The influence of tax-free wealth transfer on housing consumption in the Netherlands

October 5, 2023

ABSTRACT

This paper investigates the impact of receiving a Jubelton, a Dutch government subsidy for housing, on housing consumption. With the impending abolition of the Jubelton in January 2024 after being implemented for eleven years, opinions are divided among the public regarding its removal. The government's decision to abolish the Jubelton aims to address rising housing prices and reduce wealth disparities. Through a hedonic pricing method, the main question of how receiving the Jubelton influences housing consumption is addressed. The findings reveal that receiving a Jubelton has a significant positive impact on expected housing consumption, increasing it by over 9%. Moreover, the study shows that higher amounts of received Jubeltons correspond to higher expected housing consumption, supporting both hypotheses. These results provide data-driven evidence for societal debates surrounding the impact of the Jubelton. Beneficiaries of the Jubelton had a distinct advantage in purchasing more expensive homes. Overall, this paper highlights the importance of understanding the effects of governmental decisions on housing consumption and society at large, aiming to promote fairness and better societal outcomes.

Keywords: Wealth transfer, Tax-free gifting, Economic inequality, WOZ value

COLOFON

Title	The influence of tax-free wealth transfer on housing consumption in the Netherlands
Version	Final Version
Author	Viënna Gertruda Jeanette van Holsteijn
Supervisor	Dr. Xiaolong Liu
Assessor	Dr. Mark van Duijn
E-mail	v.g.j.van.holsteijn@student.rug.nl
Date	5th of October 2023

"Master theses are preliminary materials to stimulate discussion and critical comment. The analysis and conclusions set forth are those of the author and do not indicate concurrence by the supervisor or research staff."

PREFACE

This paper culminates six (parttime) months of research, analysis and writing on the Dutch Jubelton scheme. The Dutch Jubelton is a scheme where it is possible to gift up to € 100,000 tax-free for someone buying a home, mostly given to their children. This scheme will be abolished from January 2024 onwards, but the effect remains. This paper has measured the effect of receiving a Jubelton on housing consumption.

The motivation behind this study stems from the need to provide a data-driven perspective on the Dutch Jubelton's impact, offering insights into its effects on housing consumption patterns. By employing a hedonic pricing method, this thesis aims to answer the central research question: "To what extent does receiving the Dutch 'Jubelton' as a household influence housing consumption?"

Ultimately, this research aims to inform public discourse and policy decisions regarding housing subsidies and their implications for societal welfare. By shedding light on the relationship between the Jubelton and housing consumption, this thesis intends to contribute to a more comprehensive understanding of the housing market dynamics, bridging the gap between academic research and real-world policy implications.

I would like to express my gratitude to my supervisor Dr. Xiaolong Liu who has provided guidance, support, and insights throughout the process of completing this thesis. His expertise and encouragement have been invaluable in shaping the research design, refining the methodology, and interpreting the findings. Besides, my family and in special Nils de Koning, has supported me through sharing tips in academic writing.

It is my hope that this thesis stimulates further discussion, encourages future research endeavors, and contributes to the ongoing efforts to create a fairer and more inclusive housing environment for all members of society.

Viënna van Holsteijn
Rijksuniversiteit van Groningen, Faculty of Spatial Sciences
5th of October 2023

1. INTRODUCTION

1.1. Motivation

The Dutch government has introduced the 'Jubelton' (*the joyful ton*) in 2013, which allows individuals to gift up to € 100,000 tax-free to someone buying a home (Ministerie van Financiën, 2022). However, from January 2023, the tax-free amount is reduced to €28,947 and from January 2024, the tax-free option for homebuyers will be removed entirely.

The Dutch government expects to help the following two issues by abolishing the 'Jubelton': decreasing the gap between the wealthy and the poor and reducing the housing prices (Hüsken, 2021). In 2017 alone, 1.5 billion euros has been gifted within 35,000 gifts using the 'Jubelton' scheme (Centraal Bureau voor de Statistiek, 2021b). Most users do not gift the maximum of € 100,000 as the average 'Jubelton' is worth € 63,200 (Centraal Bureau voor de Statistiek, 2021b). This data implies that people with wealthy parents (in law) getting a 'Jubelton' have an advantage on the housing market. The 'Jubelton' scheme has also been abolished to reduce the housing prices (Hüsken, 2021). Housing prices have been peaking in mid 2022 and the government expects a decrease in housing price growth due to abolishing the 'Jubelton' (De Hypotheker, 2023a). In the housing market peak of the Netherlands, 80% of the buyers overbid the asking price of the home (De Hypotheker, 2023b). In the Netherlands it is possible to lend up to 100% of the value of the home, which means that overbidding will have to be paid by the buyer in cash (Ministerie van Algemene Zaken, 2022). Receiving a Jubelton thus has given receivers a huge advantage in this period of overbidding (Venneman, 2022). It is also a known problem that people who do not receive a 'Jubelton', will in general experience more difficulty with buying a home (De Preter, 2023).

The Dutch 'Jubelton' is a tax-free gift to people who want to use the gift for a home (Ministerie van Financiën, 2022). The use of the 'Jubelton' must be to buy a home, to renovate a home, to pay off a mortgage or to buy off the rights of ground lease, superficies, or encumbrance of your owner-occupied home (Ministerie van Financiën, 2022). The receiver, or the partner of the receiver should be between 18 and 40 years old (Ministerie van Financiën, 2022). It is allowed to receive one 'Jubelton' from the same person or household in your lifetime. This means that it is not possible to receive a tax-free Jubelton from one parent and the next year from the second parent who are a married couple (Ministerie van Financiën, 2022).

By investigating whether people receiving a 'Jubelton' have increased housing consumption, it could be measured how much of a privilege this group has had in comparison with homebuyers not receiving a 'Jubelton'. Housing consumption will be measured using the WOZ

value of the house and captures how valuable a home is. When a household then uses a Jubelton to pay off their existing mortgage, this will then not be captured in this research. Besides, this research does not distinct between how the value is captured in a house, for example in a good location or more squared meters. In addition, this is not an event study where the impact of the introduction of the Dutch Jubelton is measured, but it compares two groups of people who have or have not received a Jubelton and its impact on housing consumption. This thesis aims to measure the correlation between receiving tax-free funds from the 'Jubelton' scheme and housing consumption using the WoON 2021 dataset, which includes information on home prices, home characteristics, household characteristics and tax-free gifts.

Another reason why the Jubelton scheme is interesting to investigate, is the relevance of the case. The Jubelton scheme has been present for a period of in total 11 years and has been abolished due to a significant price increase of housing and for decreasing the gap between the wealthy and poor (Hüsken, 2021). This reasoning of the government could be justified by investigating whether receivers of the Jubelton indeed have been privileged by being able to increase housing consumption. The Dutch case is thus in specific interesting due to the unique 100% loan-to-value option in the Netherlands and to investigate whether this scheme indeed have helped households buying more expensive homes during a period of extreme house price increases. It could thus be interesting to investigate the situation of tax-free gifting in the Netherlands.

1.2 Academic relevance

Despite a large body of empirical research on the relationship between tax free gifting and financial behavior within the finance literature, studies on the Dutch 'Jubelton' effecting housing consumption have not been done yet. In general, research on tax-free gifting and the impact on housing consumption is quite rare. However, research has been done on the characteristics of inter-vivos giving (Joulfaian and McGarry, 2004; Cox and Rank, 1992; Poterba, 2001; Norton and Van Houtven, 2006), which implies tax free gifting between the living and is thus similar to the Dutch 'Jubelton'. Joulfaian and McGarry (2004) and Poterba (2001) have found that wealthy families are more prone to make use of inter-vivos than less wealthy families. Also, when using inter-vivos it is mostly given to children when they are younger in comparison to when they are older (Norton and Van Houtven, 2006; Joulfaian and McGarry, 2004). This shows that gifting tax-free money is indeed more prevalent in wealthy families and for younger generations who are more likely to buy a new home.

Research has also found a positive correlation between budget and housing consumption (Bostic et al., 2009; Quigley, 1982). It shows that demand for certain housing characteristics do increase when having a higher budget (Bostic et al., 2009). This implies that consumers logically expect more favorable features in a home when having a higher budget. This literature is in line with the theory of people receiving a 'Jubelton', who thus have a higher budget and thus will in theory show an increase in housing consumption.

Besides, buying a home in the Netherlands is different than in most countries. In most countries it is not possible to have a loan-to-value higher than 80%, while in the Netherlands it is possible to lend up to 100% (Ministerie van Algemene Zaken, 2022). In the Netherlands the buyer thus only needs own cash for costs besides the value of the home when buying a home and thus could buy a more expensive home with the same budget than with a loan-to-value of 80% (Venneman, 2022). In theory, the magnitude of the correlation between budget and housing consumption should thus be more extreme in the Netherlands in comparison with other countries.

