The Impact of Financial Literacy on Home Ownership Rate: Evidence from the Netherlands.

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Bachelor Thesis in Part Fulfilment for the Degree of Bachelor of Science in Urban, Port, and Transport Economics.

Table of Contents

1 Introduction

Owning a home has been considered a gateway to long-term and short-term financial success since time immemorial. This decision of buying a home is one of the largest investment decisions that adults encounter. According to PolicyAdvise (2016), increasing property prices coupled with a sudden change in circumstances have forced most buyers purchasing homes to use mortgages. Mortgages however are complex financial instruments which require a certain level of financial sophistication to utilise. Weber and Gatherhood (2017) through their research suggest that this complexity serves as a striking barrier to less financially proficient households from becoming potential homeowners.

According to Centraal Bureau Voor de Statistiks (2019), less than 70 per cent of the Dutch population live in self-owned homes. This places the Netherlands in the bottom 10% of the rankings in the European Union. Besides, the Netherlands, along with Sweden and Denmark, infamously boasts the highest share of homeowners with a mortgage or loan on their house. In most EU countries, the share of the population living in self-owned homes encumbered with mortgage debt is half of that in the Netherlands.

Academics in the field such as Dean Baker (2016) claim that the housing industry is closely tied to the economy — when home sales are up, so are jobs. He uses the wealth theory to elucidate his claim that rising home prices along with rising homeownership rates encourage consumer spending and lead to stronger economic growth. While the reverse i.e. falling home-ownership rate and falling house prices can contribute to economic recession. According to Aaronson (2008), homeownership has other fringe benefits as well that help to improve the areas surrounding individual homes as it improves neighbourhood stability and greater property value appreciation. Together, these complementary forces create a more stable local, state, and national economy. Thus, homeownership can be seen as a driver for economic growth which is being hindered due to the population's lack of savings as well as their incompetence of handling complex financial instruments such as mortgages.

Governments and policymakers can influence homeownership rates by setting up favourable conditions for potential home-buyers with the use of macro-economic policies, expanding developmental opportunities, relaxing zoning laws, reducing red tape, and capitalizing on market

activity. Fiscal and monetary policies such as increasing the supply of subsidized housing and the formation of price caps can also help in mitigating the problem. Moreover, providing direct support to potential homeowners in the form of education and training concerning the use of financial tools can indeed facilitate more buyers to enter the market. This paper focuses on the latter. Prevailing academic literature has loosely highlighted the importance of financial education in increasing homeownership rates. Almenburg (2017) found that educating the population on the uses of financial tools can have multi-generational benefits in asset building, especially in the housing industry. Furthermore, Osteen and Auberlee (2006) state that low-income and minority families fall into a rabbit hole as they rely on high-cost financial services because they lack education concerning other alternatives and some scrupulous lenders target such groups. This paper shall focus on the role financial literacy plays in preparing an individual to purchase a home.

Financial literacy according to the US Treasury (2013) is defined as the "ability to use one's knowledge and skills to manage financial resources effectively for a lifetime of financial well-being." Lusardi and Mitchell (2014), find that financial literacy is becoming increasingly important as it is coupled with economic growth. They further state that ir enables individuals to manage their savings as well as optimally plan their pension scheme. Previous research conducted by Gathergood and Weber (2017) showed that in England and Wales, financial literacy is worse amongst renters than among homeowners. Their econometric analyses further depicted that financial literacy could predict homeownership rates for a younger subset of the population. Further, they concluded that young homeowners with poorer financial literacy tend to take on larger mortgage debts. Thus, this paper investigates the impact financial literacy has on the likelihood of an individual owning a home with the principal question being:

Research Question: To what extent does financial literacy affect the home-ownership rate in the Netherlands?

Among the handful of academic papers that study the relationship between financial literacy and home ownership, they all focused on specific countries such as the United States, Canada, England, and Australia. This paper focuses on the Netherlands not only to extend current literature but to examine the relationship in a country where home-ownership is at a record low

and knowledge of financial instruments is of dire importance in owning a home. Furthermore, the paper aims to serve the government and other relevant policymakers with useful insights as to what factors should be targetted in an effort to stimulate home-ownership within the country.

The paper proceeds as follows. Section 2 describes a conceptual framework where other academic literature pertaining to the topic in question is studied and analyzed. Section 3 states the two hypotheses that shall be studied. Section 4 and 5 delves into the data collection and specify the empirical strategy employed. While Section 6 provides the results on the effects of financial literacy on home-ownership for different subsets of the population. Section 7 provides the discussion and conclusion while section 8 provides recommendations for policymakers.

2 Literature Review:

A stagnant or falling home-ownership rate in some cases could be a cause of concern (Green, 2004). Central Bureau of Statistics (2019) claim that the Netherlands not only have had a falling home-ownership rate but it has consistently ranked amongst the bottom 10% of European countries in terms of percentage of homeowners per capita. Meanwhile, the cost of purchasing a house in the Netherlands has been skyrocketing due to the simple fact that the supply is not able to keep up with the rise in demand (Vermeulen & Rouwendal, 2017). With prices of houses increasing in such a fashion, individuals in the market need either of the two to purchase a home: (i) copious amounts of saving (ii) a proficient understanding of complex financial instruments such as mortgages to help fund the transaction.

Both these factors could be achieved when an individual's competence in financial foresight and planning is of a high calibre. The most appropriate metric to judge this and one which has gained considerable traction in recent times is financial literacy. Lusardi and Mitchell (2011, 2013, 2009) in their extensive work studying financial literacy have illustrated that it alters behaviour in individuals which contributes to their planning and usage of assets and capital. It also better prepares an individual to plan for their retirement and enables them to make wiser purchasing decisions. It is a term that is becoming extremely important as it is associated with economic prowess because it ensures that individuals possess a decent understanding of how to optimally utilize the modern banking culture.

Across the pond, the United States Department of Housing and Urban Depart (HUD) in their effort to spur the homeownership rate set up several programs that offered not only housing counselling but financial lessons to individuals and families that taught them valuable skills on the workings of compound interests, financial planning, and usage of mortgages. They also set up other initiatives and non-profit organizations such as the "Own a Home" program with the sole intention to provide financial education and make them accessible via self-sufficient initiatives. This suggests that in order to work on the stagnant home-ownership rate, governments and policymakers alike can and should focus on increasing financial literacy rates.

Moreover, Behrman and Soo (2012), have found evidence that amongst families that intend to purchase a house, those that exhibit better planning of their finances end up fulfilling their dream of buying a home almost 10-15 years earlier than their counterparts. They also claim that adults that did not attain secondary education or ventured into fields of academia that do not deal with finance, exhibited very poor knowledge of financial instruments and preparedness. They call for financial literacy programs to be initiated by the government for the adult population along with mandatory courses to be incorporated into the high-school curriculum.

Although its importance has been widely emphasized, there has been no clear metric in order to measure an individual's level of financial literacy. Rieger (2009) studies the several measures available in an empirical format and finds that "these measures are often only slightly related and that this is a so-far overlooked empirical problem in this field". Thus, they suggest using a combination of factors that test an individual understanding of borrowing, interest rates, bonds, and return on investments. The closest metric to this was suggested by Lusardi and Mitchell (2011) and has proven to be a reliable approach that ensures a comprehensive measure of an individual's financial literacy. This paper follows the above-stated metric and shall be explained in depth in Section 5.1.

