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Investing at Home: The Role of Property Rights in Shaping Household Investments in Quelimane, Mozambique

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Abstract

This paper investigates the impact of property rights on household investments in Quelimane, Mozambique. Using a sample of 3,430 residents surveyed within the period 2021-2023, we employ Ordinary Least Squares (OLS) and Two-Stage Least Squares (2SLS) analyses, the latter using proximity to properties titled under a 2012 Millennium Challenge Account program as an instrumental variable The findings reveal that property rights ownership significantly increases the number of household assets, elevates the likelihood of investing in reliable energy, and improves the quality of roofing. Additionally, secure property rights boost educational expenditures and reduce educational deficits among cohabitants.

Keywords

Property Rights

Household Investment

Microeconometrics

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1. Introduction and Motivation

The landscape of household investment has undergone significant transformations across the globe, particularly in developing economies (Source: CEPR[1]). Among these, property rights emerge as a key factor influencing individual and collective economic decisions and outcomes. This paper examines the intriguing role of property rights in shaping household investment behaviors in Quelimane, Mozambique—a city characterized by rapid urbanization and complex economic dynamics. By examining the local context, this research aims to uncover how clear ownership of property rights impacts the willingness and capacity of households to invest in their homes and the education of their inhabitants. Quelimane, the capital of Zambezia Province, presents a unique case study due to its socio-economic diversity and evolving land ownership policies. The city's rapid urbanization, fueled primarily by migration from surrounding rural areas, has led to a population estimated at over half a million people (World Population Review[2]). In graph 1 (in Appendix) we can observe the accelerating tendency of the decline in the percentage of rural population in Mozambique, and in graph 2 (in Appendix) we can see the rapid growth of the population of Quelimane, since 1990, a tendency that is only expected to accelerate. This growth, coupled with inadequate urban planning, has given rise to issues such as informal land occupation. Many residents, lacking legal entitlement, occupy whatever land they find available. In some instances, the occupied land may have been home to families for generations without any formal legal title. This scenario underscores the critical importance of legal documentation, which transcends the mere legal transfer of property. (Source: DPU Quelimane[3])

So, how can a simple document affirming property ownership transform household dynamics in Quelimane? This question forms the core of our study, and the implications are profound.

[1] More information can be found here: -https://worldpopulationreview.com/world-cities/quelimane-population

[3] DPU Quelimane refers to the Urban Planning Directorate of Quelimane

Property rights enhance security and stability by legally safeguarding against eviction, thus fostering a safer living environment conducive to long-term planning. Furthermore, well-defined property rights can increase property values, attracting potential buyers and investors, and significantly reducing disputes over land and resources. These aspects are particularly pertinent in Quelimane, where increased demand in the housing sector, driven by migration from rural areas, contrasts with several challenges. These include poor urban planning and numerous uninhabitable zones due to vulnerabilities in coastal regions that, while protected, are still populated, posing risks to both the community and the environment (Source: DPU Quelimane). Additionally, Quelimane, a city prone to major flooding during Mozambique's rainy season, faces further housing supply issues due to its flat terrain and the use of materials in construction that are not resistant to natural phenomena (Source: DPU Quelimane). For example, the significant impact of Hurricane Freddy in early February 2023 highlights the ongoing vulnerability to such events. (Source: IFRC[4]). Furthermore, property rights can facilitate financial opportunities. If owners can use their property as collateral to access credit, it can enable further improvements or business expansions. Importantly, owning property ensures there is a tangible asset to pass on to heirs, providing financial security for future Thus, by holding a title, households not only secure a valuable asset but also gain access to credit, enjoy greater neighborhood stability, and acquire the means to provide for future generations. Through this lens, it becomes evident why establishing property rights can be linked with increased investment at the household level

This study aims to delve into these dynamics, exploring how property rights influence investment at home, particularly in home assets and in the education of its inhabitants.

[4] More information can be found here: https://reliefweb.int/report/mozambique/mozambique-floods-and-tropical-cyclone-freddy-dref-operational-update-mdrmz020

For that purpose, we will first use an Ordinary Least Squares (OLS) approach to regress property ownership on household investment and education indicators, including controls and blocked fixed effects. For that purpose, We will use data collected from a survey to 3430 residents in Quelimane in 2020 in 542 block across different neighbourhoods. Subsequently, we will employ a two-stage least squares (2SLS) approach using one instrumental variable—the proximity to a house that received a property title from a programme issued by the Millennium Challenge Account (MCA) in 2012—to isolate the causal effect of secure property rights on investment behaviors. Furthermore, we will examine the effect of property ownership on the educational levels of cohabitants, using a regression at the level of the cohabit with fixed effects.

Our study's key findings reveal substantial impacts of secure property rights on household investment. Specifically, property rights are associated with an increase in household assets by approximately nine assets and raise the likelihood of investing in reliable energy by 127.2 percentage points. Roofing quality also improves dramatically by 477.1 percentage points. Additionally, we observed a significant increase in educational expenditures, with school payments rising by 25,830.8 MZN (approximately 361.63 EUR) among households owning property. Lastly, property ownership reduces the likelihood of residents having no education by 2.1 percentage points.

This paper begins with a review of the theoretical framework linking property rights to economic investment. It then provides background context before detailing the methodology used for collecting and analyzing household data from Quelimane. Finally, the paper presents the research findings and policy implications.

2. Literature Review

The importance of property rights in economic theory is long-standing and extremely rooted, reflecting a connection between resource allocation and investment incentives. Historically, scholars like North (1990) have underlined that well-defined property rights are vital in reducing transaction costs and mitigating uncertainties, thereby catalyzing economic growth. Echoing this, De Soto (2000) argues that clarity in property rights is indispensable for accessing financial markets and securing loans, which are crucial for household and community development. Furthermore, Acemoglu and Johnson (2005) elucidate how the institutions governing property rights shape economic outcomes by molding the structure of economic incentives and investment behaviors.

Empirical evidence further reinforces the vital role of secure property rights in propelling investments in durable household assets. For example, Field (2005) documented marked increases in home improvement investments in Peru following the formalization of property rights. Similarly, Galiani and Schargrodsky (2010) observed in Argentina that land titling significantly boosted household expenditure on housing improvements due to enhanced tenure security. Looking into sub-Saharan Africa, Goldstein and Udry (2008) examined property rights in Ghana, showing that secure land tenure acts as a catalyst for agricultural investment by diminishing uncertainty and fostering a long-term investment outlook.