Research has also been done in investigating the gap between the wealth and the poor in the Netherlands (Hochstenbach and Boterman, 2015). Research shows that children from rich parental background are more likely to live in rich neighborhoods (Hochstenbach and Boterman, 2015). This research can contribute to this research by investigating whether Jubelton receivers in the Netherlands indeed are more privileged to live in more valuable homes. The Dutch case is in addition interesting due to it being abolished, because there is claimed that the Jubelton has caused housing prices to increase significantly and increasing the gap between the wealthy and the poor (Hüsken, 2021). This reasoning can be verified or rejected by proving if the Dutch Jubelton indeed had a positive effect on housing consumption for households as is expected looking at previous literature. With this research, the influence of the Dutch Jubelton on housing consumption inequalities will be measured which has not been investigated yet in former literature. Whether tax-free gifting relates to housing consumption inequalities also in the case for the Dutch Jubelton, will be investigated and added to the literature.

1.3 Research problem statement

The research aim of this study is to investigate the correlation between receiving tax-free funds from the 'Jubelton' scheme and housing consumption. This research aims to fill the research

gap by focusing on tax-free gifting in the Netherlands and the correlation with housing consumption. The central research question is:

"To what extent does receiving the Dutch 'Jubelton' as a household influence housing consumption?"

To answer the main research question, three sub-questions are formulated. The first sub-question is formulated as follows: "*What is the theoretical relationship between having a higher budget and housing consumption?"*. To answer the first sub-question former research will be examined to find the theoretical relationship between having a higher budget and housing consumption. This conclusion will be used for creating an empirical model in the second sub-question which states: "*How strong is the relationship between receiving tax-free funds from the 'Jubelton' scheme and the expected WOZ value?".* Sub-question 2 will be answered by examining the WoON21 dataset and by completing a regression analysis. The third sub-question aims to explore the differences between different given amounts of the Jubelton. The third sub-question is stated as follows: *Is the relationship between receiving tax-free funds from the 'Jubelton' scheme and the expected WOZ value increasing when the amount of received Jubelton is higher?* Sub-question 3 measures whether the WOZ value of the home increases with the amount of the Jubelton received. This sub-question can be answered using the WoON21 dataset as well and performing a regression with instead of the binary main independent variable of the received Jubelton, a categorical main independent variable stating the amount of the received Jubelton.

The answers to the sub-questions and the conclusion of the main research question will inform the Dutch government whether the 'Jubelton' has had an influence on housing consumption for households for future decisions regarding tax-free gifting schemes. With this information they have a better view what the 'Jubelton' had as an effect and whether there will be a reduction in housing prices, which helps in future decisions regarding tax-free gifting (Hüsken, 2021).

The remainder of this paper is organized as follows. Section 2 describes the conceptual model and section 3 the data and methods. Section 4 presents the results, and section 5 concludes.

2. THEORY, LITERATURE REVIEW & HYPOTHESES

First the relationship between budget and housing consumption will be looked at through investigating different research papers. Secondly, the characteristics and findings of tax-free gifting and the impact on housing consumption will be investigated. The first sub-question: "*What is the theoretical relationship between having a higher budget and housing consumption?"*, will be answered through the literature and hypotheses will follow up logically at the end of chapter 2.

2.1 Budget and housing consumption

When investigating the relationship between receiving a Dutch 'Jubelton' and housing consumption, it is essential to look at existing literature between budget and housing consumption. Existing literature shows that there is a positive relation between budget and housing consumption (Bostic et al., 2009; Quigley, 1982; Paiella, 2007; Berger et al., 2018). Also, one study has found a non-significant relationship between budget and housing prices in some cases (Paiella, 2007). Paiella (2007) has not found a significant relationship between increasing wealth and increasing consumption in Italy, while in the US there is a significant effect of increasing consumption when wealth increases as showed in the paper. This non-significant effect between budget and housing consumption in Italy can be explained by Italians having a low marginal propensity to consume out of real assets when their wealth increases, while in the US this is not the case (Paiella, 2007). The effect of budget on housing consumption could thus be also depended on the culture of the country and is not prevalent in every country (Paiella, 2007).

This research show that when the budget is higher, housing consumption will highly likely increase. These findings are in line with economic theories about spending more when having a higher budget (Case, Fair and Oster, 2020). It also shows that demand for certain housing characteristics do increase when having a higher budget (Bostic et al., 2009). This implies that consumers logically expect more favorable features in a home when having a higher budget. The relationship between budget and housing consumption in the Netherlands is unclear, but it is highly likely that the relationship is positive, since literature only shows a non-significant relationship in Italy where wealthy people do not spend significantly on real assets.

There has also been a study where the effect on the number of cars on housing value is measured. Staats and Swain (2020) show a negative effect on housing value, when the number

of cars increases (2020). Because of this, the number of cars will be used as a control variable in this study for measuring housing consumption.

2.2 Tax-free gifting

Research has not been done yet about the Dutch 'Jubelton' effecting the housing consumption, but much research has been done about tax-free gifting, including inter-vivos gifting (Joulfaian and McGarry, 2004; Cox and Rank, 1992; Norton and Van Houtven, 2006; Poterba, 2001), which implies tax free gifting between the living and is thus in this respect similar to the Dutch 'Jubelton'. Joulfaian and McGarry (2004) and Poterba (2001) have found that wealthy families are more prone to make use of inter-vivos than less wealthy families. Also, when using inter-vivos it is mostly given to children when they are younger in comparison to when they are older (Norton and Van Houtven, 2006; Joulfaian and McGarry, 2004), which is also the case with the Dutch 'Jubelton' due to the age restrictions stated above. This shows that gifting tax-free money is indeed more prevalent in wealthy families and for younger generations who are more likely to buy a new home. However, inter-vivos gifting is not restricted to individuals buying a home. Thus, receivers could also use inter-vivos for other types of consumption (Joulfaian and McGarry, 2004). It has also been found that inter-vivos are not used as efficient as possible in the US (Poterba, 2001). Many households lose money on estate taxes by not transferring money through tax-free inter-vivos gifting which shows inefficiency (Poterba, 2001).

Exploring the economic literature regarding the correlation between tax-free gifting and the housing sector reveals a limited body of research that starts in the 1990s. Engelhardt and Mayer (1994) initially examined how family wealth transfers contributed to down payments for home purchases and found that households that received gifts were more likely to purchase more expensive homes than households that not received gifts. The primary mechanism at play was the existence of credit constraints, which wealth transfers could alleviate, thereby reducing the negative impact of capital market imperfections. Luea (2008) distinguished between the impact of financial help, which is received more frequently and in smaller shares, and substantial lifetime gifts, finding that only the latter had a positive and significant impact on housing demand.

The study of Hochstenbach and Boterman (2015) revealed that parental background has a huge impact on the housing situation of children moving out. Children from parents with higher asset values, are twice as much more likely to end up in high-status central neighborhoods than less wealthy parents (Hochstenbach and Boterman, 2015). This research is part of proving the

impact of the gap between the wealthy and the poor in the Netherlands. When investigating the impact of the Jubelton scheme, research can be added to this literature on proving how wealth transfers within wealthy families impact the expectation of housing value, which has an impact on the gap between the wealthy and the poor.

In the analysis of the impact of the 'Jubelton' scheme on housing consumption, several control variables play a crucial role in providing a comprehensive understanding of the dynamics involved. Monthly costs and household debt are relevant control variables due to their potential influence on individuals' financial decisions and housing consumption patterns.

Monthly costs encompass an array of recurring expenses associated with housing upkeep, maintenance, and utility bills. A household with higher housing consumption may naturally incur elevated monthly costs due to the inherent expenditures tied to more substantial or better-located properties (Rosen & Fullerton, 1977). These costs can represent the level of investment individuals commit to their housing situation, indicative of a potential positive relationship between monthly costs and WOZ values.

Similarly, household debt, often stemming from property financing, could be positively associated with housing consumption. Households with greater housing consumption might be more inclined to invest in properties that align with their preferences and needs, necessitating higher debt levels to acquire or improve their housing situation (Bostic et al., 2009). Although not a direct causal factor, a positive correlation between household debt and WOZ values could signify that individuals leverage debt to enhance their housing consumption, aligning with the notion of income elasticity of demand within the housing market.

By incorporating these control variables, the regression analysis can offer a nuanced understanding of the impact of the 'Jubelton' scheme on housing consumption, considering both the direct effects of the scheme and the contextual financial factors that influence housing decisions.

In the realm of economics, it is pivotal to explore various perspectives on how individuals might utilize the 'Jubelton' to influence their housing decisions. Within this framework, possible scenarios emerge, such as overbidding for preferred properties to secure a desirable home, purchasing larger homes to accommodate changing household needs (Hulchanski, 1995), or targeting preferred neighborhoods known for their amenities and quality of life (Rosen, 1974). Additionally, recipients could allocate the 'Jubelton' toward upgrading their existing homes, enhancing property value through renovations or improvements (Hulchanski, 1995). However, a noteworthy consideration arises from the methodology employed in the regression analysis of this study. Although the analysis measures the impact of receiving a

'Jubelton' on the WOZ value of a home, it does not capture the specific utilization of the incentive, preventing the identification of the precise avenue through which households channel the financial benefit. This underscores the complexity of disentangling the multifaceted impacts of the 'Jubelton' scheme on housing consumption and highlights the need for a comprehensive examination that encompasses diverse potential outcomes.