Amongst other previous literature that studies the relationship between financial literacy and home ownership the study conducted by Gathergood and Weber (2017) was particularly interesting. They find that in the United Kingdom, financial literacy levels are considerably lower amongst renters than homeowners. They argue that financial instruments such as mortgages are complex instruments that less-sophisticated households are not aware of, thus fail

to use them or that they fall victim to worse mortgage deals and take up larger debt. This essentially serves as a barrier for them to enter into the already highly competitive and expensive housing market. Literature investigating the direct relationship between financial literacy and home-ownership rates amongst the Dutch population could not be found.

3 Hypothesis

Based on the pieces of academic research discussed above, a direct and positive association between financial literacy and homeownership is conjectured. This leads to the formation of the following hypotheses:

H1: An individual with higher levels of financial literacy will have a higher likelihood of owning a home.

Hoekstraa (2021) in his research has shed light on how homeownership is becoming an increasingly arduous undertaking for individuals and families around the world. It requires an increased knowledge of as well as access to complex financial instruments. Meanwhile, Hailwood and Widdowson (2018) suggest that financial literacy is an adequate metric to judge an individual's readiness to use financial instruments. The superimposition of the above two statements falls in line with Gathergood and Weber's studies (2013) that portray the lack of financial literacy as a resilient barrier to home-ownership in the younger subset of the population. This prediction is extrapolated to all sections of the population and thus the first hypothesis presumes that individuals with a higher financial literacy rate have an increased probability of owning a home in the future.

H2: The effect of financial literacy on home-ownership will be higher for women.

According to Allen (2012), there exists a considerable gender disparity in the home-ownership rate in the United States and Europe. This disparity is even larger in under-developed and developing countries which creates the opportunity for increasing the homeownership rate amongst women. Furthermore, Adam (2017) in his research highlights the dearth of financially literate women and how governments around the world should focus on tackling this issue in

order to alleviate women from financial distress. Falahati's (2011) studies show similar findings in regards to how educating women to use financial instruments can play a massive role in the betterment of planning and investing which in turn should increase their likelihood of purchasing a home. This leads to the emergence of our second hypothesis that predicts the effect financial literacy plays on homeownership to be more potent for women when compared to men.

Figure 1 below provides a basic illustration of the model used for this research where financial literacy is used as an independent variable and its effects shall be studied on the dependent variable, namely, home ownership.

Figure 1. The conceptual model for the study
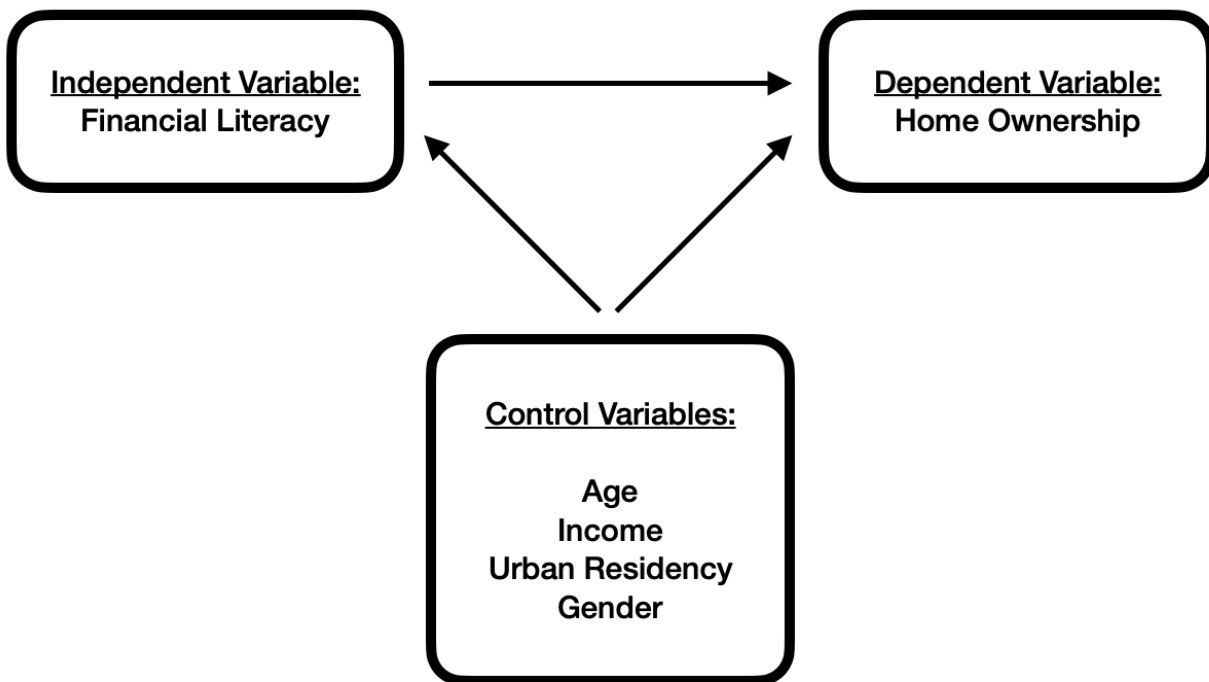
4 Data Collection

The data for the study was obtained from the LISS panel (Longitudinal Internet Studies for the Social Sciences). The following 2 datasets were used: Financial Literacy and Economic Situation: Housing. The database comprises 6,000 households with about 7,800 people partaking in each study. The panel is based on Statistics Netherlands' population record and permits researchers to use this data to conduct studies. According to Knopf & de Vos (2009), the sample used by LISS is a reasonable representation of the average Dutch population.

Members of the panel spent a total of 20 to 30 minutes every month completing online surveys. The participants are paid for each answered survey in order to incentivize them to fill the questionnaires truthfully. The data for the household is provided by one person who also updates it on a regular basis. The longitudinal study was first conducted in 2006 and is repeated in order to track changes in real-time in the panel member's life courses and living situations thus ensuring relevant and accurate information. The survey questions are constructed such that they provide a holistic view of relevant variables which are considered the most worthwhile as per existing literature.

4.1 Variables

4.1.1 Selection of Sample

To facilitate my research, I used the two surveys which were sent out to a total of 7438 households (panel members 18 years or older) and 4567 responses were obtained (60.5%). However, the number of households that completed both the surveys was required for my study. As a result, I merged the two datasets and removed participants that did not complete both surveys. This allowed me to obtain the final number of respondents who completed both surveys which lead to the formation of my sample size.

In order to obtain the home-ownership variable, I had to collect the data from the LISS dataset named '*Economic Situation: Housing*' which was conducted over a series of periods (waves 1 to

14). These waves start in 2006 and are repeated yearly. However, for the purpose of my study, I used waves 7 onwards in order to align it with the years from which data on financial literacy was available. This choice added to the reliability factor of the study as it deals with more recent data. It should also be noted that as suggested by Wu et al. (2003), I eliminated the top and bottom 1% of the respondents as outliers based on total wealth in order to avoid any possible skewing of my study. Upon merging the two datasets, selecting particular waves, and eliminating outliers, the total sample size of my study was 2,023 observations.

4.1.2 Financial Literacy

Four scenario-based questions made up the financial literacy survey, which was a single-wave study carried out in 2011. As previously mentioned, Lusardi and Mitchell created the "Big Three" survey in 2004 with the specific intention to gauge an individuals financial literacy level. An individual's knowledge of risk diversification, inflation, and interest rates is covered by the "Big Three" survey, which is a three-question, straightforward financial quiz that is recognized by the consensus of scholars around the world. This Big Three survey is used in the four scenario-based questions of the LISS Panel Data survey, making it a valid indicator of financial literacy. The questions are founded on four overarching factors: simplicity, aptness, conciseness, and differentiation ability. Keeping things simple guarantees that the core components of decision-making are assessed in an intertemporal scene. Aptness ot relevance ensures that the questions ought to be connected to a person's ongoing financial decisions through their life. Reducing the length guarantees that the number of queries is relatively minimal, enabling widespread acceptance. Last but not least, the ability to differentiate requires that the questions differ in terms of financial knowledge so that distinct comparisons can be made.