The ripple effects of property rights extend into the realm of infrastructure quality within residential environments, which is important for enhancing life quality and economic productivity. Besley (1995) found that property rights are connceted with improved infrastructure maintenance, stimulated by increased homeowner investments. This interplay is particularly pronounced in the context of African urbanization. Durand-Lasserve and Royston (2002) delve into the dynamics of land tenure and urban development, underscoring the necessity of formal property rights to underpin sustainable urban growth. They argue that in

the absence of secure property rights, urban residents are hesitant to invest in permanent structures or improvements, a challenge that resonates with the situation in Quelimane.

Although the link between property rights and educational investments might appear indirect, its significance is undeniable. In contexts like Malawi, families with secure land tenure are more inclined to invest in their children's education, driven by expectations of long-term stability and economic returns (Kolenikov and Angeles, 2009). Brasselle et al. (2002) propose that when families are freed from concerns about eviction, they can redirect resources from securing housing to enhancing human capital.

Despite the robust body of research connecting property rights with economic development, notable gaps persist. A considerable portion of the literature has focused on the impact of property rights on agricultural investments and urban home improvements, yet there is scant research addressing the nuanced effects of property rights in rapidly urbanizing African cities like Quelimane. This gap extends to the understanding of how property rights not only influence physical investments but also impact expenditures on education and other facets of human capital. This study seeks to bridge these gaps by offering a analysis of how property rights affect household investment behaviors in Quelimane, Mozambique, providing insights that could be extrapolated to other rapidly urbanizing regions across sub-Saharan Africa.

3. Context

3.1 Property Rights in Quelimane

In Mozambique, all land is owned by the state in trust for the people. However, citizens (as well as foreign and corporate entities) can acquire land use rights. In Quelimane, like elsewhere in Mozambique, property rights management is decentralized and primarily handled at the municipal level by entities such as the Urban Planning Directorate. The management quality is

indicated by a Land Administration Quality Index score of 9 out of 30 and an Infrastructure Reliability Index score of 3 out of 8 (Source: World Bank), highlighting ongoing challenges in land administration.

In Quelimane, property rights within legalizable areas are documented through two main types of ownership documents: DUATs (Direito de Uso e Aproveitamento do Território) and TOMBOS. DUATs, generally valid for 50 years, authorize the use and benefits from a designated land parcel. However, due to technological constraints, DUATs are seldom issued currently. Conversely, TOMBOS, which do not expire and necessitate extensive documentation, are more commonly granted. For this study, ownership of either document type is considered as having property rights. (Source: DPU Quelimane) The procedure to secure a title involves multiple fees, starting with a 50 meticais (approx. 0.70 euros) application fee at the neighborhood directorate, a 260 meticais (approx. 3.60 euros) submission fee at the Department of Urban Planning (DPU), and a land legalization fee of 5 meticais per square meter (approx. 0.07 euros). This complex and costly process, coupled with a predominantly paper-based property registration system centered in the urban registry office, poses significant bureaucratic and financial barriers to securing land titles. (Source: DPU Quelimane).

The challenging and variable nature of accessing property rights in Quelimane raises concerns about potential confounding factors in the study of property rights' impact on investment. The variability in how and whether property rights are secured—often influenced by household income, job, location, and other socio-economic factors—underlines the difficulty in establishing a clear causal link between property rights and household investment. To address potential endogeneity issues and isolate the effect of property rights on investment behaviors, the use of an instrumental variable, such as the involvement in the MCA LEGAL Programme, becomes crucial in this analysis.

3.2 The MCA LEGAL Programme

The MCA Legal Programme, launched in 2012 in Mozambique, aimed to improve land administration and tenure security in both rural and urban areas. Key initiatives included evaluating legal frameworks, institutional capacities, parcel registration methodologies, and auditing existing land records. A significant focus was the regularization of land tenure, resulting in over 200,000 parcels registered and more than 157,000 DUAT titles issued. (Source:DAI)[5] .

In Quelimane, a primary target for neighborhood legalization, the programme faced significant hurdles, including financial and time constraints, which limited its reach to only a fraction of the intended areas. The Urban Planning Directorate indicated that while the programme did not use specific criteria for selecting blocks for land title issuance, the implementation started according to a predetermined plan (suppose to reach all neigbourhoods) but was cut short. Most property titles in Quelimane were either directly issued under this programme or were influenced by proximity to titled properties.

The non-selective and incomplete implementation of the MCA programme in Quelimane suggests that the distribution of DUATs through this initiative was exogenous, relative to the inherent characteristics of the households or their investment behaviors. This aspect is critical as it indicates that receiving a title through the MCA programme was largely independent of household traits, which might otherwise influence investment decisions. Therefore, this non-selectivity and the arbitrary cessation provide a unique opportunity to use the MCA programme as an instrumental variable in our econometric analysis. It is important to note that households

[5] More information on this programme can be found here :
https://www.dai.com/uploads/FF%20Moz%20Land_%20MCA_Final_2018.pdf

that did not get a DUAT and only got proof of land registration (which does not give the same rights to the propetary as a DUAT) are also accounted for as part of the programme.

Given the specific implementation dynamics of the MCA programme, we propose to employ a two-stage least squares (2SLS) approach to explore the causal impact of property rights on household investment. The instrumental variable, denoted as 'MCA', will measure whether a household's property was directly involved in the MCA programme or was within a radius of 10 meters from a property that received a title, accounting for potential inaccuracies in GPS data. This variable is instrumental in isolating the exogenous variation in property rights acquisition attributable to the programme, thus allowing for a more precise estimation of the effects of property rights on various dimensions of household investment.

However, our instrument presents its limitations**.** If the allocation of property titles by the MCA program was not entirely random, despite assurances to the contrary[6], but instead influenced by certain characteristics of the households or the neighborhoods, then the proximity to these properties might be correlated with these characteristics. To test for exogeneity, we compared the observable characteristics of households participating in the MCA program (mca_all = 1) and those not participating (mca_all = 0). Households with mca_all = 1 tend to have a higher proportion of literate individuals and higher household incomes compared to those with mca_all = 0. Additionally, the proportion of females is higher in households with mca_all = 0. There are no significant differences in the completion of secondary school or the distribution of religion between the two groups. However, households with mca_all = 0 have a higher average age compared to those with mca_all = 1 (Images 1 - 5 in Appendix). These findings suggest some differences in observable characteristics that could challenge the exogeneity of the instrument. Nevertheless, the MCA program was implemented in 2012, and the data was

[6] Insurances provided by the Infrastructure Councilor of Quelimane

collected in 2021-2023. It is plausible that the program's positive effects, such as improved literacy and income, influenced the observed differences over time. The higher proportion of males in the MCA program aligns with the existing gender inequality in Mozambican society, where men typically control household property

Furthermore, Looking at the Stock-Yogo Weak ID Test Critical Values, our F statistic is higher than the 15%, 20%, and 25% critical values in most of our models but lower than the 10% critical value. This suggests that while the instrument is not weak if a maximal IV size of 15% is acceptable, it could be considered weak under stricter criteria. (Image 6 in Appendix).