The first sub-question: "*What is the theoretical relationship between having a higher budget and housing consumption?"* can now be answered by using the above literature. Mainly a positive relationship has been found between a higher budget and housing consumption (Bostic et al., 2009; Quigley, 1982; Paiella, 2007; Berger et al., 2018; Engelhardt and Mayer, 1994; Luea, 2008; Hochstenbach and Boterman, 2015). However, a non-significant relationship also has been found (Paiella, 2007). These findings are explainable by Italians not spending significantly more on real assets when being wealthy. The theoretical relationship between having a higher budget and housing consumption is thus mainly positive, only not in one certain situation. When looking at the Netherlands and the tax-free 'Jubelton' it is almost certain that the relationship between having a higher budget and housing consumption will be positive due to the former findings. The Dutch situation only differs in the loan-to-value mortgage which can be up to 100%, but this will only strengthen the relationship between budget and housing consumption as explained earlier. However, due to abolishment of the Jubelton for decreasing the gap of the wealth and the poor, it is interesting to prove this exact correlation. This will add to existing literature on the gap between the wealthy and the poor and how this impacts households.

2.3 Hypotheses

The first hypothesis that will be used to test the relationship between gifting the Dutch 'Jubelton' and housing consumption is stated below.

Hypothesis 1: *"Receiving a Dutch Jubelton as a household has a positive effect on housing consumption in comparison with not receiving a Jubelton."*

The second hypothesis will test whether the size of the Jubelton is positively correlated with the level of housing consumption and is stated below.

Hypothesis 2: "*The size of the Jubelton received is positively associated with the level of housing consumption.*"

3. DATA & METHODS

3.1 Context

The Dutch Jubelton is, as mentioned before, implied in 2013 and will be abolished from 2024 onwards (Ministerie van Financiën, 2022). The Dutch housing prices have risen over 90% from June 2013 until January 2022 (Langenberg and Jonkers, 2022). Within this timeframe, the increase of housing prices was 21% from January 2021 to January 2022, which is the highest rise since 1995 (Langenberg and Jonkers, 2022). Langenberg and Jonkers (2022) state that this significant rise since medio 2013 is partly due to a lower mortgage interest rate and higher incomes. Due to low interest rates, it was more interesting for individuals to invest in real estate, and this also drove up the demand and thus the housing prices. Due to the high demand, houses in the Netherlands were being overbid by 80% of the cases in the first half of 2022 and by 44% of the cases in the second half of 2022 (De Hypotheker, 2023b).

Since the maximum mortgage in the Netherlands is 100% of the value of the home, overbidding should be financed with own cash (Ministerie van Algemene Zaken, 2022). When receiving a Jubelton, overbidding is easier to finance and potential homeowners who received a Jubelton should have had an advantage in this period of excessive house prices (Venneman, 2022). The excessive housing prices is one of the reasons why the government has decided to abolish the Jubelton, besides the reasoning of decreasing the gap between the wealthy and the poor (Hüsken, 2021). To find out whether the Dutch Jubelton indeed had an advantage for the wealthy people, this paper will test whether households receiving a Jubelton, indeed have an increased housing consumption.

3.2 Data collection

To execute the analysis the "WoonOnderzoek Nederland" (WoON21) dataset will be used. Accessibility of the WoON21 dataset is obtained through the website of DANS KNAW. After filling in where this data will be used for, access has been given. This data is only used for this thesis and deleted after it has been graded. The data is stored on the student drive and analyzed through STATA.

This dataset contains all the data needed regarding this research. This implies at least the value of the home in WOZ values, whether the surveyor (or the partner of the surveyor) received a Jubelton (binary), how much the Jubelton was worth (categorical) and possible control variables. The question asked to measure whether the household has received a Jubelton is:

‘Did you or your partner receive money from your parents (in law) to purchase this home?’, with the options ‘*yes*’ and ‘*no*’. After this question the amount of the donation (if answered ‘*yes*’) is asked with four possible answers between ‘*Less than € 25,000*’ and *‘€ 100,000 or more*’. This data and the data about the WOZ value of the home and multiple control variables make the dataset suitable for this research. While WOZ values serve as a conventional metric to gauge housing consumption and property value, it is crucial to acknowledge the inherent limitations associated with this measure. One primary concern pertains to the fact that WOZ values do not precisely reflect actual transaction prices. WOZ values are typically determined through a mass appraisal process, which considers a range of factors, including property characteristics, neighborhood trends, and market conditions. However, this method may not capture the nuances of individual property features or unique local dynamics that influence transaction prices. Consequently, there might be instances where the WOZ value deviates from the true market value, particularly in rapidly changing markets or neighborhoods with heterogenous property types (Kuijper & Kaathman, 2015). Despite these limitations, WOZ values remain widely used in various policy and assessment contexts due to their convenience and cost-effectiveness (Brounen and Kok, 2011). Therefore, while it is acknowledged that WOZ values might not provide the most accurate reflection of actual market transactions, they still offer a workable approximation for assessing the relative impact of the 'Jubelton' scheme on housing consumption within the scope of this study.

One possible ethical problem with the WoON21 dataset is that hundreds of questions are asked to the respondents of the surveys which makes it possible that many respondents did not answer the necessary questions for this research or that the answers are not much reliable due to fatigue of the respondents. However, WoON21 is a well-known dataset in the Netherlands with over 40,000 observations per version and is the most complete dataset to measure the impact of the Jubelton on housing consumption. The timing of the measurement of WoON21 was between August 2020 and July 2021 (Rijksoverheid, 2020). Other datasets, including CBS micro data, do not contain data about receiving a Jubelton on household level which is necessary for this research. Therefore, WoON21 is the most fitting dataset for this research.

The entire WoON21 dataset consists of 872 variables and a total of 46,658 observations. However, not every variable is necessary for this research. The binary variable to indicate whether households received a Jubelton has a total of 4,420 observations and the categorical variable of the amount of the Jubelton has a total of 681 observations. The binary variable is necessary the execute the research and thus 42,238 observations will be removed since they do not contain information on this variable. These observations include renters, since this question

is not asked to surveyors who entered they rent a home. The 4,420 observations thus consist of surveyors who are homeowners and answered the question whether they have received a Jubelton or not. From these 4,420 observations, 3,649 contain information on all the variables, including the chosen control variables. Observations that did not contain information on at least one of the variables, are removed from the sample. This sample represents the population of homeowners in the Netherlands from all provinces.

3.3 Empirical model

The model used for the analysis is a hedonic price model. The logarithm of the value of the home is predicted using 11 different independent variables. The model contains on the left-hand side the natural logarithm of the WOZ value of 2021 of the home i and is a function of a constant, the main independent variable whether the household has received a Jubelton, control variables controlling for characteristics of the household and the property and the error term. This can be summarized in the following formula:

$$
\begin{aligned}
lnWOZ\_2021_i &= \beta_0 + \beta_1 Dummy\_Jubelton_i + \beta_2 Rooms_i \\
&+ \beta_3 lnMonthly\_Costs_i + \beta_4 Cars_i + \beta_5 Debt_i + \beta_6 Living\_Enivornment_i \\
&+ \beta_7 Energylabel_i + \beta_8 Income_i + \beta_9 Children_i + \beta_{10} Squared\_Meters_i \\
&+ \beta_{11} Province_i + \varepsilon_i
\end{aligned}
$$

Where $lnWOZ\_2021_i$ is the natural log of the WOZ value of the property in 2021; β_0 is the constant; $Dummy\_Jubelton_i$ is the binary variable of whether the household has received a Jubelton; $Rooms_i$ is the number of rooms of the property and is a continuous variable; $Monthly\_Costs_i$ is a continuous variable for the monthly costs of the property; $Cars_i$ is a continuous variable with the number of cars the household owns; Debt is a continuous variable of the amount of debt of the household; $Living\_Environment_i$ is a categorical variable containing information about the environment of the property; $Energylabel_i$ contains a categorical variable with the energy label of the property; $Income_i$ is a categorical variable indicating the income in comparison with the average; $Children_i$ is a categorical variable about the number of children in the household; $Squared\_Meters_i$ is a categorical variable containing the squared meters of the property; $Province_i$ is a categorical variable containing

the province of the property and ε_i is the error term of the regression model. The parameters β_1 to β_{11} give information on the correlation between the independent variables and the WOZ value of the property in 2021. This indicates the direction, positive or negative, and the significance of the relationship.

For the second hypothesis the hedonic price model below is used for interpretation.

$$lnWOZ\_2021_i = \beta_0 + \beta_1 Categorical\_Jubelton_i + \beta_2 lnMonthly\_Costs_i + \beta_3 Debt_i + \beta_4 Province_i + \beta_5 Rooms_i + \beta_6 Squared\_Meters_i + \beta_7 Energylabel_i + \varepsilon_i$$

This model is similar to the model for the first hypothesis. However, some control variables are removed due to begin insignificant. The number of rooms variable also turned out to be insignificant, but has not been removed due to being theoretically indispensable. With this model the number of observations is 511, which explains the insignificance of some control variables after removing over 3,000 observations.