Thus, the survey was divided into two sections with two questions each. The first section was designed to gauge the respondent's fundamental financial know-how, and the first one related to interest rates: *If you have 100 euros in a bank account, and the interest rate provided is 3% per annum, what will the amount be in your bank account after 1 year?*. The second was related to inflation: *If the interest rate provided to you was 3% and inflation per annum is 6%, would you be able to purchase less/more/same after a year when compared to what you can purchase with*

the same money on your account today?. The next section was more complex with the first question pertaining to the mutually inverse relationship between the prices of bonds and market interest rates: *What happens to bond prices when the market interest rate rises?* The second question was related to ROI: *Which would usually offer a more guaranteed return - investing in a share of a firm or investing in a fund that invests in shares?*

As a result of the demarcation of the two sections, an individual's financial literacy can also be distinguished based on basic and advanced financial literacy levels. Although previous academic studies on financial literacy levels mentioned prior have factored in penalties for wrong answers by respondents as well as weighing a question for its level of difficulty, my study aggregates financial literacy on the basis of the number of correctly answered questions. This was done not only for the sake of convenience but also to keep in mind that the questions in the survey were all rather brief and in accordance with the guidelines mentioned by Lussardi and Mitchel (2011).

4.1.3 Home-Ownership

Collecting and organizing data regarding homeownership was relatively straightforward. It was obtained from the LISS dataset titled "*Economic Situation: Housing*" which contains a questionnaire with a variety of housing-related questions. Out of this vast questionnaire, only one variable was needed for my study which is: Home-ownership status. The question asked to respondents had a categorical answer and was as follows: *In the property, you currently reside in*, *are you a tenant, sub-tenant, co-owner, or owner?* As my study pertains to home-ownership rate, I combined the responses of tenants and sub-tenants as one, and owner and co-owners as another. This led to the formation of a binary home ownership variable where respondents were assigned a value of 0 if not owning a home and 1 if owning a home.

4.1.4 Background Variables

All LISS panel data participants are asked to complete the background variables survey, which asks questions about each participant's age, income, occupation, place of residence in an urban area, level of education, gender, and household composition. Participants in the survey responded to a variety of questions regarding their socio-economic status. They fill out the

survey on an annual basis, thus guaranteeing up-to-date and accurate data. To incorporate control variables in my study, this survey is of great importance. Previous research mentioned in Section 2, indicates that a number of variables, including age, education, urban residency, income, and gender, may have an impact on financial literacy. Additionally, these background variables are significant since excluding them would lead to omitted variable bias. They may have an impact on both financial literacy as well as home ownership. If the household consists of multiple people, one person must respond to the questions on behalf of the entire household.. The list of background variables included in the study is mentioned below in Table 1.

Table 1: Background Variables:

Variable	Options
Age	Respondents type in their age in years
Gender	Respondents choose between Male or Female
Level of Education	Respondents choose from seven levels ranging from primary school to university degree
Income per Month	Respondents enter their gross income per month
Urban Residency	Respondents enter the name of the street they live on and urban residency is consequently calculated based on population density per km2

Note: The above tables contains the background variables used in the model for the study as well as the possible options respondents had while answering the questions.

4.2 Descriptive Statistics

4.2.1 Financial Literacy

The survey on LISS panel data provides each individual's answer to 4 questions related to different financial topics. For the purpose of my study, I converted the response to these questions into a score out of 4 which resulted in the formation of a continuous independent variable. A respondent was thus assigned a score between 0-4 based on the number of questions they answered correctly and the calculation method is displayed in Table 2 whereas Table 3

provides us with an illustrative view of each topic covered by the specific questions and the mean of respondents who answered it correctly.

Table 2: Variation of Financial Literacy Scores across participants

Questions Answered Correctly	Score Assigned
0 out of 4	0
1 out of 4	1
2 out of 4	2
3 out of 4	3
4 out of 4	4

Note: The table above provides the Financial Literacy scoring chart of the respondents filling the survey

Table 3: Subtopics of questions related to financial literacy and mean of correct answers.

Variable	Number of Observations	Mean
BASIC: Interest Rates	2023	.765
BASIC: Inflation	2023	.698
ADVANCED: RoI	2023	.376
ADVANCED: Bonds	2023	.175

Note: The table above provides the different levels of questions included in the survey along with the mean of the respondents who answered the respective questions correctly.

As per table 3, there is a distinctly visible decreasing pattern as the difficulty of questions regarding financially literacy increases. The mean of respondents answering the questions correctly answers reduces from .765 to .175 illustrating a sharp decline. It can also be inferred that respondents fared better while answering questions that tested their basic financial knowledge when compared to their advanced financial knowledge.

4.2.2 Description of summary statistics for IV and DV + Internal Consistency Test

In order to gain more insight into the general home ownership and financial literacy levels of the sample population studied, table 4 below provides the descriptive statistics of the home ownership and financial literacy variables.

Table 4: Summary of descriptive statistics for IV and DV variables used in the dataset

Variable	Mean	Min	Max	Std. Dev.	Observations
Home Ownership	0.682	0	1	1.032	2023
Financial Literacy	2.357	0	4	.462	2023

Note: The table above displays the mean, minimum and maximum levels, and the standard deviation of the independent and dependent variables.

The table above depicts that the average level of financial literacy amongst the subset of the population studied is 2.357 out of 4. Homeownership levels meanwhile have an average rating of 0.682 which is close to the level stated by CBS (2019). Although LISS panel data is said to be a good representative of the general Dutch population (Knof & de Vos, 2009), I further test the validity of a study by employing the Cronbach Alpha method. According to Grey (2009), this test can be used for measuring the internal consistency of a test and it dishes out scores in the range of 0 to 1. The test evaluates the extent to which the questions included in a study are reliable in evaluating the concept in question. The combination of the four questions used to measure financial literacy in this study got a Cronbach alpha score of 0.79 and according to Quansah (2019), any score above 0.7 is deemed acceptable, thus making my variable reliable. The same test was not required for the dependent variable home ownership as it is binary in nature.

Table 5: Mean of background variables of the sample population chosen vs total panel data obtained from LISS

Variable	Mean	Std. Dev.	Obs.	Mean	Std. Dev.	Obs
	Sample Studied			Total Panel Data		
Age	43.56	11.32	2023	36.23	22.54	4567
Income_Log	8.23	2.43	2023	7.98	1.23	4567
Urban Residency	3.56	1.43	2023	3.86	1.30	4567
Education	5.32	2.23	2023	4.97	4.34	4567

Note: The above table illustrates the descriptive statistics for the variables studied in the subset of the population studied as well as values for all the respondents who answered surveys sent out by LISS (including those respondents that were excluded in the study)

Table 5 provides an overview of the average respondent in the sample population (subset) studied in terms of the background variable. As seen above, individuals in my dataset have an average age of 43.56 years, have obtained secondary education (MBO level), and live in a semi-urban area. For calculating their income, logarithmic values were preferred over gross income in order to avoid further skewness caused by outliers in the data from LISS. Thus the variable *Income_Log* was created and its average value for the sample population is 8.23.

Apart from including data related to the subset of the population used in the study, Table 5 also contains data about the total population that responded to the surveys sent out for the survey which includes respondents that were excluded from this study as they failed to answer both the financial literacy and home-ownership survey. This was presented in order to verify that the subset of the population studied does not greatly differ from the general population surveyed by LISS. In the appendix, this parallelism is further backed up by a t-test that was performed and resulted in a statistically insignificant difference between the two average values of the two samples. This verified the cogent representation of the sample population chosen for this study.