4. Hypotheses

The research is driven by two primary hypotheses aimed at examining the specific impacts of property rights on various aspects of socio-economic development in Quelimane, Mozambique. Each hypothesis is crafted to test a particular dimension of how property rights can influence household behaviors:

Household Investment Hypothesis: "Secured property rights are associated with an increase in household investments in both physical assets and utilities." This hypothesis posits that when households have legally recognized property rights, they experience enhanced security. Consequently, these households are more likely to invest in home improvements and essential utilities, such as electricity and sanitation, reflecting a commitment to long-term property enhancement and well-being.

Educational Investment Hypothesis: "Property rights ownership positively influences the educational expenditures of households." This hypothesis suggests that the security offered by clear property rights enables households to allocate more resources towards the education of their members. The stability and reduced risk of eviction provided by property rights allow

families to focus on long-term planning and investment in human capital, anticipating better educational outcomes and future economic returns.

4. Methodology

4.1 Data

The primary data for this research was collected through a survey administered by NOVAFRICA as part of a Randomized Control Trial aimed at estimating the components involved in integrating rural migrants into the coastal city of Quelimane, Mozambique. This survey served as the baseline for the study "Integrating Rural Migrants in Cities – A Field Experiment in Mozambique." It included household-level questions and reached 3,430 residents across 542 blocks in different neighborhoods in Quelimane in October 2021 and January 2022.

The second set of data was collected through the endline survey for the same study, conducted by NOVAFRICA from November to December 2023, reaching the same 3,430 residents across 542 blocks within different neighborhoods in Quelimane.

The third data source, provided by the Urban Planning Directorate in SHP file format, consisted of shape files of houses labeled through the MCA program in 2012. We utilized this dataset to construct the instrumental variable. Employing QGIS, we pinpointed the locations of the households in our main sample and generated a 10-meter buffer around each to accommodate for potential inaccuracies in geographical data. Subsequently, we intersected this buffered area with the MCA data, isolating households participating in the MCA program, thus obtaining our instrument.

4.2 Variable definitions

4.2.1 Independent variable

Owns property right: Assessed using a survey question from the first dataset asking if the household has any title for their land. This variable is coded as 1 for DUAT or TOMBO responses, and 0 otherwise.

4.2.2 Dependent Variables

All the dependent variables were obtained through survey questions, using the firs and the second datasets, both the baseline survey and the endline, and are the following : Household Assets: Calculated as the aggregated sum of ownership across eight categories: radio, TV, mattress, van, motorcycle, freezer, phone, and bicycle. Each category is represented by a dummy variable (1 = owned, 0 = not owned). Electricity Investment: A binary variable indicating whether the household has invested in solar panels or electric grid connections (1 = yes, 0 = no). Sanitary Investment: A binary variable indicating whether the household has an upgraded latrine or a toilet in the bathroom, with or without plumbing (1 = yes, 0 = no).School Payments: Represents the total amount spent annually on school tuition. Uniforms and Books: The annual expenditure on school uniforms and books. Other Expenses (School-related): Includes annual expenditures on school transport, meals at school and at home, contributions to school building funds, additional payments for teachers, and boarding school fees. House Built by Owner: A dummy variable indicating whether the house was constructed by the owner (1 = yes, 0 = no). High-Quality Roof: Indicates the use of higher quality roofing materials such as zinc, iron, and metal (1 = yes, 0 = no). High-Quality Floor: Represents the use of high-quality flooring materials like cement, brick, or tile (1 = yes, 0 = no). High-Quality Exterior: A dummy variable indicating the use of high-quality external materials such as rocks or zinc (1 = yes, 0 = no).

4.2.3 Control Variables

Definitions and explanations of the control variables can be found in the Appendix.

4.2.4 Instrument Variable

The Instrumental variable was obtained using the third dataset, as described previously, and is represented by MCA, a dummy variable taking the value 1 if the household property was within a 10-meter radius of a house that participated in the MCA program in 2012, otherwise 0.

4.3 Estimation Strategy

4.3.1 OLS

The empirical strategy of the research employs a series of progressively econometric models to estimate the impact of having a property title on various household investment outcomes. We structure our analysis in five distinct models, each building on the last, to robustly isolate the effect of property titles while controlling for confounding variables and accounting for potential endogeneity.

$$Y_{i=}\beta_0 + \beta_1 OwnsProperty + \epsilon_i \qquad (1)$$

This model assesses the basic linear relationship between the property rights ownership and the dependent variable Y. Vector Y will include multiple dependent variables (e.g., household assets, education expenses, infrastructure quality), where ϵi represents the error term. Standard errors are clustered at the block level to account for potential correlations within blocks that might bias standard error estimates.

$$Y_{i=}\beta_0 + \beta_1 OwnsProperty + +\sum\beta_k X_{k\,i} + \epsilon_i \qquad (2)$$

Adds control variables X (Gender, Normalized Weekly Income, Religion, Literacy, Completion of High School, Normalized Age) to the simple regression to account for additional variance and potential confounders.

$$Y_{i=}\beta_0 + \beta_1 OwnsProperty + +\sum\beta_k X_{k\,i} + \sum\gamma_j \text{Block}_{ji} + \epsilon_i \qquad (3)$$

Introduces blocked fixed effects γj to control for unobserved heterogeneity within geographic blocks alongside the control variables.

4.3.2 2SLS

First Stage: $OwnsProperty_i = \pi_0 + \pi_1 MCA_i + \eta_i$

$$Y_{i=} \beta_0 + \beta_1 Owns\widehat{Property} + \epsilon_i \quad (4)$$

Uses 'Mca' as an instrument for property rights in the first stage to predict property rights ownership. The predicted values $PropertyRights\hat{}i$ are then used in the second stage to estimate the effect on Y

First Stage: $OwnsProperty_i = \pi_0 + \pi_1 MCA_i + \sum \pi_k X_{k_i} + \eta_i$

$$Y_{i=} \beta_0 + \beta_1 Owns\widehat{Property} + + \sum \beta_k X_{k_i} + \epsilon_i \ (5)$$

Includes the same control variables in both stages as in Model 2, but like Model 4, block effects are omitted due to the block-level implementation of the instrument.