3.4 Dependent variable

The WOZ value is a common measure for housing consumption and is used more often in research as a measure of housing consumption in the Netherlands (Engelhardt and Mayer, 1994). The WOZ value is the value of a home determined by an appraiser (Ministerie van Algemene Zaken, 2023). This WOZ value is given every year to homes to be able to tax the homes in the Netherlands (Ministerie van Algemene Zaken, 2023).
In this research the WOZ value of 2021 will be used to measure housing consumption of the households. The respondents of WoON21 have answered the survey between August 2020 and July 2021 and thus the WOZ value of 2021 will be sufficient (Rijksoverheid, 2020). Even if the respondents did not buy their home within this time frame, the WOZ value of 2021 will reflect what the value of the property is in 2021, and thus can be compared with other home values. When looking at the distribution of the WOZ value of the homes (*wozvalue2021*), it is not normally distributed as can be seen in Appendix A-1. Because of this, the logarithm of *wozvalue2021* is taken and this value is distributed more normally as can be seen in Appendix

A-1. The new value is called *lnwozvalue21*. In much research when housing prices is included, it is common to use the logarithm of housing prices since the observations are most of the time not normally distributed (Brooks and Tsolacos, 2010).

3.5 Independent variables

The main independent variable of this research is whether the household has received a Jubelton or not (*binary_jubelton*). There is a total of 4,420 observations where 15,4% did receive a Jubelton. After cleaning the data as mentioned in Chapter 3.2, 3,649 observations are left with 14% (511 observations) having received a Jubelton and 86% not having received a Jubelton (3,138 observations). The main independent variable is a binary variable where only *yes* or *no* is given. When testing the second hypothesis, this main independent variable will be replaced by a categorical variable with how much money has been received by the household with 511 observations. This second main independent variable indicates the amount of received Jubelton with the possible answers being '*less than € 25,000*', '*between € 25,000 and € 53,000*', '*between € 53,000 and € 100,000*' and *'€ 100,000 or higher'*.

Besides the main independent variable, ten other control variables are added. Control variables which are included in the model are number of cars per household, number of children, energy label, living environment, income in comparison with the average income of the Netherlands, number of rooms, monthly costs of the mortgage, living space in square meters, province of the house and debt per household in euros. These control variables could explain a relation with the WOZ value of the home and turned out to be significant after running various regressions. Many OLS regressions have been executed with adding and deleting control variables and looking at the impact of the adjusted R-squared and the significance of the relation.

These control variables are chosen to account for other factors that may impact the relationship between receiving a Jubelton and housing consumption. Also, many possible variables were not chosen to include in the model due to being irrelevant. The WoON21 dataset not only contains relevant variables for this research and thus many variables have been dropped. Another reason why variables are not chosen are due to multicollinearity issues. After doing several regressions the Variance Inflation Factor (VIF) of these models was tested and many times the VIF exceeded the critical number 5. The current average VIF value is 4.27 and thus lower than 5, which shows no multicollinearity issues. Also, some control variables are added, because they ensured a higher adjusted R-squared which means that the model is better

explained using these control variables. The current regression model has an adjusted R-squared of 0.7272.

3.6 Descriptive statistics

The variables of interest for the model are stated below. The mean, standard deviation, minimum and maximum can be seen per variable and with every categorical variable the different options and the percentages are stated. For the variables where the logarithm is taken in the model, the variable before logging is also stated in table 1. Also, the logarithmic version of the variable *monthlypayment* is stated in the table. The control variable costs of mortgage (*monthlypayment*) is significant in its logarithmic form and will be more logic to interpret this way. The distribution of the monthly payment variable in linear and logarithmic form can be seen in appendix A-3.

TABLE 1: DESCRIPTIVE STATISTICS

Variables	N / %	mean	sd	min	max
WOZ value 2021 (*wozvalue2021*)	3,649	331,679	150,874	57,655	2,926,000
Logged WOZ value 2021 (l*nwozvalue21*)	3,649	12.63	0.404	10.96	14.89
Dummy Dutch Jubelton (*binary_jubelton*)	3,649	1.860	0.347	1 = yes	2 = no
Number of rooms (*rooms*)	3,649	4.874	14716	1	15
Monthly costs (*monthlypayment*)	3,649	974.1	450.7	12	4500
Logged Monthly costs (*lnmonthlypayment*)	3,649	6.784	0.451	2.485	8.412
Number of cars (*cars*)	3,649	1.144	0.728	0	4
Debt of households (*debt)*	3,649	248,441	192,340	0	4,677,625
Received money from Jubelton (*categorical_jubelton*)	511	2.112	1.037	1	4
Less than € 25,000	34.25%				
€ 25,000 - € 53,000	34.83%				
€ 53,000 - € 100,000	16.44%				
More than € 100,000	14.48%				
Living environment (*environment*)	3,649	3.022	1.151	1	5
Centre / urban	4.69%				
Close to center	39.90%				
Green and urban	15.15%				
Centre of village	29.08%				
Rural	11.18%				
Energylabel (*energylabel*)	3,649	3.044	1.820	1	7
Energylabel A	28.91%				
Energylabel B	12.83%				

Energylabel C	23.57%				
Energylabel D	12.39%				
Energylabel E	9.81%				
Energylabel F	6.96%				
Energylabel G	5.54%				
Income in comparison with average (*income*)	3,649	3.670	1.097	1	5
Lower than average	3.89%				
1-1.5 times average	12.80%				
1.5-2 times average	20.33%				
2-3 times average	38.39%				
More than 3 times average	24.58%				
Number of children (*children*)	3,649	0.970	1.028	0	3
No children	46.12%				
1 child	19.05%				
2 children	26.56%				
3 or more children	8.28%				
Square meters living space (*sqm)*	3,649	4.549	1.346	1	7
Less than 50 sqm	1.86%				
50-69 sqm	5.70%				
70-89 sqm	11.92%				
90-119 sqm	28.09%				
120-149 sqm	27.60%				
150-199 sqm	18.25%				
More than 200 sqm	6.48%				
Province (*prov*)	3,649	26.51	2.771	20	31
Groningen	2.22%				
Friesland	2.55%				
Drenthe	3.34%				
Overijssel	11.29%				
Flevoland	2.60%				
Gelderland	11.54%				
Utrecht	13.92%				
Noord-Holland	11.62%				
Zuid-Holland	18.74%				
Zeeland	2.33%				
Noord-Brabant	14.58%				
Limburg	5.26%				

Note: The dependent variable is *lnwozvalue21;* the independent variables are *binary_jubelton* and *categorical_jubelton;* the control variables are *rooms, monthlypayment, cars, debt, environment, energylabel, income, children, sqm* and *prov.*

The distribution of the variables of interest is stated in table 1. 14% of the 3,649 observations have received a Jubelton (511 observations). The average WOZ value in 2021 of the respondents' homes is € 331,679 with a standard deviation of € 150,874. The lowest measured WOZ value is € 57,655 with the highest being € 2,926,000. The national average of the WOZ value in 2021 was € 290,000, which shows that the average WOZ value of the sample is higher than the population (Centraal Bureau voor de Statistiek, 2021a).

The number of rooms is on average 4.874 with the lowest being 1 and the highest being 15 rooms. Almost 40% of the respondents live close to the center of a city and 29% live in the center of a village. The energy label of the respondents' home is C or above for 65% of the respondents, which is lower than the national data where 74% of the population has an energy label of C or higher (Rijksoverheid, 2023).

From this pool of 3,649 responses 83.3% earns at least 1.5 times the average pay, which indicates that the sample has many respondents who have a higher wage than average. Of the respondents who have received a Jubelton, 69% has received less than € 53,000, which shows that most receivers do not receive the maximum possible amount of € 100,000.

46% of the households do not have children. In the Netherlands, 17% of the 45-year-old women are childless which shows that the households in the sample have less children than the average (Centraal Bureau voor de Statistiek, 2004). This could be due to a younger age of the respondents in the survey; however, a variable indicating the age is not added in the model and thus this reasoning cannot be verified.

TABLE 2: DESCRIPTIVE STATISTICS 'YES' AND 'NO' GROUP JUBELTON

Mean Variables	'Yes' group 511 observations	'No' Group 3,138 observations
WOZ value 2021 (*wozvalue2021*)	338,348	330,593
Logged WOZ value 2021 (l*nwozvalue21*)	12.64	12.62
Dummy Dutch Jubelton (*binary_jubelton*)	1	2
Number of rooms (*rooms*)	4.595	4.919
Monthly costs (*monthlypayment*)	874.2	990.4
Number of cars (*cars*)	.9569	1.175
Debt of households (*debt)*	217,037	253,555
Living environment (*environment*)	2.724	3.070
Centre / urban	7.24%	4.27%
Close to center	52.05%	37.92%
Green and urban	10.57%	15.90%
Centre of village	21.33%	30.34%
Rural	8.81%	11.57%
Energylabel (*energylabel*)	3.329	2.997
Energylabel A	24.46%	29.64%
Energylabel B	9.39%	13.38%
Energylabel C	23.29%	23.61%
Energylabel D	14.48%	12.05%
Energylabel E	13.89%	9.15%
Energylabel F	9.00%	6.63%
Energylabel G	5.48%	5.54%
Income in comparison with average (*income*)	3.507	3.696
Lower than average	6.07%	3.54%

1-1.5 times average	18.00%	11.95%
1.5-2 times average	19.57%	20.46%
2-3 times average	31.90%	39.45%
More than 3 times average	24.46%	24.60%
Number of children (*children*)	0.6673	1.019
No children	61.06%	43.69%
1 child	17.22%	19.34%
2 children	15.66%	28.33%
3 or more children	6.07%	8.64%
Square meters living space (*sqm)*	4.090	4.624
Less than 50 sqm	4.11%	1.50%
50-69 sqm	11.94%	4.68%
70-89 sqm	17.22%	11.06%
90-119 sqm	26.81%	28.30%
120-149 sqm	23.09%	28.33%
150-199 sqm	11.15%	19.41%
More than 200 sqm	5.68%	6.72%
Province (*prov*)	26.75	26.47
Groningen	1.37%	2.36%
Friesland	1.76%	2.68%
Drenthe	1.96%	3.57%
Overijssel	7.44%	11.92%
Flevoland	1.17%	2.84%
Gelderland	8.41%	12.05%
Utrecht	25.44%	12.05%
Noord-Holland	15.66%	10.96%
Zuid-Holland	16.24%	19.15%
Zeeland	1.76%	2.42%
Noord-Brabant	14.68%	14.56%
Limburg	1.11%	5.45%

Note: These descriptive statistics are used to test hypothesis 1 and show the similarities and differences between group ‘yes’ and group ‘no’.