4.2.3 Distribution of correct answers by gender

Table 6: Mean Values of Financial Literacy and Home Ownership for men and women

	Men	**Women**
Home Ownership	0.78	0.49
Financial Literacy	2.67	1.98
Observations	1213	810

Note: The above table presents the difference of home-ownership rate and financial literacy levels (DV and IV) within the subset of the population on the basis of gender.

The table above depicts that the sample population consists of 810 women and 1213 men resulting in an approximate 45:55 split in gender. Further, the table illustrates that among the sample studied, men have a considerably higher level of financial literacy (2.67) when compared to women (1.98). This is in accordance with Allen (2012) as this study also finds that men tend to have an advanced understanding of finances and financial instruments when compared with women. The difference in home-ownership rate between men and women is also clearly depicted in the table. As a result, the variance of both the dependent and independent variables on the basis of gender is emphasized which perfectly sets up the second hypothesis studied in the paper.

5 Methodology

5.1 Logistic Regression

As the dependent variable in our study is home ownership, it can be fit easily into 2 categories. Namely, 0 (if not owning a home) and 1 (if owning a home). This binary, also referred to as dummy, nature of our dependent variable enforces the usage of a binary choice model for our analysis (Verbeek, 2012). The dependent variable of a binary-choice model tends to be dichotomous and discrete in nature and takes the value of 1 or 0 if the event occurs or not, respectively. Thus our model will attempt to estimate the probability of an individual owning a home, given their financial literacy level.

However, in the case that the model we are studying did not have a binary dependent variable, we could use an econometric method to solve the model such as an LPM (Linear Probability Model) by using the OLS method (Ordinary Least Square Regression):

$$P_i = E\ (Y=1/X_i) = \beta_1 + \beta_2\,X_{i2} + \ldots + \beta_k\,X_{ik}$$

In the above equation, P_i represents the probability of an individual owning a home, X is the financial literacy level of the individual, Y=1 represents that the individual owns a home, β_1 denotes the intercept of the model while β_k is the slope of the explanatory variable k. Thus combining the background variables mentioned in section 5.1, the model obtained would be as follows:

$$P_i = \beta_1 + \beta_2\,Financial\_Literacy + \beta_3\,Gender + \mu$$

However if we were to use this equation, our model would undergo the following problems: (i) the probabilities lie beyond the accepted limit of [0,1]; (ii) marginal effect of explanatory variables being constant would be a wrongful presumption, and lastly (iii) heteroskedasticity[1]. In order to resolve the problem (iii), we can modify the data such that it is homoskedastic[2] in nature thus ensuring unbiased and unskewed results. However to resolve the other two problems we would need to (a) use a model where the approximate probabilities are between the [0,1] interval and (b) ensure the non-linear probability of the relationship of the explanatory variable.

In such a case, Bekhor (2001) suggests the usage of either a logit or probit model for analysis. For the purpose of my study, I had to make a choice between the two candidates. The logit (logistic) model transforms the probabilities of an outcome such that they are not bounded. The probability p is converted into the odds ratio $p/(1-p)$ in order to remove the upper limit and the logarithmic value of the odds ratio: $\ln(p/(1-p))$ is used to get rid of the lower limit. The logit model is said to be more convenient to interpret the coefficients as it is linear in the log-odds ratio, unlike the probit model. However, the conclusions inferred from both these models are

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[1] Heterskedasticity: biased estimator of β_k arising due ot change in variance while coefficient X changes.

[2] Homoskedastic: assumption of equal or similar variances in different groups being compared.

predominantly similar and it is rather difficult to differentiate between their statistical significance (Prentice, 2004). Other academics in the field such as Ramanathan (1995) and Griffith (2001) also claim that the logit model is more appealing as well as simpler to work with than the probit model. Thus, the logit model was chosen for the purpose of this study.

The dependent variable in the model is whether individuals own a home or not is already explained above and consists of either 1 or o respectively. Whereas the independent variable is the financial literacy level of an individual as well as the gender. The relationship between financial literacy and owning a home is tested in order to answer the first hypothesis. The interaction term between the two independent variables and the dependent variable is also studied in order to test the second hypothesis. McKinnen (1982) states that the logit model can be used only when the number of observations in the sample is greater than 60 as the model will not provide enough explanatory variables to estimate an accurate regression. Our model satisfies this criterion as the sample population is 2023 individuals.

The model is tested using the statistics and data analysis software Stata® v.16.1. The method that is used is the logit model analysis in order to check the odds ratio of each possibility. The post estimation analysis command of creating marginal predictions was also used and is further illustrated in Section 7. More references to the techniques used for analysis can be found in Arne (2013), Maarten (2011), and Maddala (1983).

5.2 Accounting for Control Variables

According to Scholz (1999), control variables enhance the internal validity of a study as it considerably limits the influence of extraneous variables and confounding variables. This enables us to form a causal or correlational relationship between our independent and dependent variables It is further noted by Scholz (1999) that the control variables included must correlate with the dependent as well as the independent variables and should not consist of colliders. As a result, the control variables chosen for our study include Income, Age, and Urban_Residency. The selection of these control variables stemmed from studies done by Grohmann and Menkhodd (2015) as they state that these three variables best control for differences between a

sample population while accounting for variables concerning home ownership and financial preparedness.

Appendix 1 shows that there is a visibly positive correlation between age with both financial literacy as well as home ownership. This is self-explanatory as with age, an individual's chances of buying a home as well as their financial literacy tend to increase. Thus when age is used as a control variable in our model, the pre-existing relationship between the dependent and independent variables will be reduced. The same effect can be seen in Appendix 3 for Income as it has a positive relationship with both the dependent and independent variables. However, for Urban_Residency, there is an inconclusive correlation between our independent and dependent variable and thus it cannot be used to form a prediction for our model. Overall, studying the interference of these control variables allowed me to gauge the positive or negative impact these variables had on my findings.

6 Empirical Results

As mentioned prior, a logit analysis model is run in Stata and its results are presented in Table 7 below. First, the logistic regression is computed on the distinct effect of financial literacy on home-ownership.

Table 7(a): Estimation results LOGIT model - Coefficients

home_ownership	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
financial_literacy	.528651	.0494654	10.69	0.000	.4317006	.6256014
constant	-.39870	.1184024	-3.37	0.001	-.6307688	-.1666399

Note: The above table contains the coefficients of the logit regression results between financial literacy on home ownership

Table 7(b): Estimation results LOGIT model - Odds Ratio

home_ownership	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf. Interval]	

financial_literacy	1.696642	.083925	10.69	0.000	1.539874	1.86937
constant	.6711891	.0794704	-3.37	0.001	.5321825	.8465044

Note: The above table contains the odds ratio of each logit regression results between financial
literacy on home ownership

Table 7(c): Estimation results LOGIT model - Coefficients

home_ownership	**Coef.**	**Std. Err.**	**z**	**P>|z|**	**[95% Conf. Interval]**	
financial_literacy	2.066715	.3458883	4.34	0.000	1.488752	2.869055
financial_literacy^2	.9540137	.0361988	-1.24	0.001	.8856394	1.027667
constant	.5726732	.1006302	-3.17	0.002	.4058201	.8081279

Note: The above table contains the coefficients of the logit regression results between financial
literacy on home ownership

From the Table 7(a) and (b) it can be concluded that financial literacy has a positive as well as statistically significant effect on home ownership level. However, as the relationship is curvilinear in nature, we use the square of the dependent variable financial_literacy to see its main effect as well as its interaction with itself. The results are seen in Table 7(c) where the financial literacy variable has a positive coefficient of 2.066 and is highly significant with a P-value of 0. However, the R-squared value of this model is 0.0495 which translates to the fact that merely 4.95% of the relationship between the two variables is explained by the model. Another factor to keep in mind is the possibility of omitted variable bias which essentially says that there could be other variables involved which affect home ownership to increase apart from financial literacy by itself. The addition of control variables such as gender, income, and urban residency as explained in Section 5.2 does play a role in reducing this OVB and can be seen in Appendix 5.