4.3.3 Model for Educational Levels of Cohabits

$$EducationLevel_{ij} = \alpha_0 + \alpha_1 OwnsProperty_{ij} + \sum \alpha_k Z_{k_i} + u_i + \epsilon_{ij}$$

Uses a regression model where i indexes household heads and j indexes cohabitants. μi is a random intercept for each household head, capturing unobserved heterogeneity at the household level. This model examines the effect of property ownership on the educational achievements of cohabitants, adjusting for owner-specific variability and controlling variables, represented by vector Z, which are: Gender of Owner, Normalized Weekly Income, Literacy of Owner, Completion of High School of Owner, Normalized Age of Owner, Relationship Owner-Cohabit, Cohabit is Female, Age of Cohabit

5. Results

5.1 Descriptive Statistics

Table 1 provides a detailed overview of the key variables used in the study, capturing the socio-economic characteristics of 3,430 residents across 542 blocks in Quelimane. The data reveal significant variations in income, household assets, educational expenditures, and investments in infrastructure, which are critical for understanding the impact of property rights.The average weekly income among households is 1,257.42 MZN (approximately 17.65 EUR), with a substantial standard deviation of 1,508.51 MZN (21.19 EUR), indicating considerable income disparity.

Table 1: Descriptive Statistics of Key Variables

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
Weekly Income (MZN)	2,709	1,257.42	1,508.51	0	20,000
Age	2,963	31.91	45.33	18	999
Total Number of Household Assets	3,430	3.29	2.18	0	8
School Payments (MZN)	3,430	2,742.32	10,570.48	0	144,000
Uniforms and Books (MZN)	3,430	358.48	1,321.15	0	50,000
Other School-Related Expenses (MZN)	3,430	186.75	1,428.65	0	45,000
Owns Property Right	3,430	0.094	0.292	0	1
Gender (Female)	3,430	0.440	0.496	0	1
Literacy	3,430	0.784	0.412	0	1
Secondary Education Completed	3,430	0.494	0.500	0	1
Catholic	3,430	0.613	0.487	0	1
Part of the MCA Programme	3,430	0.449	0.497	0	1
Sanitary Investment	3,430	0.472	0.499	0	1
Electricity Investment	3,430	0.899	0.302	0	1
House Built by Owner	3,430	0.150	0.357	0	1
High Quality Exterior	3,430	0.015	0.123	0	1
High Quality Floor	3,430	0.515	0.500	0	1
High Quality Roof	3,430	0.812	0.391	0	1
Cohabit Relation	54,880	0.9111	3.1170	0	18
Cohabit is Female	54,880	0.0641	0.2449	0	1
Age of Cohabit	54,880	2.3171	8.6195	0	99

All monetary values are reported in Mozambican Metical (MZN)

On average, households own 3.29 assets out of a possible eight, with a standard deviation of 2.18. This asset ownership serves as a key indicator of economic well-being within the sample.

The mean annual expenditure on school payments is 2,742.32 MZN (approximately 38.51 EUR), with a high standard deviation of 10,570.48 MZN (148.47 EUR), reflecting significant variation in educational investment. Only 9.4% of households reported owning a property right (DUAT or TOMBO), highlighting a significant gap in property formalization. Approximately 44% of household heads are female, with 78.4% literate and 49.4% having completed secondary education. The majority of the sample (61.3%) identifies as Catholic. Nearly half (47.2%) of the households have invested in improved sanitation facilities. A significant 89.9% have invested in electricity, either through solar panels or grid connections. Regarding housing quality, 15% of houses were built by their owners, 1.5% have high-quality exterior materials, 51.5% have high-quality floors, and 81.17% have high-quality roofs, indicating a higher priority for durable roofing and flooring. Only 6.41% of cohabitants are female, and the average age is 2.3171 years, indicating a young demographic profile within households.

5.2 Regression Outcomes

Bearing table 2 in mind, The OLS regressions (columns 1-3) indicate a significant positive impact of property rights on household assets. The coefficients from OLS range from 1.442 in the basic model to 1.240 with controls and blocked fixed effects and are statistically significant at the 1% level. This implies that households with property rights own approximately 1.24 additional assets compared to those without property rights. The inclusion of additional controls and blocked fixed effects increases the explanatory power of the models, as reflected in the adjusted R^2 values, which rise from 0.0351 to 0.195.

Table 2: Impact of Property Right on Household Assets

	OLS			2SLS	
	(1)	(2)	(3)	(4)	(5)
Household Assets					
Coefficient	1.442***	1.339***	1.240***	9.38***	8.98**
Standard Error	(0.119)	(0.126)	(0.158)	(2.481)	(3.23)
Observations	3412	2695	2695	3412	2695
Adjusted R^2	0.0351	0.0646	0.195	-1.099	-0.976
F First Stage	-	-	-	19.594	14.047
Sanitary Investment					
Coefficient	0.190***	0.166***	0.121**	2.908***	2.945**
Standard Error	(0.029)	(0.033)	(0.038)	(0.860)	(1.005)
Observations	3430	2709	2709	3430	2709
Adjusted R^2	0.0121	0.0400	0.248	-2.518	-2.492
F First Stage	-	-	-	18.986	13.821
Electricity Investment					
Coefficient	0.0778***	0.0601**	0.0528**	1.548***	1.272**
Standard Error	(0.0176)	(0.0198)	(0.0203)	(0.4128)	(0.4283)
Observations	3430	2709	2709	3430	2709
Adjusted R^2	0.00716	0.0308	0.193	-2.489	-1.801
F First Stage	-	-	-	18.986	13.821
Model Features					
Controls		X	X		X
Blocked Fixed Effects			X		

Statistical Details: Standard errors are in parentheses. Robust standard errors are clustered at the block level. $***p < 0.001$, $**p < 0.01$, $*p < 0.05$.

Additional Notes: *F First Stage:* Reports the F-statistic from the first stage of the instrumental variables estimation, indicating the strength of the instrument. This is shown only for models (4) and (5) where instrumental variable methods are used.

The 2SLS regressions (columns 4-5), using the MCA instrument, also demonstrate a significant positive effect, with much larger coefficients of 9.38 and 8.98, significant at the 1% level. This suggests that when accounting for potential endogeneity, households with property rights have about 9 more assets on average.The F First Stage statistic of 14.047 robustly supports the strength and relevance of the instrument, affirming the reliability of these IV estimates.