Table 2 shows the descriptive statistics of the group ‘yes’ and the group ‘no’ of the main independent variable *binary_jubelton*. For reliable results of the regression analysis, it is important that the two groups are very similar. If not, it is unsure whether the effects on the WOZ value are due to the differences in the binary variable, or due to other major differences between the two groups. The more similar the two groups, the more reliable the interpretation on the effect of receiving a Jubelton on housing consumption. As can be seen in table 2, most variables are quite similar. However, some differences do exist. First, the monthly payment is higher for non-receivers of the Jubelton versus the ‘yes’ group. This could be because some receivers do use the Jubelton to pay off their mortgage (Ministerie van Financiën, 2022). Second, non-receivers have on average more children than receivers of the Jubelton, which is likely due to the required age of 18 – 40 of receivers from the Dutch Jubelton (Ministerie van

Financiën, 2022). Also, the square meters of the homes are higher than non-receivers, which is not expected with a higher budget. However, the location of the non-receivers is more leaned towards the rural area, in which homes are less expensive than in the urban area where most receivers of the Jubelton are located. This shows that Jubelton receivers are more likely to use the transfer for a better location than for a bigger house. Also, 25.44% of the Jubelton receivers are from the province Utrecht, which is out of proportion in comparison with the population in this province in comparison with other provinces. Utrecht is thus overrepresented in the 'yes' group. In conclusion, there are some differences between the 'yes' and 'no' group, however, the differences are not significant and will not lead to unreliable results of the regression analysis. However, it is important to keep in mind these differences when analyzing the results.

4. RESULTS AND DISCUSSION

This section provides the results on the relation between receiving a Jubelton on housing consumption, including multiple control variables. First, table 3 displays the results of the applied multiple OLS regression analysis. Second, the model outcomes will be revealed and explained. And lastly, we discuss the model outcomes extensively and connect these to earlier literature research.

TABLE 3: REGRESSION RESULTS, OLS ESTIMATES

	(1)	(2)	(3)	(4)
	Lnwoz21	Lnwoz21	Lnwoz21	Lnwoz21
Dummy Dutch Jubelton: 'Yes'	0.0194	0.0860***		
	(0.315)	(0.000)		
Received money: € 25,000 - € 53,0000			0.0593***	0.0931***
			(0.007)	(0.000)
€ 53,000 - € 100,000			0.1122***	0.1134***
			(0.000)	(0.000)
€ 100,000 or more			0.1762***	0.1908***
			(0.000)	(0.000)
Number of rooms		0.0214***	0.0112	0.01817**
		(0.000)	(0.121)	(0.029)
Logged monthly costs		0.2337***	0.1751***	0.2314***
		(0.000)	(0.000)	(0.000)
Number of cars		-0.0153***	-0.0192	
		(0.003)	(0.192)	
Debt of household		2.84e-07***	2.67e-07***	3.01e-07***
		(0.000)	(0.000)	(0.000)
Living Environment: Close to center		-0.0876***	-0.0720	
		(0.000)	(0.111)	
Green and urban		-0.0828***	-0.0756	
		(0.000)	(0.140)	
Centre of village		-0.1205***	-0.1039**	
		(0.000)	(0.038)	
Rural		-0.0812***	-0.0864	
		(0.001)	(0.123)	
Energy label B		-0.0533***	-0.0345	-0.0255
		(0.000)	(0.338)	(0.517)
Energy label C		-0.1028***	-0.0783***	-0.0945***
		(0.000)	(0.002)	(0.001)
Energy label D		-0.0856***	-0.0682**	-0.0728**
		(0.000)	(0.017)	(0.017)
Energy label E		-0.0945***	-0.1063***	-0.0981***
		(0.000)	(0.000)	(0.003)
Energy label F		-0.0617***	-0.0710**	-0.0814**
		(0.000)	(0.035)	(0.020)
Energy label G		-0.1078***	-0.1006**	-0.1050**

		(0.000)	(0.029)	(0.036)
Income: 1 – 1.5 times average		-0.0012	-0.0207	
		(0.957)	(0.619)	
Income: 1.5 – 2 times average		0.0344	0.0649	
		(0.119)	(0.137)	
Income: 2 – 3 times average		0.1116***	0.1193***	
		(0.000)	(0.005)	
Income: more than 3 times average		0.2142***	0.2280***	
		(0.000)	(0.000)	
Number of children: 1 child		0.0368***	0.0048	
		(0.000)	(0.856)	
2 children		0.0768***	0.0994***	
		(0.000)	(0.000)	
3 or more children		0.0519***	0.0351	
		(0.000)	(0.447)	
Living space: 50 - 69 m^2		0.0411	0.1374**	0.1756***
		(0.216)	(0.021)	(0.004)
70 - 89 m^2		0.1060***	0.1835***	0.2128***
		(0.001)	(0.003)	(0.000)
90 – 119 m^2		0.1907***	0.2932***	0.3537***
		(0.000)	(0.000)	(0.000)
120 – 149 m^2		0.2797***	0.3831***	0.4523***
		(0.000)	(0.000)	(0.000)
150 – 199 m^2		0.4027***	0.5978***	0.6754***
		(0.000)	(0.000)	(0.000)
200 m^2 or more		0.5517***	0.7027***	0.7879***
		(0.000)	(0.000)	(0.000)
Province: Friesland		0.0046	0.1181	0.0491
		(0.829)	(0.254)	(0.654)
Drenthe		-0.0352	0.0184	-0.0450
		(0.294)	(0.848)	(0.649)
Overijssel		0.0872***	0.1607**	0.0664
		(0.003)	(0.043)	(0.446)
Flevoland		0.0599*	0.2608***	0.1622*
		(0.075)	(0.003)	(0.084)
Gelderland		0.1581***	0.1875**	0.0953
		(0.000)	(0.017)	(0.277)
Utrecht		0.3476***	0.4139***	0.3850***
		(0.000)	(0.000)	(0.000)
Noord-Holland		0.3749***	0.5622***	0.5280***
		(0.000)	(0.000)	(0.000)
Zuid-Holland		0.2278***	0.3601***	0.3202***
		(0.000)	(0.000)	(0.000)
Zeeland		0.0355	0.0455	-0.0607
		(0.350)	(0.629)	(0.661)
Noord-Brabant		0.1746***	0.2831***	0.1920**
		(0.000)	(0.000)	(0.023)
Limburg		-0.0070	0.3012	-0.0550
		(0.823)	(0.750)	(0.597)
Constant	12.62***	10.45***	10.68***	10.29***

	(0.000)	(0.000)	(0.000)	(0.000)
# Observations	3,649	3,649	511	511
R-squared	0.0003	0.7272	0.7853	0.7391

Note: the natural logarithm of WOZ value of 2021 of the home is the dependent variable. The parentheses *p <0,10; **p<0,05; ***p<0,01 indicate the significance levels of the regression standard errors of respectively 10, 5 and 1 per cent.

4.1 Results

The results of the models in table 3 include the dependent variable, the WOZ value of the home in 2021, the main independent variables and the control variables. Two final regression models are present in the table, model (2) and model (4). Model (2) contains the *binary_jubelton* as the main independent variable and model (4) contains the *categorical_jubelton* as the main independent variable. Hypothesis 1 can be analyzed with model (2), whereas hypothesis 2 can be analyzed by using regression model (4). The first model has an explanatory power (R-squared) of lower than 1%, where the final models have an R-squared of 72,7% and 73,9% respectively. In all models is the constant significant.

The first model only contains the main dependent variable of *lnwozvalue2021* and the main dependent variable *binary_jubelton*. The dependent variable in this model is not significant with a P-value of 0.312 and the explanatory power is very low with a value of 0.0003. In the second model, all control variables are added to the model resulting in an R-squared of 0.7272. Only significant control variables have been added to model (2). Model (2) is the final model for interpretation of hypothesis 1.

Model (3) is created to analyze hypothesis 2 by replacing the main independent variable of *binary_jubelton* with *categorical_jubelton*. The number of observations changes from 3,649 to 511 and many control variables turn out to be insignificant with *categorical_jubelton* as main independent variable as can be seen in model (3). Control variables that must be removed to create a significant model to test hypothesis 2 are: number of cars, living environment, income and number of children. Model (4) is the final model for testing hypothesis 2 with only significant control variables and an R-squared of 0.7391. The interpretations of model (2) and (4) will be discussed below.