If this was a simple OLS regression, we could use a global F test in order to test the hypothesis that all β's $= 0$ against the alternative hypothesis. However, in a logistical regression, we employ a likelihood ratio chi-squared test. Stata calculated the chi-squared value of the above test as 17.90. This is calculated by comparing our model to a model which does not have any

independent variables (only the constant present). The degree of freedom of our model is 2 as there are two coefficients present.

It is interesting to note that Menard in his book *Applied Logistic Regression Analysis,* highlights that a number of statisticians in the past have attempted to formulate a statistic that is similar to the R^2 measurement for a logit regression but to no avail as none of them attained widespread recognition. However, Smith (2013) states that McFadden's pseudo R^2 is the most appropriate and popular method to date. It is calculated using the following formula:

$$\text{Pseudo } R^2 = \text{Model L1} / \text{DEVo} = 1 - \text{DEVn}/\text{DEVo} = 1 - \text{LLn}/\text{LLo}$$

The statistic will equal 1 if the model is perfectly fit and 0 if not. The pseudo R^2 value of our model is 0.65 which translates to a moderately fit model.

Next, in order to better understand the meaning behind the odds ratio, I chose to analyze the marginal means of outcome for differing levels of the covariate as suggested by Harrel (2019). This allowed me to see the predicted probability of an individual owning a home at differing levels of financial literacy ranging from 1 to 5 (one representing a score of 0 in the quiz). It can be seen from Table 8 below that there is a clear and increasing marginal probability of home ownership as an individual's financial literacy score increases from 1 to 4. These values are also highly statistically significant as they have a P-value of 0.

Table 8: Adjusted predictions of home ownership at different levels of financial literacy using the Delta method.

Level of Financial Literacy	Margin	Std. Err.	z	P>|z|	[95% Conf. Interval]	
1	.36414	.04068	8.95	0.000	2843957	4438843
2	.53032	.01921	27.60	0.000	.4926654	.5679817
3	.66955	.01405	47.64	0.000	.6420101	.6970993
4	.76798	.01143	67.19	0.000	.7924135	.7903481

5	.83106	.01971	42.15	0.000	.7455427	.8697086

Figure 2: Adjusted predictions with 95% confidence intervals.
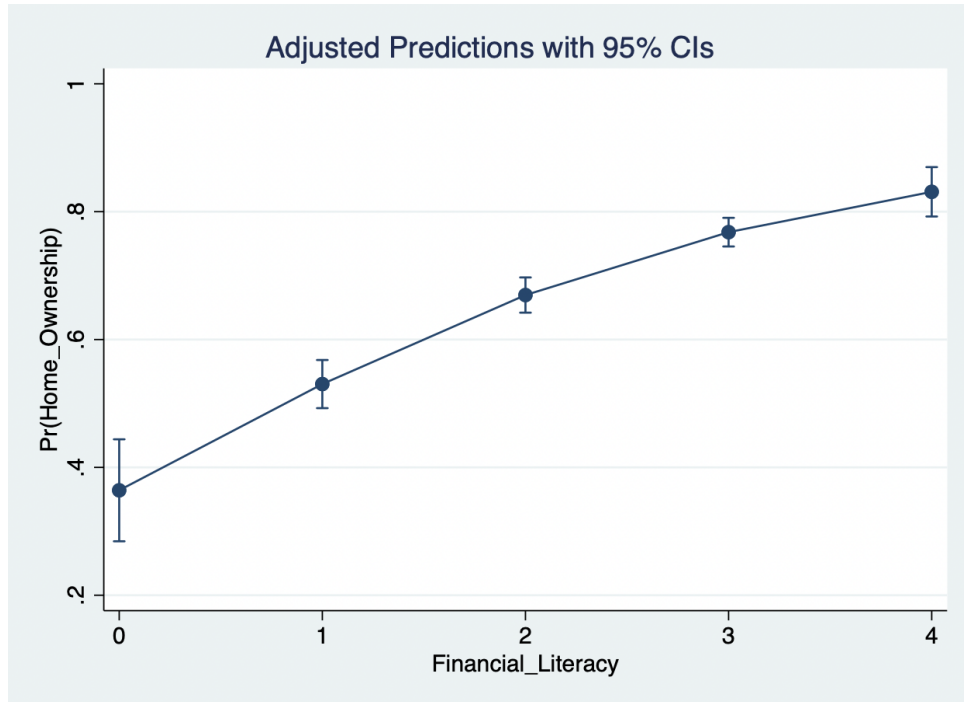
Graph 1 above illustrates the marginal predictions in the form of a profile plot. In the graph, the *x-axis* or horizontal axis represents the 5 levels of financial literacy based on the number of questions answered correctly by the individual. The *y-axis* or the vertical axis on the other hand represents the probability of the individual owning a home. The error bars represent the confidence interval which is set to 95%. The relationship is seen to be steadily increasing as the level of financial literacy increases. This is in accordance with our first hypothesis that an individual's chances of owning a home increase if they have an advanced level of financial literacy.

Now, in order to test our second hypothesis, the role gender plays in the association between financial literacy and homeownership is studied. This is done by investigating the relationship between the interaction of financial literacy and gender, with home ownership. Another logistic regression between the dependent variable and the 2 independent variables is run. Gender is

treated as a categorical variable which can have the two possibilities of male or female while financial literacy, like before, remains a continuous variable. The result of the regression can be seen in Appendix 7. In order to test the interaction, we used the Wald test which resulted in the P value of 0.042, which thus rejects the null hypothesis that both coefficients are equal to zero. This results in the formation of a reasonably statistically significant interaction between the two variables, which in our case is the interaction of gender and financial literacy on home ownership.

However, the pseudo R^2 value of the test is 0.62 which means our model is only a moderate representation of the actual model. The likelihood ratio chi-squared is seen to be 122.82 with 3 degrees of freedom. In order to get a better understanding of this interaction, we find marginal predictions of homeownership for both genders for each level of financial literacy. This can be seen in Appendix 8. The model includes financial literacy and the interaction of gender and financial literacy, and the predicted probabilities are adjusted for both financial literacy and the interaction. The P-values of all the marginal estimates are lesser than 0.05, thus making our findings statistically significant. There seems to be a very subtle variation of home ownership based on gender with males ranking consistently higher. Figure 3(a) below shows a side-by-side profile plot of the marginal analysis for males and females with a 95% confidence interval. Age is presented on the horizontal *x-axis* while the probability of home ownership is seen on the vertical *x-axis*. A clear increasing trend is seen but the difference is not easily discerned from this. Hence, a superimposed marginal plot is drawn in Figure 3(b) which illustrates that the effect of financial literacy on males is higher although the difference is very small. The lines seem to merge as one for high levels of financial literacy implying that the disparity between gender is close to none when individuals are highly financially literate.

