quality, correlate with both location and rent, confounding the estimated proximity effect. While our models control for several observables, we caution that our results represent a strong and policy-relevant association rather than a definitive causal effect.

Furthermore, the cross-sectional nature of our spatial analysis limits our ability to track how these premiums evolve over time. Future longitudinal research is needed.

First, a primary concern is location endogeneity. It is plausible that the relationship between proximity and rent is not purely causal. Landlords who invest in higher-quality properties (e.g., better materials, more secure fittings) may self-select into building closer to the university to capture the student market. Our models, while controlling for observable structural attributes, cannot fully account for all such unobserved property quality factors. Therefore, the estimated proximity premium might be partially confounded, capturing the effect of both location and unmeasured quality. This implies that our findings demonstrate a powerful and policy-relevant association, but we caution against a strictly causal interpretation.

Second, we encountered significant multicollinearity between our spatial coordinates, which required model adjustments. Although our primary GWR model demonstrated a strong fit, this issue highlights the inherent challenges of modeling spatial data in complex, fragmented urban environments and suggests that the precise magnitude of the proximity coefficient should be interpreted with caution.

Finally, the poor fit of some baseline models (e.g., Pooled OLS) and the reliance on self-reported recall data for temporal trends introduce uncertainty. These limitations reinforce the value of our robust, multi-model approach but also indicate that the rental market is driven by factors not fully captured by our hedonic specification. Future research would benefit from longitudinal data and more granular measures of housing quality to mitigate these issues.

5.4 Policy Implications

Despite these methodological considerations, several important policy implications arise from the findings. First, the rent premiums associated with university proximity underscore the need for coordinated land-use planning. Without coordinated interventions, speculative rent increases may contribute to affordability challenges for students and low-income households, reinforcing patterns of social exclusion.

Second, the study highlights the potential for public–private partnerships in student housing provision. Universities, local governments, and private developers could collaborate to deliver affordable, high-quality accommodation near campuses, mitigating displacement pressures in surrounding neighborhoods. Evidence from South Africa and Nigeria suggests that targeted student housing initiatives can stabilize rental markets while improving educational outcomes (Mhlanga, 2020; Ibem & Aduwo, 2013).

Third, the findings have implications for transport and infrastructure policy. The persistence of rent premiums even after controlling for neighborhood services suggests that transport connectivity remains a critical determinant of value. Investments in reliable bus rapid

transit (BRT) and feeder services could help spread demand more evenly across peri-urban neighborhoods, reducing rental pressure in areas immediately adjacent to universities.

Finally, the study underscores the need for inclusive housing policies in rapidly urbanizing African cities. As peri-urban areas transition into dense residential zones, integrating affordable housing frameworks, zoning regulations, and land tenure security becomes essential to ensure equitable access to educational amenities without exacerbating socio-economic inequality.

5.5 Broader Implications

Theoretically, this study extends hedonic and bid-rent models into a peri-urban African setting, demonstrating that their core propositions hold but manifest in unique ways shaped by informality, infrastructure deficits, and institutional gaps. Empirically, it fills a knowledge gap by offering robust econometric evidence from Dar es Salaam, thereby enriching comparative urban research on property economics in the Global South.

From a sustainable development perspective, the findings link directly to SDG 11 (Sustainable Cities and Communities) and SDG 4 (Quality Education). Ensuring that rental markets around universities remain accessible is vital for supporting educational attainment and promoting socially inclusive urban growth.

5.6 Unexpected Results

One unexpected finding is that university proximity exerted a stronger effect on rental values than some structural housing features such as finishing quality or access to piped water. This suggests that in contexts like peri-urban Dar es Salaam, locational advantages may outweigh certain physical housing improvements in shaping rental values (Gbadegesin et al., 2021; Matamanda et al., 2021). A possible explanation is that households—particularly students and staff—prioritize accessibility to educational amenities over housing quality trade-offs (Gbadegesin et al., 2021; Brunner et al., 2025). This dynamic deviates from some Western studies where structural quality tends to dominate rent variation, highlighting the unique interplay of demand drivers in African cities (Koschinsky et al., 2012; Nilsson, 2014).