The main independent variable *binary_jubelton* '*yes*' has a significant value of 0.0860 at the 1% significance level in comparison with the constant '*no*' on the dependent variable *lnwozvalue21*. This means that the expected *lnwozvalue21* increases with 0.0860, when the household has received a Jubelton. When taking the exponential, the expected WOZ value will then increase with 9,3% when a Jubelton has been received. The number of rooms also has a

positive effect on *lnwozvalue21*. One added room will lead to a higher expected value of 2% in the WOZ value of the house. The monthly cost variable is a logarithmic value. To interpret the effect of monthly cost on WOZ value, we will use the log-log model approach. For every 1% increase in monthly costs, the WOZ value of the home is expected to increase with 0,2337%.For example, if the monthly costs increase with 10%, the WOZ value is expected to increase with 2,34%.The number of cars has a significant negative effect on WOZ value on the 1% significance level. This is line what Staats and Swain (2020) has found on the number of cars having a negative effect on housing value.

With a debt value of € 200,000 the expected WOZ value will increase with 5%. This is in line with theory showing a positive correlation between higher debt amounts and housing consumption (Bunn and Rostom, 2015). The constant of the living environment 'Centre' has the most increasing effect on the expected WOZ value since all other categories have a significant negative effect. This is line with literature showing housing prices in urban area are relatively higher than in more rural areas (Archer, Gatzlaff and Ling, 1996). The reference category of Energy label is energy label 'A', and every other energy label has a negative effect on WOZ value, which is also in line with literature showing homes with a higher energy label are relatively more expensive (Brounen and Kok, 2011). However, the energy labels do not have a descending order of negative effect on WOZ value which is not logical following the reasoning of higher energy labels being more energy efficient and thus more valuable (Brounen and Kok, 2011). The amount of living space in contrast, does have a perfectly ascending order which is expected from literature (Bostic et al., 2009). The higher the number of square meters, the higher the expected value of the home (Bostic et al., 2009). When looking at the provinces, not every province has a significant effect on housing value. The reference category in provinces is the province 'Groningen' and most provinces have a positive effect on WOZ value in comparison with Groningen. The three most significant positive effects on WOZ value are '*Noord-Holland'*, '*Zuid-Holland'* and '*Utrecht*'. This is in line with data that has been found that the three most expensive provinces to live are indeed these provinces (Centraal Bureau voor de Statistiek, 2019). Another important predictor of the WOZ value is the income of the household. There has been found significant effects from 2 times or higher in comparison with 'lower than average income'. When income is 3 times or higher than the average, the WOZ value is expected to increase with 24%. This is in line literature that find a positive correlation between income and housing consumption (Bricker, Krimmel and Ramcharan, 2021). Also, children have a positive effect on expected housing consumption. However, 3 or more children have a lower positive effect than 2 children. 2 children give a higher expected value of 7,7%

on housing consumption, while 3 or more children give an expected higher value of 5,2%. Children being a positive indicator on housing consumption is in line with literature (Browning and Ejrnæs, 2009). The constant in model (2) is 10.45, which means that for every house and household with the characteristics of the reference category in the variables, the expected value of a home is € 34,544.

When investigating the results of model (4), There are significant differences between receiving little amount of money for the Jubelton in comparison with higher amounts on the WOZ value of the home. The higher the gift, the bigger increase in WOZ value. The reference category for the main independent variable *categorical_jubelton* is receiving a Jubelton of *'€ 25,000 or lower'*. When the household has received a Jubelton between '€ 25,000 and € 53,000', the expected increase in WOZ value is 9,8%, for 'between € 53,000 and € 100,000' 12% and for the answer 'more than € 100,000' an increase of 21%. An increase of 10% in *monthlypayment* will increase the expected WOZ value with 2,3%. The effect of amount of living space is, as is model (2), ascending which is in line with the literature (Bostic et al., 2009). The reference category of living space is '*less than 50 m2'*, and when the house is for example '*between 120 – 149 m^2'*, the expected WOZ value increases with 57,2%. The only 1% significant effects in model (4) of provinces are '*Utrecht*', '*Noord-Holland'* and '*Zuid-Holland*' which is again in line with data found that these are the most expensive provinces to live in the Netherlands (Centraal Bureau voor de Statistiek, 2019). The constant in model (4) is 10.29, which means that for every house and household with the characteristics of the reference category in the variables, the expected value of a home is € 29,437.

4.2 Discussion

The results of the regression analyses are subject for further discussion. For many decades, discussions about the gap between the wealthy and the poor have been present (Hochstenbach and Boterman, 2015; Hüsken, 2021). The Jubelton makes it possible for rich families to transfer money tax-free to children for buying a home (Ministerie van Financiën, 2022). There has been stated that receivers of the Jubelton, had an easier time buying a home in mid-2022 when housing prices were irrationally high with 80% of houses being overbid (de Preter, 2023; Ministerie van Algemene Zaken, 2022; Venneman, 2022). The impact of the Jubelton variable in model (2) shows indeed that a significant effect is present on housing consumption. Model (2) shows that the expected WOZ value increases with 9% when a Jubelton has been received

in the household. This finding supports hypothesis 1, suggesting that the Jubelton has a positive impact on housing consumption measured in WOZ values.

Model (4), which replaced the main independent variable with *categorical_jubelton*, was used to analyze hypothesis 2. The results indicated that the amount of the Jubelton had a significant impact on the WOZ value. Higher amounts of the Jubelton were associated with larger increases in WOZ value. This finding supports hypothesis 2, suggesting that the amount of the Jubelton influences housing consumption.

Both results of model (2) and model (4) are in line with the literature on budget and housing consumption (Bostic et al., 2009; Quigley, 1982; Paiella, 2007; Berger et al., 2018). This shows that the Jubelton in the Netherlands, is no exemption on this general theory. When comparing model (2) and model (4), it is evident that the inclusion of *categorical_jubelton* in model (4) provided a more detailed understanding of the impact of different Jubelton amounts on the WOZ value. However, it also led to a reduced number of observations and the exclusion of several control variables that became insignificant in the presence of *categorical_jubelton*. This highlights the importance of carefully selecting variables and considering the trade-off between model complexity and explanatory power.

5. CONCLUSION

This paper aims to investigate the impact of receiving a Jubelton on housing consumption. The Jubelton will be abolished from January 2024 onwards and will have been implemented for eleven years. Many people have different opinions about the abolishment of the Jubelton. 41% is not content with the abolishment while 59% has the opinion that the abolishment is a good initiative (DVHN Redactie, 2022). Also, the government has decided to abolish the Jubelton for stabilizing housing prices and wealth inequality (Hüsken, 2021). With the investigation of the impact of the Jubelton on housing consumption, a more data driven opinion can be formed about the impact of the Dutch Jubelton. Besides, this thesis is able to forecast what will happen to WOZ values when the Jubelton will be fully abolished.

The main question of *"To what extent does receiving the Dutch 'Jubelton' as a household influence housing consumption?"* can be answered using a hedonic pricing method. We have found that receiving a Jubelton has a significant impact on the expected housing consumption of over 9%. Besides, when looking at the different values of the received Jubeltons, a higher received Jubelton does imply a higher expected housing consumption. Both hypothesis 1 and hypothesis 2 can both thus not be rejected. In context of societal debates, this paper has given data driven evidence of the effect of receiving a Jubelton as a household. Fortunate receivers of the Jubelton have had a huge advantage in buying more expensive homes. Not only where they able to buy more expensive homes, but also in the time were 80% of selling homes were overbid, they had a bigger chance of financing the overbidding, due to this being with 100% own cash (Ministerie van Algemene Zaken, 2022). However, no proof is present of whether Jubelton receivers indeed have had more success in buying homes than non-receivers in this period of overbidding. Only speculation is possible when it comes to researching whether the Jubelton scheme has given 'the poor' a disadvantage in buying a home. Future research could investigate whether Jubelton scheme recipients had a higher rate of successful home purchases compared to non-recipients during periods of overbidding, using 'Rate of Successful Home Purchases' as the dependent variable and comparing these two groups to evaluate the scheme's impact on housing access.

There are limitations present in the paper. The first limitation is the WoON21 database which has over 40,000 respondents who are being asked hundreds of questions. In this paper, we have only examined 12 of these hundreds of questions which leaves 3,649 observations and it is possible that many respondents have not answered the questions carefully. This would mean that the data is not fully reliable and could have a high rate of inaccuracy in the answers.

Besides, model (4) only is left with 511 observations where conclusions are drawn from. This number of observations is on the low side and should be considered. A second important limitation is that with this study receivers of the Jubelton who used it for paying off their mortgage is not considered. Only the effect on the WOZ value is measured. When receivers have used it to pay off their mortgage, this WOZ value will not have a significant effect. Another limitation is the categorical variable of the received amount of the Jubelton. This categorical variable consists of 4 categories but would have been more interesting to research as a continuous variable. It could for example be that there is an interesting, non-linear pattern in the Jubelton amount versus the WOZ value. A third limitation is the use of the WOZ value as a proxy of housing consumption. In many cases, the WOZ value does not reflect the true value of the house and thus not the true value of the housing consumption (Kuijper & Kaathman, 2015). In future research it could be interesting to use the transaction prices of the house as a proxy of housing consumption.