The influence of property rights extends to investments in essential utilities such as sanitation and electricity. Households with property rights are 19 percentage points more likely to invest in improved sanitation facilities, as seen in the coefficient of 0.190 in model (1) ($p < 0.001$). This impact significantly increases to 2.945 in the IV model (5) ($p < 0.01$), with an associated F First Stage statistic of 13.821, suggesting a causal impact and strong instrument validity.

Similar to sanitary investments, property rights have a significant positive effect on investments in electricity. The coefficients show a decrease from 0.0778 to 0.0528 in the OLS models, but with a p value of <0,01 %, indicating greater likelihood of investing in electricity. The 2SLS model shows an even stronger effect (coefficient = 1.272), suggesting that people with secure property rights may invest more 127,2 % percentage points in more reliable energy sources, significant at a 1 % threshold.

Table 3: Impact of Property Rights on House Infrastructure

	OLS			2SLS	
	(1)	(2)	(3)	(4)	(5)
House built by owner					
Coefficient	0.344***	0.336***	0.370***	-0.291	-0.0674
Standard Error	(0.0200)	(0.0221)	(0.0241)	(0.3063)	(0.3210)
$R^2_{adjusted}$	-0.00091	0.0132	0.612	-0.00609	-0.0278
F First Stage	-	-	-	39.692	23.391
High quality exterior					
Coefficient	0.00345	0.0101	-0.000532	-0.130	-0.109
Standard Error	(0.0088)	(0.0122)	(0.0106)	(0.1095)	(0.1429)
Observations	3430	2709	2709	3430	2709
$R^2_{adjusted}$	-0.00034	0.00700	0.250	-0.101	-0.0554
F First Stage	-	-	-	18.986	13.821
High quality floor					
Coefficient	0.0807**	0.0466	0.0240	4.804***	4.771***
Standard Error	(0.0290)	(0.0328)	(0.0338)	(1.2382)	(1.4378)
Observations	3430	2709	2709	3430	2709
$R^2_{adjusted}$	0.00204	0.0591	0.378	-7.641	-7.499
F First Stage	-	-	-	18.986	13.821
High quality roof					
Coefficient	0.0165	0.00142	0.0000927	1.488**	0.749
Standard Error	(0.0239)	(0.0203)	(0.0092)	(0.5737)	(0.4483)
Observations	3430	2709	2709	3430	2709
$R^2_{adjusted}$	-0.00021	0.0184	0.598	-1.218	-0.785
F First Stage	-	-	-	18.986	13.821
Model Features					
Controls		X	X		X
Blocked Fixed Effects			X		

Statistical Details: Standard errors are in parentheses. Robust standard errors are clustered at the block level. $***p < 0.001$, $**p < 0.01$, $*p < 0.05$.

F-test, First Stage: Reports the F-statistic from the first stage of the instrumental variables estimation, indicating the strength of the instrument. This is shown only for models where instrumental variable methods are used.

Regarding housing infrastructure, looking into table 3, property rights are only linked to the owner-driven construction using the OLS models. The OLS models show a consistent positive

effect (coefficients range from 0.336 to 0.370), but this effect becomes insignificant in the 2SLS models, suggesting that the simple models might capture some unobserved biases.

The use of high-quality materials for roofing, flooring and exterior enhancement shows mixed results. The results for high-quality flooring investments are notable. In the OLS model, without controls, the coefficient is 0.0807, indicating a modest but statistically significant effect, however not robust.

However, the 2SLS model with controls reveals a much more substantial effect, with a coefficient of 4.771, indicating that people with property rights are 477,1 percentage points more likely to have higher quality materials on their floor, which strongly suggests a significant causal relationship between property rights and investments in high-quality flooring. On the other hand the analysis of investments in high-quality exterior materials did not yield statistically significant results across any of the models. And analysis of investments in high-quality roofing materials only yields a significant results on 2SLS resgression without controls, making it harder to infer a casual relationship.

Looking into Table 4, it reveals significant increases in education-related expenditures associated with property rights. Households with property rights spend substantially more on school payments. The IV model (5) shows an exceptional increase in school payments to 25830.8 MZN (approx. 361.63 EUR ($p < 0.05$), with the high F First Stage value of 13.821 confirming the instrument's strength, Expenditures on uniforms and books follow a similar pattern, with a starting coefficient of 312.8 (approx. 4.38 EUR) ($p < 0.01$) in model (1), escalating to 801.0 (approx. 11.21 EUR) in model (5)

Table 4: Impact of Property Right on Education

	OLS			2SLS	
	(1)	(2)	(3)	(4)	(5)
School Payments					
Coefficient	3592.1***	3263.2**	2973.0**	27099.9*	25830.8*
Standard Error	(906.2)	(1102.5)	(1066.7)	(11395.4)	(12915.4)
Observations	3430	2709	2709	3430	2709
R^2 (Adjusted)	0.00915	0.0329	0.276	0.4124	0.3307
F first stage	-	-	-	18.986	13.821
Uniforms and Books					
Coefficient	312.8***	281.9**	273.0*	471.8	801.0
Standard Error	(92.3)	(107.6)	(114.7)	(1072.3)	(1112.5)
Observations	3430	2709	2709	3430	2709
R^2 (Adjusted)	0.00462	0.0229	0.254	0.0031	0.0002
F first stage	-	-	-	18.986	13.821
Other Expenses (school related)					
Coefficient	302.7	235.9	286.5	2262.9	1874.1
Standard Error	(189.2)	(231.3)	(280.7)	(1379.8)	(1655.8)
Observations	3430	2709	2709	3430	2709
R^2 (Adjusted)	0.00371	0.00887	0.197	0.1572	0.0921
F first stage	-	-	-	18.986	13.821
Model Features					
Controls		X	X		X
Blocked Fixed Effects			X		

Statistical Details: Standard errors are in parentheses. Robust standard errors are clustered at the block level. $***p < 0.001$, $**p < 0.01$, $*p < 0.05$.

Additional Notes: F First Stage: Reports the F-statistic from the first stage of the instrumental variables estimation, indicating the strength of the instrument. This is shown only for models (4) and (5) where instrumental variable methods are used.

However, the increase in expenditures on uniforms and books is not statistically significant in the latter model, suggesting a complex relationship that may not be as pronounced as that observed for school payments.The effect of property ownership on other school expenses is non significant in any of the models.

This analysis shows the significant causal impacts of property rights on enhancing household asset values, utility investments, educational expenditures, and housing quality. The robustness of these findings, particularly in the IV models, highlights the importance of secure property rights as a cornerstone for economic development and improved living standards. The strong F First Stage statistics across these models validate the instrumental variable approach, suggesting that the estimates might reflect genuine causal relationships rather than spurious

correlations.