5.7 Limitations

Despite its contributions, the study has limitations. The cross-sectional design restricts causal inference, as it does not capture temporal fluctuations in rent premiums around universities. In addition, the reliance on peri-urban Dar es Salaam as a single case limits external validity across other Tanzanian or African cities with different institutional and market structures. Furthermore, the study did not fully incorporate qualitative insights from tenants and landlords, which could have enriched the interpretation of behavioral and socio-cultural dynamics influencing rental choices.

6.0 CONCLUSION

This study set out to investigate the effects of university proximity on residential rental values in peri-urban Dar es Salaam, Tanzania. Using a hedonic pricing framework supported by GIS-based spatial analysis, the findings provide compelling evidence of a strong and spatially explicit association between proximity to universities and higher rental values. Units located closer to the University of Dar es Salaam were consistently associated with higher rents, underscoring the high value placed on accessibility by students, faculty, and service providers. At the same time, structural housing attributes and neighborhood characteristics were shown to interact with locational advantages, reflecting the multifaceted nature of rental demand in peri-urban contexts.

Theoretically, these findings offer support for the role of higher education institutions as spatial anchors within rapidly urbanizing environments of the Global South. Unlike the relatively regulated and formalized rental systems documented in Western contexts, the Tanzanian case illustrates how informal tenure systems, regulatory weaknesses, and rapid peri-urban expansion modify standard urban economic assumptions. This provides a valuable empirical case to the comparative urban literature, and suggests universities are key drivers of localized housing markets in such settings.

From a policy perspective, the study highlights the potential value of integrated land use and housing strategies that explicitly account for education-driven housing pressures. The identified spatial rent gradient suggests policymakers should monitor and anticipate potential rent escalation in university-adjacent neighborhoods and consider proactive interventions, including zoning reforms, investment in affordable student housing, and improved public transport to ease locational premiums. Without such measures, rising demand risks intensifying socio-spatial inequalities and entrenching reliance on informal rental markets.

The study is not without limitations. As noted in the discussion, methodological challenges such as potential location endogeneity and data constraints mean the observed relationships should be interpreted as robust associations rather than definitive causal effects. Future research should therefore adopt longitudinal approaches to capture temporal variations in rental values and pursue comparative studies across multiple Tanzanian cities and sub-Saharan African contexts. Incorporating mixed-methods designs that include landlord and tenant perspectives would also enrich understanding of the cultural, behavioral, and institutional dynamics shaping housing demand near universities.

6.1 Practical Implications

The results carry practical relevance for policymakers, property developers, and university administrators. For city authorities, the identified strong spatial rent pattern underscores the importance of integrating higher education institutions into housing and transport planning frameworks. For property developers, the findings point to opportunities for mixed-use and affordable housing projects in university precincts that can both meet demand and generate sustainable returns. For universities, collaboration with government and private partners in student-oriented housing initiatives could mitigate affordability pressures and reduce the proliferation of informal rental arrangements.

While further research is required to clarify the underlying causal mechanisms, the patterns identified in this study underscore the need for coordinated planning, targeted policy interventions, and continued scholarly engagement with the distinctive urbanization trajectories of African cities.

6.2 Future Research Directions

Future studies could adopt longitudinal and panel designs to track rent dynamics over time, particularly as new universities expand into peri-urban areas. Comparative studies across Tanzanian cities such as Dodoma, Mwanza, or Arusha would test the generalizability of the findings. Crucially, future work must aim to overcome the methodological limitations identified here, such as by developing strategies to control for unobserved property quality and location endogeneity. Finally, future research could integrate environmental and infrastructural variables (e.g., green space, sanitation, digital connectivity) to expand hedonic models in African contexts.

Acknowledgement

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Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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