Much literature has been done on the relation between budget and housing consumption (Bostic et al., 2009; Quigley, 1982; Paiella, 2007; Berger et al., 2018). This paper adds to the general theory that a higher budget indeed increases housing consumption, also in the case of the Dutch Jubelton. The results of the paper also add to the literature of Hochstenbach and Boterman (2015) who have researched the impact of rich family background on the neighborhood areas where the children end up. This paper shows again that children from rich families are more fortunate in housing due to being able to buy more expensive homes than non-receivers of the Jubelton.

A recommendation for future research is to investigate what of an influence the Jubelton has had in the housing boom in mid-2022. The government, among other specialists, believe that the Jubelton scheme has had an increasing effect on the housing price in this period of time and this is also one of the reasons for the abolishment (Hüsken, 2021). However, no data analysis has been done to verify this reason and thus this could be interesting for future research.

There is much attention needed for researching the gap between the wealthy and the poor in different ways. This paper is one of them. When making governmental decisions, but also private decisions it is needed to know the impact of these decisions. This paper is a step in addressing the effect of such schemes for wealthy families and the effect of them on society, making the world a more fair and better place.

REFERENCES

Archer, W.R., Gatzlaff, D.H. and Ling, D.C. (1996) "Measuring the Importance of Location in House Price Appreciation," *Journal of Urban Economics*, 40(3), pp. 334–353. Available at: https://doi.org/10.1006/juec.1996.0036.

Berger, D.H. *et al.* (2018) "House Prices and Consumer Spending," *The Review of Economic Studies*, 85(3), pp. 1502–1542. Available at: https://doi.org/10.1093/restud/rdx060.

Bostic, R.W., Gabriel, S.A. and Painter, G. (2009) "Housing wealth, financial wealth, and consumption: New evidence from micro data," *Regional Science and Urban Economics*, 39(1), pp. 79–89. Available at: https://doi.org/10.1016/j.regsciurbeco.2008.06.002.

Bricker, J., Krimmel, J. and Ramcharan, R. (2021) "Signaling Status: The Impact of Relative Income on Household Consumption and Financial Decisions," *Management Science*, 67(4), pp. 1993–2009. Available at: https://doi.org/10.1287/mnsc.2019.3577.

Brooks, C. & Tsolacos, S. (2010). Real Estate Modelling and Forecasting. Cambridge: Cambridge University Press.

Brounen, D. and Kok, N. (2011) "On the economics of energy labels in the housing market," *Journal of Environmental Economics and Management*, 62(2), pp. 166–179. Available at: https://doi.org/10.1016/j.jeem.2010.11.006.

Browning, M. and Ejrnæs, M. (2009) "Consumption and Children," *The Review of Economics and Statistics*, 91(1), pp. 93–111. Available at: https://doi.org/10.1162/rest.91.1.93.

Bunn, P. and Rostom, M. (2015) "Household Debt and Spending in the United Kingdom," *Social Science Research Network* [Preprint]. Available at: https://doi.org/10.2139/ssrn.2669425.

Case, K.E., Fair, R.C. and Oster, S.M. (2020). *Principles of economics*. Boston Pearson.

Centraal Bureau voor de Statistiek (2004) "Kinderloosheid en opleidingsniveau," *Centraal Bureau Voor De Statistiek*, 24 May. Available at: https://www.cbs.nl/nl-nl/nieuws/2004/22/kinderloosheid-en-opleidingsniveau (Accessed: May 24, 2023).

Centraal Bureau voor de Statistiek (2019) "Regionale verschillen in huizenprijzen groter," *Centraal Bureau Voor De Statistiek*, 22 March. Available at: https://www.cbs.nl/nl-nl/nieuws/2019/12/regionale-verschillen-in-huizenprijzen-groter.

Centraal Bureau voor de Statistiek (2021a) "Gemiddelde WOZ-waarde van woningen in 2021 7 procent hoger," *Centraal Bureau Voor De Statistiek*, 29 September. Available at: https://www.cbs.nl/nl-nl/nieuws/2021/39/gemiddelde-woz-waarde-van-woningen-in-2021-7-procent-hoger (Accessed: May 24, 2023).

Centraal Bureau voor de Statistiek (2021b) *Minder geschonken onder verruimde vrijstelling voor de eigen woning*. Available at: https://www.cbs.nl/nl-nl/nieuws/2021/09/minder-geschonken-onder-verruimde-vrijstelling-voor-de-eigen-woning.

Cox, D.P. and Rank, M.R. (1992) "Inter-Vivos Transfers and Intergenerational Exchange," *The Review of Economics and Statistics*, 74(2), p. 305. Available at: https://doi.org/10.2307/2109662.

De Hypotheker (2023a) *Gemiddelde huizenprijzen Nederland gestegen*. Available at: https://www.hypotheker.nl/actueel/huizenprijzen-nederland/ (Accessed: February 28, 2023).

De Hypotheker (2023b) *Hoeveel overbieden op een huis in 2023?* Available at: https://www.hypotheker.nl/begrippenlijst/huis-kopen/overbieden/ (Accessed: March 14, 2023).

De Preter, J. (2023) *Woning kopen in Vlaanderen: 'Wie van zijn ouders geen dikke envelop krijgt, is gedoemd.'* Available at: https://www.knack.be/nieuws/belgie/woning-kopen-in-vlaanderen-wie-van-zijn-ouders-geen-dikke-envelop-krijgt-is-gedoemd/.

DVHN Redactie (2022) *Maakt de afschaffing van de jubelton de woningmarkt eerlijker? Dit is de uitslag van de stelling van de dag*. Available at: https://dvhn.nl/meningen/Stelling-van-de-dag-De-afschaffing-van-de-jubelton-maakt-de-woningmarkt-eerlijker-28041574.html.

Engelhardt, G. V. & Mayer, C. J. (1994). Gifts for Home Purchase and Housing Market Behavior. *New England Economic Review, (May),* 47-58.

Hochstenbach, C. & Boterman, W. R. (2017). Intergenerational Support Shaping Residential Trajectories: *Young People Leaving Home in a Gentrifying City. Urban studies, 54*(2), 399- 420.

Hulchanski, J.D. (1995) 'The concept of housing affordability: Six contemporary uses of the housing expenditure-to-income ratio,' *Housing Studies*, 10(4), pp. 471–491. https://doi.org/10.1080/02673039508720833.

Hüsken, R. (2021) *Dit zijn de gevolgen op de woningmarkt bij de afschaffing van de "jubelton."* Available at: https://www.ad.nl/wonen/dit-zijn-de-gevolgen-op-de-woningmarkt-bij-de-afschaffing-van-de-jubelton~aca4e9e6/?referrer=https%3A%2F%2Fwww.google.com%2F (Accessed: February 28, 2023).

Joulfaian, D. and McGarry, K. (2004) "Estate and Gift Tax Incentives and Inter Vivos Giving," *National Tax Journal*, 57(2.2), pp. 429–444. Available at: https://doi.org/10.17310/ntj.2004.2s.04.

Kuiiper, M., & Kaathman, R. (2015). Property valuation and taxation in the Netherlands. *Land Tenure Journal*, 15(2), 47-62.

Langenberg, H. and Jonkers, W. (2022) “Achtergrond bij de huizenprijsstijgingen vanaf 2013,” *Centraal Bureau Voor De Statistiek* [Preprint]. Available at: https://www.cbs.nl/nl-nl/longread/de-nederlandse-economie/2022/achtergrond-bij-de-huizenprijsstijgingen-vanaf-2013?onepage=true#:~:text=In%20januari%202022%20waren%20bestaande,van%20de%20tijdreeks%20in%201995.

Luea, H. M. (2008). The Impact of Financial Help and Gifts on Housing Demand and Cost Burdens. *Contemporary Economic Policy,* 26(3), 420-432.

Ministerie van Algemene Zaken (2022) *Hoeveel kan ik maximaal lenen voor mijn koopwoning?* Available at: https://www.rijksoverheid.nl/onderwerpen/huis-kopen/vraag-en-antwoord/maximaal-bedrag-lenen-koopwoning#:~:text=U%20kunt%20een%20hypotheek%20afsluiten,taxateur%20stelt%20de%20waarde%20vast.

Ministerie van Algemene Zaken (2023) *Hoe bepalen gemeenten de WOZ-waarde?* Available at: https://www.rijksoverheid.nl/onderwerpen/waardering-onroerende-zaken-woz/vraag-en-antwoord/woz-waarde-bepalen.

Ministerie van Financiën (2022) *Kabinet verlaagt schenkingsvrijstelling eigen woning per 1 januari 2023*. Available at: https://www.rijksoverheid.nl/actueel/nieuws/2022/03/08/kabinet-verlaagt-schenkingsvrijstelling-eigen-woning-per-1-januari-2023 (Accessed: February 28, 2023).

Norton, E.C. and Van Houtven, C.H. (2006) “Inter-Vivos Transfers and Exchange,” *Southern Economic Journal,* 73(1), p. 157. Available at: https://doi.org/10.2307/20111880.

Paiella, M. (2007) “Does wealth affect consumption? Evidence for Italy,” *Journal of Macroeconomics,* 29(1), pp. 189–205. Available at: https://doi.org/10.1016/j.jmacro.2005.06.001.