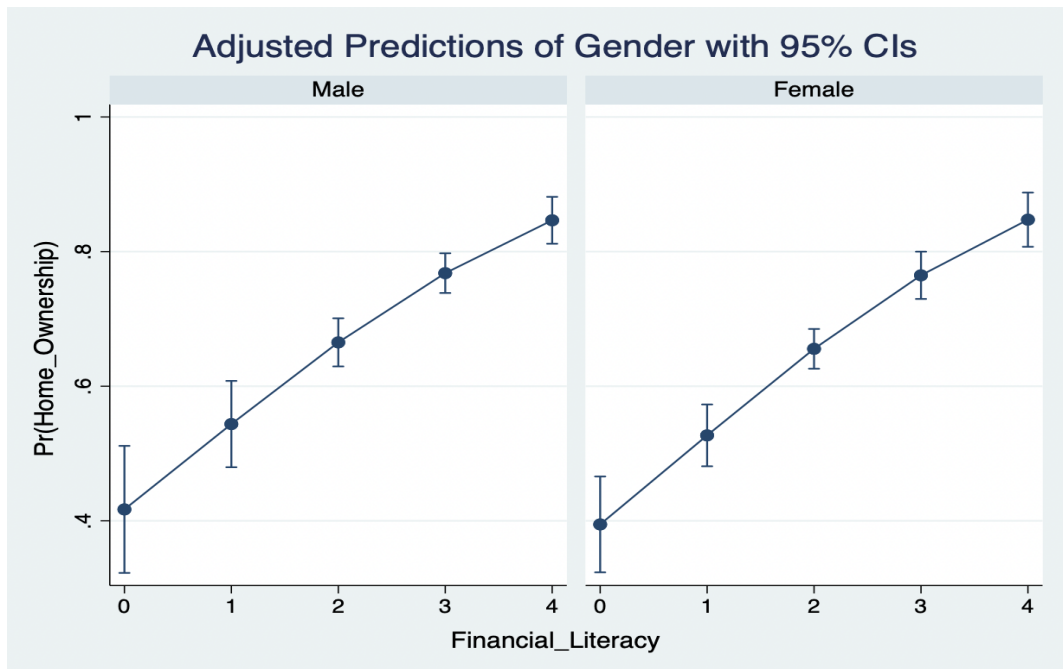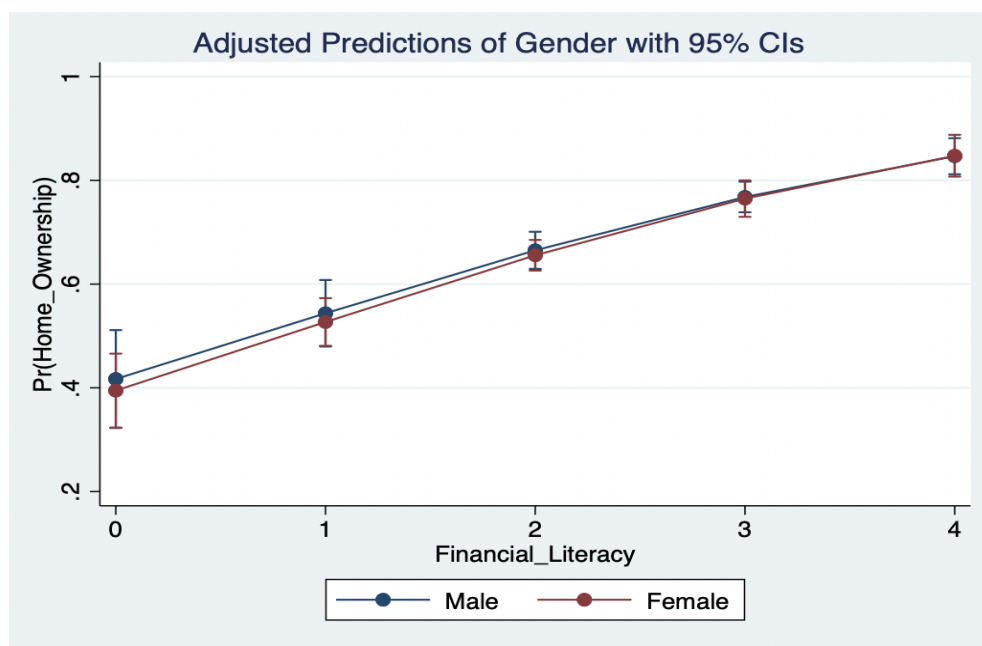*Figure 3(a): Adjusted marginal predictions at 95% CI.*

Figure 3(b): Superimposed Adjusted Marginal Predictions at 95% CI.

Note: The above figures represent the probability of an individual owning a home at different levels of financial literacy differentiated on the basis of gender. (a) provides this separately while (b) provides the superimposed version in order to gauge the slight variation that exists.

7 Discussion

7.1 Concluding remarks

This paper aimed to study the relationship between financial literacy and home ownership amongst the Dutch population. Data from the LISS panel was used in order to do so and data was curated such that individuals who answered two different surveys pertaining to the two variables in question were merged. All in all the sample population for this study contained 2,023 individuals. We then formulated two hypotheses which were tested using logistic regression and adjusted marginal predictions.

The first hypothesis was that financially literacy plays a considerable role in enabling an individual to own a home, in other words, an individual with higher levels of financial literacy will have a higher likelihood of owning a home. Logistic regression was chosen as the aptest method of testing this relationship due to the binary nature of the dependent variable (home ownership). The analysis was further expanded by using the squared of the financial literacy variable as well as using marginal predictors. The positive coefficient and the P-value being lower than 0.05, indicate a statistically significant result. Though the pseudo R^2 value is reasonable, the low R-squared value implies that only 4.95% of the relationship studied in this paper is explained by our model. This along with possible omitted variables bias and the presence of heteroskedasticity lowers the accuracy and reliability of the paper's findings. All in all, it is in fact possible to accept hypothesis 1 but the causal relationship should be accepted with precaution.

The second hypothesis stated that the effect of financial literacy on home ownership would be higher for women as previous literature suggested that women have lowers levels of home ownership as well as lower levels of financial literacy when compared to men. The logistic regression was run and estimated marginal predictors were used. It was deduced from Figure 3 that the effect was consistently lower for women at different levels of financial literacy, thus leading to the rejection of hypothesis 2. However useful insight was gained. As we approached higher levels of financial literacy, namely 3 and 4, the effect seemed to be almost similar to that

of men thus suggesting that when individuals reach a high level of financial literacy, their probabilities of owning a home level out thus tackling gender disparity.

In conclusion, this paper suggests that within the sample studied, financial literacy plays a positive relationship with home ownership which is statistically significant. An individual's chances of owning a home increase as their knowledge of using financial instruments and their expertise in financial concepts increase. It was further found that financial literacy could also be used to tackle the gender parity that exists in homeownership as when individuals have higher levels of financial literacy, their chances of buying a home are equally high regardless of whether they are males or females. It should be noted that although control variables were added in an effort to reduce omitted variable bias, it still exists in the study along with heteroskedastic errors. These decrease the accuracy of our findings. Future research on this topic that accounts for these errors and consequently increases the accuracy, reliability, and validity of this study is highly encouraged.

7.2 Limitations and suggestions for future research

In order to ensure future research do not undergo the same pitfalls as this study, this section shall express the limitations as well as make suggestions in order to tackle them.

The effects observed in this study seemed to be non-linear in nature as they changed in size and magnitude depending on the dependent variable's own values as well as values of other predictors not included in the model. We were thus unable to single out parts of our independent variable for analysis. Nonlinear systems such as this one seemed to be more complicated than expected and thus resulted in proving that changes in the output do not always imply changes in direct proportions to the inputs. It is believed that the points listed below could allow us to fix some of these errors.