Table 5: Impact of Property Rights on Cohabits

	(1)	(2)	(3)	(4)	(5)
Owns Property Right	-0.021***	0.013***	-0.001	0.005*	0.004
	(0.004)	(0.003)	(0.002)	(0.002)	(0.002)
Weekly Income of Owner	-0.000**	-0.000	0.000	0.000*	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Owner is Literate	-0.002	-0.000	-0.002	-0.001	0.004
	(0.004)	(0.003)	(0.002)	(0.002)	(0.002)
Owner is Female	-0.019***	0.012***	-0.000	0.004**	0.003*
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Owner Finished Education	-0.001	-0.005**	-0.001	-0.001	0.003*
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Relation Owner Cohabit	-0.029***	0.008***	0.001***	0.006***	0.007***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Cohabit is Female	-0.203***	0.191***	0.019***	0.038***	-0.006*
	(0.004)	(0.004)	(0.002)	(0.003)	(0.003)
Age of Cohabit	-0.014***	0.002***	0.001***	0.004***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.996***	0.008*	0.004*	0.003	-0.006**
	(0.004)	(0.003)	(0.002)	(0.002)	(0.002)
Observations	43344	43344	43344	43344	43344

Statistical Details: Standard errors are in parentheses. Robust standard errors are clustered at the block level. $***p < 0.001$, $**p < 0.01$, $*p < 0.05$.
Note: Each regression number corresponds to a specific educational level of the owner's cohabitant. -[1] No education; [2] Some primary education;[3] Completed primary education;[4] Some secondary education;[5] Completed secondary education

Table 5 of the study presents a detailed examination of how property ownership affects the educational achievements of individuals across different educational levels using a mixed-effects model that accounts for variations specific to each property owner. This nuanced analysis helps in understanding the subtle and overt influences of property rights on educational outcomes, spanning from no education to higher education stages.

Beginning with the most basic level of education—having no education—the results indicate that property ownership is associated with a decrease in the likelihood that cohabitants will remain uneducated, as evidenced by a negative coefficient of -0.021 with a significance level below 0.01, therefore owning property decreases the probability that cohabitants have no education by 2.1 percentage points. . This finding suggests that individuals who own property are more likely to create environments that foster at least minimal engagement with education,

perhaps by providing more stable and conducive living conditions that allow cohabitants to focus on educational pursuits instead of survival.As we move to primary education levels, the impact of property ownership becomes even more pronounced. The data shows that property ownership positively affects the likelihood of cohabitants receiving some primary education, with a coefficient of 0.013 and a high level of statistical significance ($p < 0.01$). This might reflect a scenario where property owners, feeling more secure in their economic and living conditions, are both capable and motivated to invest in the foundational educational needs of their household members.

However, the transition from initiating primary education to completing it appears to be less influenced by property ownership, as indicated by a coefficient near zero (-0.001). In the realm of secondary education, the study again observes a positive impact, though modest, of property ownership on the pursuit of some secondary education, noted by a coefficient of 0.005 ($p < 0.05$), owning property is associated with a 0.5 percentage point increase in the likelihood of cohabitants having some secondary education, suggesting a supportive but modest influence of property rights in continuing education beyond primary levels. This effect underscores the potential for property ownership to contribute to greater educational attainment by providing a more stable and resource-enhanced environment that can support ongoing educational expenses and commitments.However, the completion of secondary education appears to not be significantly affected by property ownership, with a statistically insignificant coefficient of 0.002. Further models explored higher levels of education attainment, such as tertiary education and beyond. However, the results from these models were all non-significant, indicating that property ownership's influence diminishes or becomes indistinguishable at these higher educational stages.

In conclusion, this analysis employed in this study provides clear evidence that property ownership generally fosters engagement in education at lower levels, but its impact becomes less pronounced at higher educational stages.

6. Policy Implications

The policy implications derived from the study suggest several strategic interventions that governments and stakeholders might consider to leverage the benefits of formalized property ownership.

Formalization of land titles is essential, with evidence pointing to substantial benefits from initiatives aimed at formalizing land titles, especially in informal settlements where the ambiguity of property rights stifles economic development. Government programs should be expanded or initiated to provide clear property titles, thereby fostering economic engagement and investment at the household level. There is also a crucial need to simplify the procedures for obtaining legal property titles. This simplification should involve reducing the bureaucratic hurdles and associated costs of land registration, which often disproportionately impact lower-income households, deterring them from securing their property rights.

Inclusive urban planning is necessary, as urban development policies should integrate secure property rights as a core element to ensure that infrastructural investments are sustainable and beneficial to all residents, particularly migrants and residents of previously informal settlements. This approach will help in creating a more organized and equitable urban growth. Given the challenges posed by natural disasters in regions like Quelimane, it is vital to invest in resilient infrastructure that not only improves the quality of life but also withstands environmental challenges, thus safeguarding the community's investments and well-being.

Access to financial services should be broadened. Financial institutions are encouraged to accept property titles as collateral for lending, which could significantly broaden access to

credit for lower-income households. Accompanying these offerings with financial education programs will maximize the benefits, enabling households to make informed decisions about leveraging their assets for further economic activities. The development of financial products tailored for newly titled property owners could facilitate further investments in home improvements and entrepreneurial ventures.

Targeted educational investments are also crucial. Recognizing the link between property rights and educational investments, governments and NGOs should deploy educational programs specifically in areas where property rights have been secured. This targeted approach could maximize the socio-economic returns on investments by enhancing educational outcomes and, consequently, long-term economic prospects of communities.

By implementing these policy measures, governments and other stakeholders can fully harness the potential of property rights as a mechanism for promoting economic stability and growth. This proactive approach will not only enhance the living standards of the citizens but also lay down a robust foundation for sustained socio-economic development, creating a resilient and prosperous society in regions like Quelimane and beyond.

7. Concluding Remarks

This research has comprehensively analyzed the impact of property rights on household investments in Quelimane, Mozambique, illuminating significant causal relationships between secured property ownership and increased investment in household assets, utilities, and education. The empirical evidence presented, supported by robust econometric models, highlights the profound effect of legal property titles on enhancing the living standards of households in a rapidly urbanizing city.