First and foremost, the sample population in question could be improved upon as LISS panel data is not the most representative sample of the Dutch population. This problem was further aggravated as a lot of respondents of LISS were omitted from our study as we picked only the individuals that answered both the financial literacy as well housing surveys. Our sample size

thus becomes even smaller (2,023 individuals) and a sample size this small further highlights the possibility of inherent differences from that of the Dutch population as a whole. The findings are hence generalized to an extent and this could be improved upon by using a broader sample population for testing this relationship.

Secondly, the only available data for this particular study was cross-sectional. This type of data greatly hinders the possibilities of analysis that could have been performed. An exemplary study would work on finding causation and not merely association by studying the interaction of the two variables in question over a prolonged period of time. This could be further enhanced by finding a more detailed metric for the dependent variable (financial literacy). This study used a scale of 0-4 as per the respondent's answers to four questions. An argument could be made to specifically test an individual's understanding of mortgages and home loans as they would play a more direct role in preparing an individual to purchase a home. Lusardi and Mitchell (2011) in their study claim that the relationship of financial literacy with age follows an inverted U-shaped pattern as it is lowest amongst the extreme younger and older subsets of the population. However, the data used for the study did not seem to follow this pattern.

Another possible limitation of this study would be concerning the control variables used. Although this study used three control variables, It is rather difficult to estimate the appropriateness of the control variables used. For example, one variable used in the study was income while some literature such as Wagner (2019) argues that income is directly related to financial literacy. On the other hand, innumerable control variables such as education, parental background, socioeconomic status, etc. could have been added in order to reduce omitted variable bias but this was not done in our study as it would require combining more datasets and thus further reduce the sample size. Thus, future research studying this relationship could focus on the factors mentioned above in order to reduce omitted variable bias and address the problem of reverse causality in order to detect a more reliable and accurate relationship. It is also important to note that the relationship in question does not always hold true as there exist a plethora of highly-educated young individuals who possess high levels of financial literacy but do not own homes due to their perceived financial appeal being low or other factors such as an overbearing student loan debt (Houle & Berger, 2014).

8 Recommendations for Policy Makers and Relevant Stakeholders

As mentioned in Chapter 2, falling or stagnant home ownership is seen as a threat to the economic growth of a nation. On a micro level, individuals view owning a home as a sense of financial security and see it as a big milestone in their life. The homeownership rate in the Netherlands is well below the average among European countries. Due to the sharp fall in supply, prices of homes in the country have skyrocketed in recent times. This has forced buyers in the market to either have copious amounts of savings or to utilise complex financial instruments such as mortgages in order to buy a home. This paper (with the help of pre-existing literature) hypothesized that increasing the financial literacy levels of individuals would solve this problem by increasing their probability of buying a home. Although portraying low levels of causality, this paper found a strong and statistically significant association between financial literacy and home ownership.

These findings can prove to be important for the government and urban policymakers as it shows that raising the financial literacy levels of the population can potentially enhance the likelihood of Dutch individuals owning a home. With the Dutch government focusing on increasing the supply of homes in order to tackle the ongoing housing crisis, they may look to financial literacy as a way of ensuring that it is individuals that get to own them instead of housing agencies and illustrious landlords with deep pockets. Mortgage providers may also find the study relevant in order to increase their target audience who are well-informed and have a solid understanding of the workings of mortgages.

Moreover, the second hypothesis studied exhibited that there exists a gender gap in both home ownership as well as financial literacy levels, with women faring consistently worse. In order to promote gender parity and equality for all, policymakers could focus on increasing financial literacy levels for women by conducting free seminars and educational programs to better prepare women for how to handle their finances. Furthermore, the ministry of education can specifically focus on incorporating introductory financial courses in the high-school curriculum as it provides multi-fold benefits in the future. It better prepares young adults regarding planning and saving thus increasing their chances of attaining financial freedom. Our research also

exhibits that when men and women have equal levels of financial literacy, their probabilities of buying a home are equally high. This too is insightful in order to attain a more equal society where the playing field between men and women is level.

All in all, this paper not only encourages the government to target the financial literacy level of the population but also highlights the need for further research to be conducted on these two variables.

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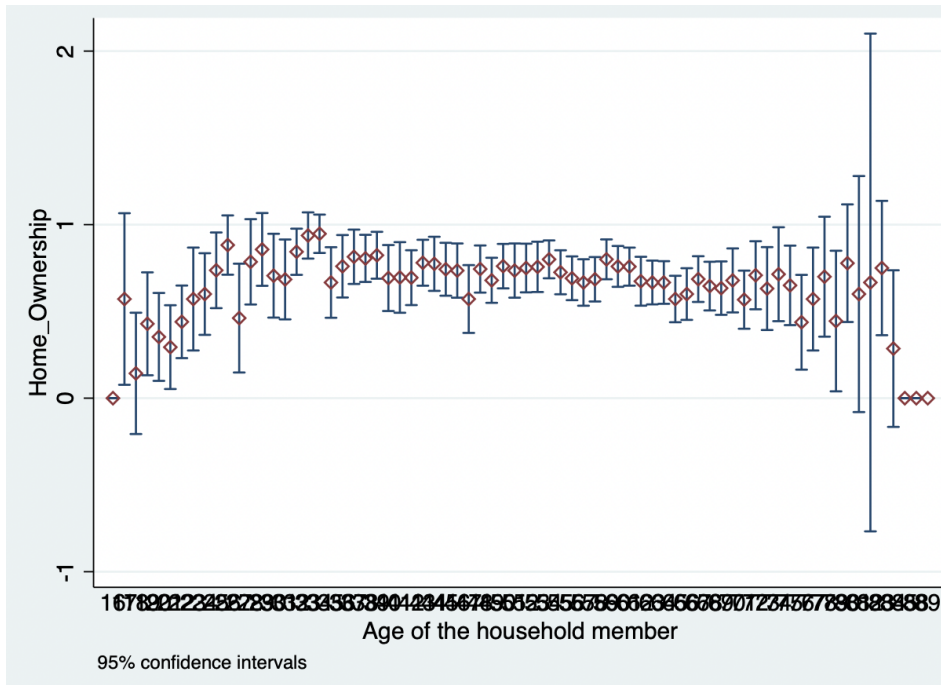
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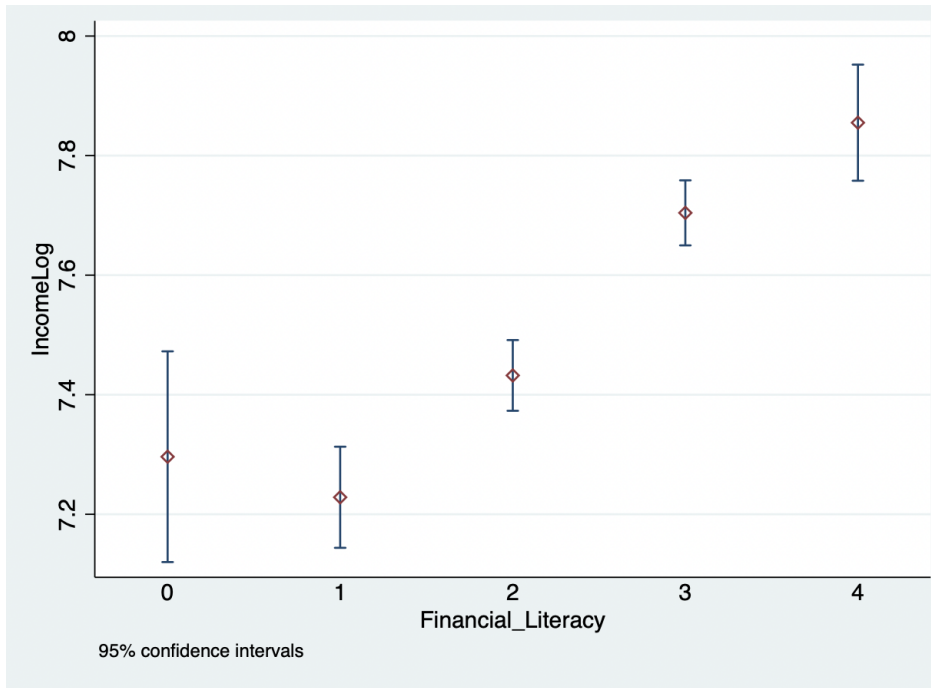
10 Appendix