Our research confirms the Household Investment Hypothesis, showing that secure property rights significantly enhance household asset values—by approximately nine assets—and boost

investments in essential infrastructure like sanitation and electricity. Holding property rights increases the likelihood of investing in reliable energy by 127.2 percentage points and enhances roofing quality by 477.1 percentage points. Additionally, our findings support the Educational Investment Hypothesis, highlighting noticeable increases in education-related expenditures. Specifically, we observe an increase in school payments by 25,830.8 MZN (approximately 361.63 EUR) among households with secure property rights. Furthermore, property ownership reduces the probability of cohabitants having no education by 2.1 percentage points

The study's results advocate for the necessity of secure property rights as a cornerstone for socio-economic development, suggesting that property ownership provides households not just with security against dispossession, but also with leverage to enhance their economic potential and well-being.

While the study provides significant insights into the role of property rights in enhancing household investments, several limitations need to be acknowledged. Firstly, the findings from Quelimane may not be universally applicable to other regions with different socio-economic backgrounds, cultural settings, or legal frameworks. The unique characteristics of Quelimane, such as its specific challenges with urban planning and frequent natural disasters, might influence the study's outcomes in ways that are not replicable in other contexts. Secondly, the reliance on survey data and the construction of an instrumental variable based on proximity to titled properties could introduce biases. The accuracy of self-reported data in surveys can vary, and potential inaccuracies in the geographical data used to construct the instrumental variable could affect the results. Lastly, the study's cross-sectional nature limits its ability to draw conclusions about the long-term effects of property rights on household behavior. Longitudinal data would provide a deeper understanding of how the impacts of property rights evolve over time, particularly in response to policy changes or economic shifts.

8. References

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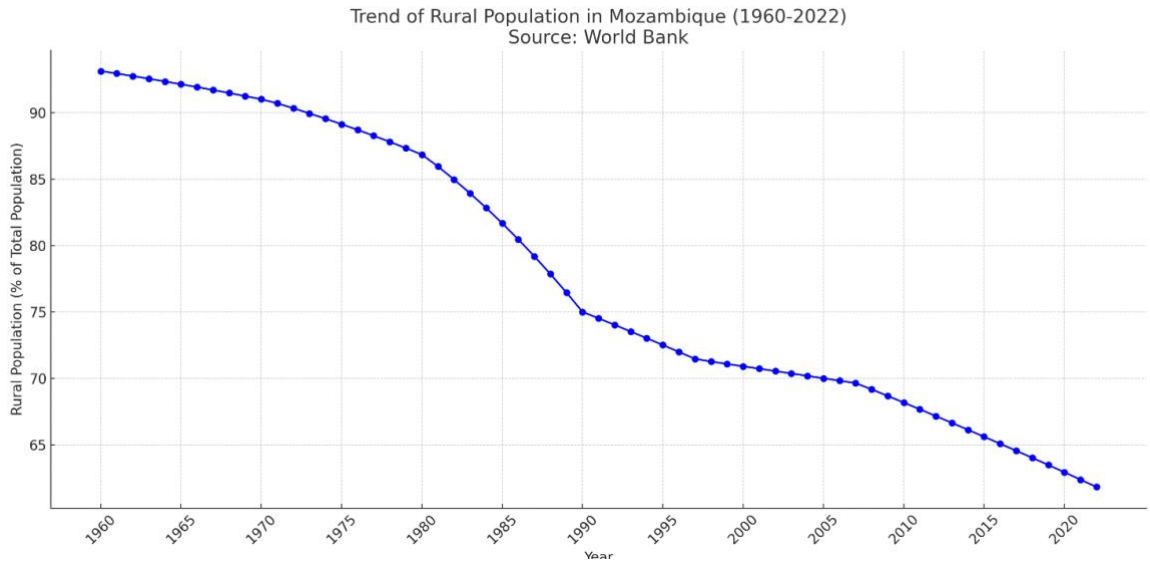
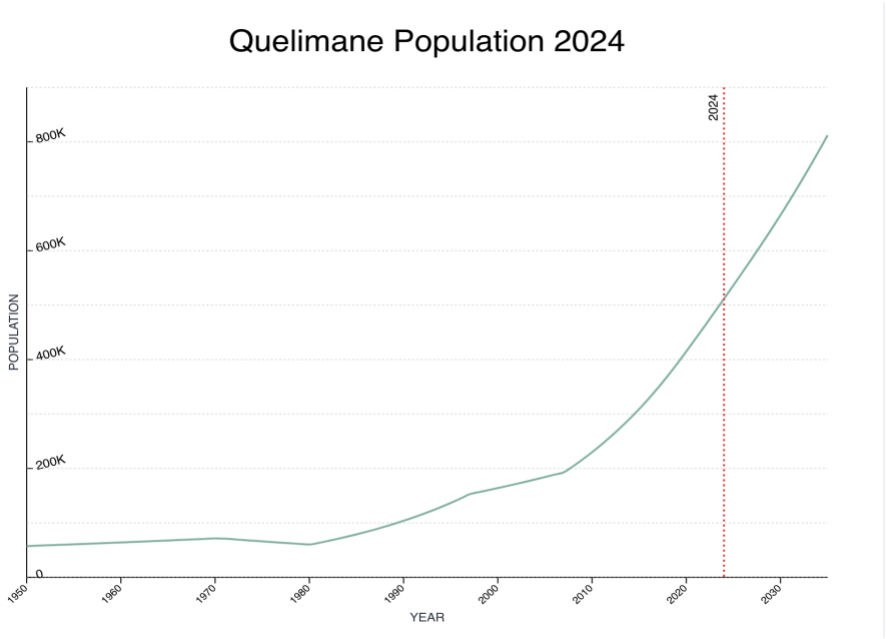
9. Appendix

Graph 1



Graph 2



Observable characteristics tests

Image 1 – 5

```
. tabulate sec_finish mca_all, chi2

  Finished |
       sec. |       mca_all_b
    school |         0          1 |     Total
-----------+----------------------+----------
         0 |       941        793 |     1,734
         1 |       949        747 |     1,696
-----------+----------------------+----------
     Total |     1,890      1,540 |     3,430

          Pearson chi2(1) =   0.9870   Pr = 0.320
```

```
. tabulate religion_n mca_all, chi2

           |       mca_all_b
religion_n |         0          1 |     Total
-----------+----------------------+----------
         0 |       743        583 |     1,326
         1 |     1,147        957 |     2,104
-----------+----------------------+----------
     Total |     1,890      1,540 |     3,430

          Pearson chi2(1) =   0.7576   Pr = 0.384
```

```
. tabulate literate mca_all, chi2
```

Literate	mca_all_b 0	1	Total
0	481	260	741
1	1,409	1,280	2,689
Total	1,890	1,540	3,430

Pearson chi2(1) = 36.7694 Pr = 0.000

```
.
. ttest wk_income_nm, by(mca_all)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf.	interval]
0	1,508	1156.33	33.34331	1294.82	1090.926	1221.734
1	1,201	1384.351	49.9861	1732.291	1286.281	1482.42
Combined	2,709	1257.42	28.98302	1508.51	1200.589	1314.251
diff		-228.0203	58.18786		-342.1174	-113.9232

```
    diff = mean(0) - mean(1)                                      t =  -3.9187
H0: diff = 0                                     Degrees of freedom =     2707

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0001          Pr(T > t) = 1.0000
```

```
. ttest age_nm, by(mca_all)

Two-sample t test with equal variances
```

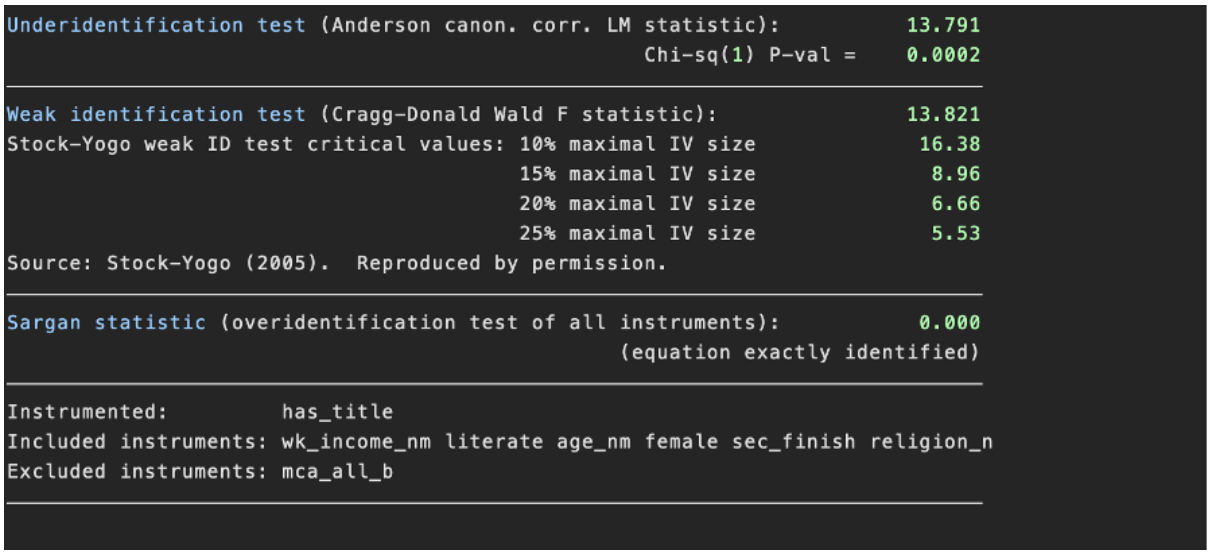
Group	Obs	Mean	Std. err.	Std. dev.	[95% conf.	interval]
0	1,599	33.67605	1.401913	56.05898	30.92627	36.42583
1	1,364	29.84824	.7530139	27.81059	28.37105	31.32543
Combined	2,963	31.91394	.8327953	45.33192	30.28102	33.54685
diff		3.827807	1.669655		.5540053	7.101609

```
    diff = mean(0) - mean(1)                                      t =   2.2926
H0: diff = 0                                     Degrees of freedom =     2961

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.9890         Pr(|T| > |t|) = 0.0219          Pr(T > t) = 0.0110
```

Weak identification test

Image 6



Control Variables

All the control variables were obtained through survey questions (controls were chosen due to significance and theoretical relevance), using the main dataset, and are the following :

Gender: Indicates the gender of the household head (1 = male, 0 = female). Controlling for the gender of the household head is crucial because investment decisions may differ based on gender due to varying access to resources, risk tolerance, and investment priorities between males and females.

Normalized Weekly Income: Household income adjusted for local purchasing power parity Controlling for icome is relevant as income levels are directly related to investment capacity. Adjusting household income for local purchasing power parity ensures that the analysis accurately reflects the actual economic strength and investment potential of households across different regions.

Catholic: Categorical variable capturing if the Hoisehold is catholic (1 = catholic, 0 = non-catholic). Religious affiliations can influence lifestyle choices, financial decisions, and community involvement, all of which can impact investment behaviors. Including religion as a control helps isolate the effect of property rights from cultural and religious influences.

Literacy: Indicates whether the household head can read and write (1 = literate, 0 = illiterate). Literacy of the household head is a key indicator of their ability to access, process, and understand information that can affect economic opportunities and decision-making processes, including investments.

Completion of High School: Reflects whether the household head has completed high school education (1 = yes, 0 = no) Education level, particularly completion of high school, often correlates with better economic opportunities and a greater understanding of financial products and investment options, influencing the decision to invest in assets and educationNormalized Age: Age of the household head adjusted to a standard scale for comparative analysis. Age may affect investment preferences and horizons. Younger individuals might prioritize different types of investments compared to older individuals. Normalizing age allows for comparative analysis across a standard scale.

Block Fixed Effects: A series of dummy variables indicating the household's residential block. Each block has a corresponding dummy variable that takes the value 1 if the household resides in that specific block, and 0 otherwise. This controls for locational advantages or disadvantages such as access to markets, infrastructure, and public services that vary by residential block and can significantly influence investment decisions, one example is the access to the city center.

In the context of the regression analysis that examines the education level of each cohabitant depending on whether the property owner holds a title, we have these 3 new controls:

Relationship Owner-Cohabit: Categorizes the relationship between the property owner and the cohabitant using numeric codes for different family roles and relationships. Controlling for the relationship between the property owner and the cohabitant is essential in this context because different family roles (such as parent, spouse, sibling) can heavily influence decisions regarding educational investment. Property ownership might empower the owner in ways that affect their support or prioritization of educational opportunities for cohabitants, particularly in family structures where decision-making is influenced by hierarchy or gender roles.

Cohabit is Female: This is a dummy variable indicating the gender of the cohabitant. It is assigned a value of 1 if the cohabitant is female, and 0 otherwise. This variable is significant as it helps to understand gender disparities within educational achievements in households Female cohabitants might experience different educational opportunities based on gender dynamics.

Age of Cohabit: This variable measures the age of the cohabitant and is treated as a continuous variable. The age of the cohabitant is crucial for understanding the educational context. Younger cohabitants might be currently in educational systems, while older cohabitants' educational levels could reflect past familial and economic circumstances.