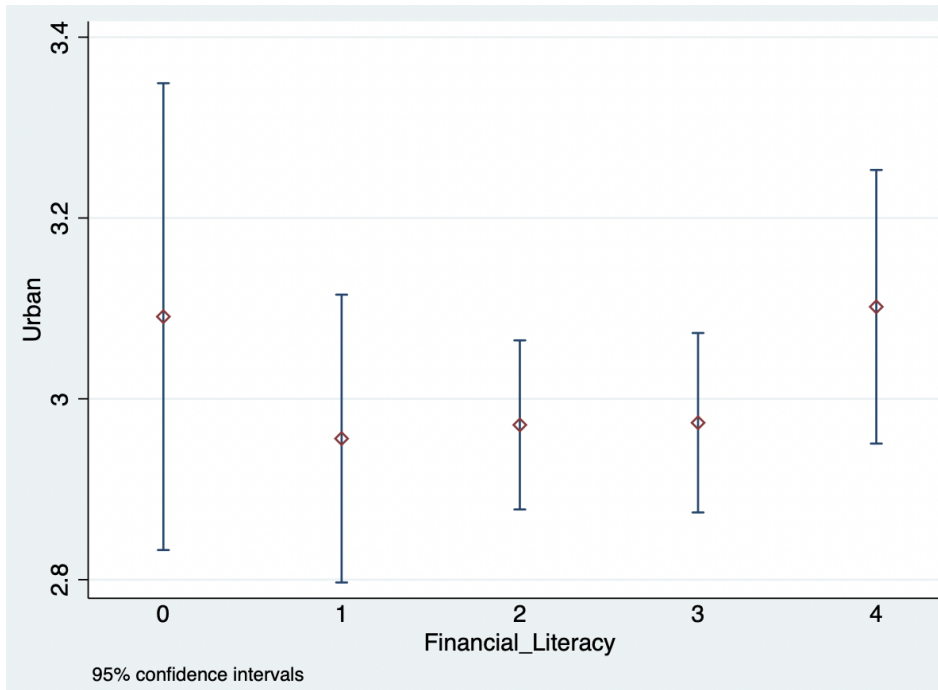Appendix 1. Relationship: Financial Literacy vs Age of the household member

95% confidence intervals
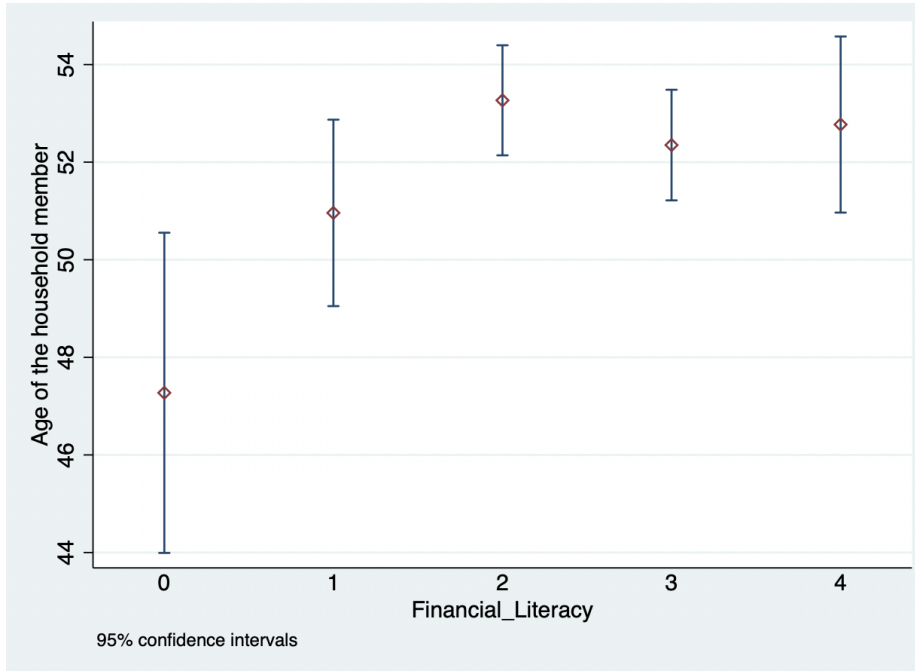
Appendix 2: Relationship: Age vs HomeOwnership

95% confidence intervals

Appendix 3. Relationship: Income and Financial Literacy

95% confidence intervals

Appendix 4: Relationship: Urban Residency vs Financial Literacy

95% confidence intervals

Appendix 5: Marginal predictions of home ownership at differing levels of financial literacy

at	Margin	Std. Err.	z	P>|z|	[95% Conf. Interval]	
					Delta-Method	
1	.36414	.0406866	8.95	0.000	.2843957	.4438843
2	.5303235	.0192137	27.60	0.000	.4926654	5679817
3	.6695547	.0140536	47.64	0.000	.6420101	.6970993
4	.7679454	.0114302	67.19	0.000	.7455427	.7903481
5	.831061	.0197185	42.15	0.000	.7924135	.8697086

Appendix 6: Logistic Regression financial literacy on home ownership including control variables

Home_Ownership	Coef	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Financial_Literacy	.2965812	.0332389	8.92	0.000	.2314341	.3617283
Urban	-.2040565	.0258527	-7.8	0.000	-.2547269	-.1533862
IncomeLog	.3545559	.0447412	7.92	0.000	.2668647	.4422471
Age	-.0104068	.0021716	-4.93	0.000	-.014663	-.0061506
_cons	-1.662517	.3372833	-4.93	0.000	-2.323581	-1.001454

Appendix 7: *Estimation Results Logit Model. Interaction of Financial Literacy + Gender with Homw Ownership*

Home_Ownership	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf. Interval]

Financial_Literacy	1.666465	.124321	6.85	0.000	1.439777	1.928845
Gender_Female	.911629	.2275838	-0.37	0.003	.5588816	1.487019
Gender#c.Financial_Literacy Female	1.025202	.1050697	0.24	0.001	.838634	1.253275
_cons	.7151707	.1416454	-1.69	0.091	.4850899	1.05438

Appendix 8: *Marginal Predictions of Interaction of Financial Literacy + Gender with Home Ownership:*

_at#Gender	Margin	Std. Err.	z	P>|z|	[95% Conf. Interval]	
1#Male	.4169676	.0481491	8.66	0.000	.3225972	.5113381
1#Female	.3946623	.0363068	10.87	0.000	.3235022	.4658224
2#Female	.5437555	.0327232	16.62	0.000	.6293809	.7008504
3#Male	.5269335	.0234262	22.49	0.000	.6260244	.6850336
3#Female	.6651156	.0182324	36.48	0.000	.738472	.7974667
4#Male	.7679694	.0150499	43.55	0.000	.738472	.7974667
4#Female	.7647728	.0150499	51.03	0.000	.7296324	.7999132
5#Male	.8465228	.0179291	42.66	0.000	.8117038	.8813418
5#Female	.8474348	.0205639	47.65	0.000	.8071303	.8877392