Poterba, J.M. (2001) “Estate and gift taxes and incentives for inter vivos giving in the US,” *Journal of Public Economics*, 79(1), pp. 237–264. Available at: https://doi.org/10.1016/s0047-2727(00)00102-x.

Quigley, J.M. (1982) “Nonlinear budget constraints and consumer demand: An application to public programs for residential housing,” *Journal of Urban Economics*, 12(2), pp. 177–201. Available at: https://doi.org/10.1016/0094-1190(82)90014-6.

Rijksoverheid (2020) *Woononderzoek 2021 gestart*. Available at: https://woononderzoek.nl/nieuws/Woononderzoek-2021-gestart/99 (Accessed: June 12, 2023).

Rijksoverheid (2023) *Energielabels van woningen, 2010 t/m 2022*. Available at: https://www.clo.nl/indicatoren/nl0556-energielabels-woningen#:~:text=Per%2031%20december%202022%20waren,en%2025%25%20een%20C%20label. (Accessed: May 24, 2023).

Rosen, K. T. (1974). Hedonic prices and implicit markets: Product differentiation in pure competition. *Journal of Political Economy,* 82(1), 34-55.

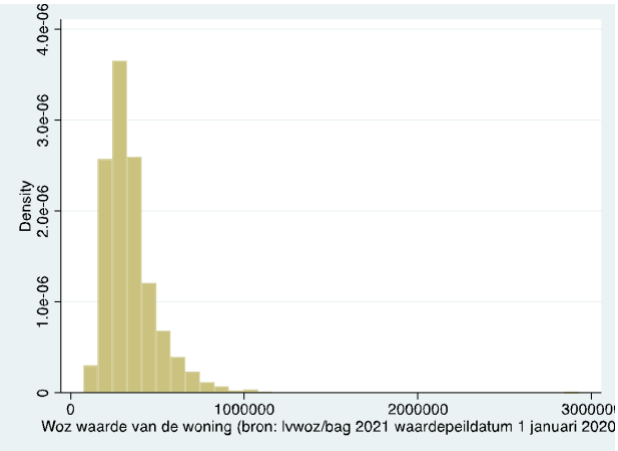
Rosen, H.S. and Fullerton, D.J. (1977) 'A note on local tax rates, public benefit levels, and property values,' *Journal of Political Economy*, 85(2), pp. 433–440. https://doi.org/10.1086/260575.

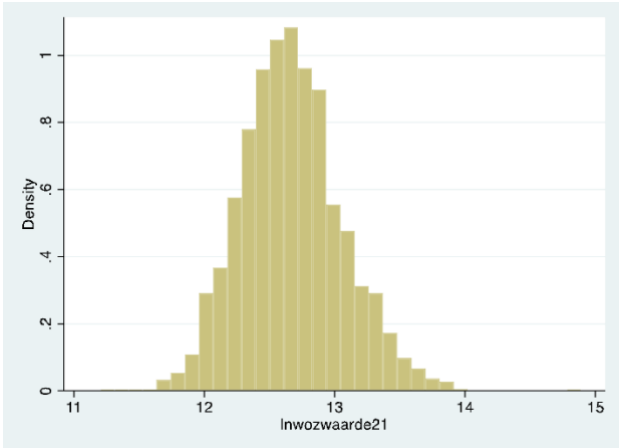
Staats, H. and Swain, R. (2020) “Cars, trees, and house prices: Evaluation of the residential environment as a function of numbers of cars and trees in the street,” *Urban Forestry & Urban Greening*, 47, p. 126554. Available at: https://doi.org/10.1016/j.ufug.2019.126554.

Venneman, I. (2022) *Na tien jaar komt er een einde aan de jubelton: "Symbool voor alles wat er misging op de woningmarkt."* Available at: https://www.volkskrant.nl/nieuws-achtergrond/na-tien-jaar-komt-er-een-einde-aan-de-jubelton-symbool-voor-alles-wat-misging-op-de-woningmarkt~b9b30368/?referrer=https%3A%2F%2Fwww.google.com%2F (Accessed: June 12, 2023).

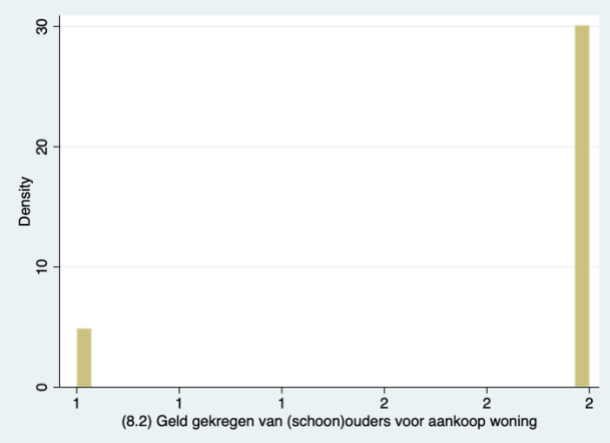
APPENDIX A: DESCRIPTIVE STATISTICS

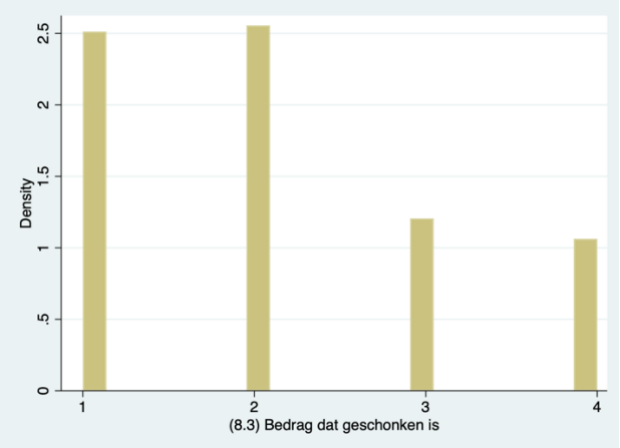
A-1. WOZ value of home (*wozvalue2021*) & Logged WOZ value of home (*lnwozvalue21*)



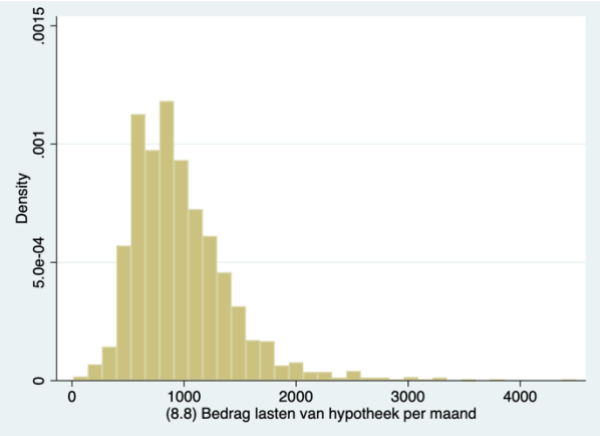


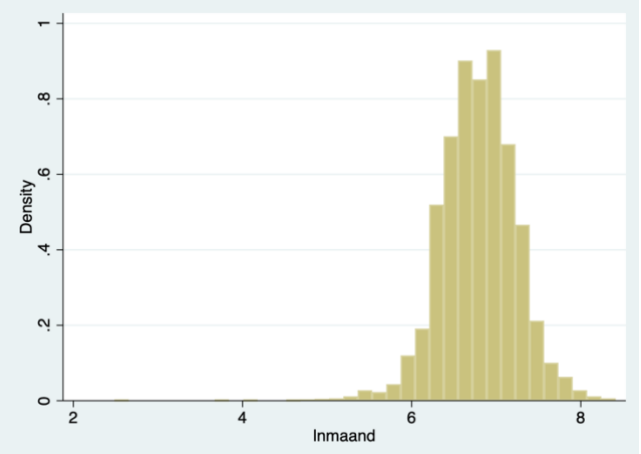
A-2: distribution of the two main dependent variables*: binary_jubelton* and *categorical_jubelton*





A-3: monthly costs per household (*monthlypayment*)





& Logged monthly costs (*lnmonth*)

APPENDIX B: VIF & CORRELATION MATRIX

B-1. Variance inflation factor

Variance inflation factor

	VIF	1/VIF
binary_jubelton	1.07	.932
cars	1.20	.836
children		
1 child	1.25	.800
2 children	1.47	.679
3 or more	1.30	.770
Energy label		
B	1.31	.764
C	1.50	.665
D	1.34	.745
E	1.31	.765
F	1.22	.818
G	1.17	.852
income		
1 – 1.5 times average	3.78	.265
1.5 – 2 times average	5.23	.191
2 – 3 times average	7.41	.135
More than 3 times	6.52	.153

rooms	1.91	.522
Logged monthlypayment	1.71	.524
sqm		
50 – 69 m^2	3.91	.255
70 – 89 m^2	6.90	.145
90 – 119 m^2	13.33	.075
120 – 149 m^2	14.08	.071
150 – 199 m^2	11.71	.085
200 or more m^2	5.83	.172
Province		
Friesland	2.11	.473
Drenthe	2.45	.408
Overijssel	5.48	.183
Flevoland	2.15	,465
Gelderland	5.53	.181
Utrecht	6.51	.154
Noord-Holland	5.75	.174
Zuid-Holland	7.88	.127
Zeeland	2.02	.495
Noord-Brabant	6.56	.152
Limburg	3.23	.309
debt	1.40	0.713

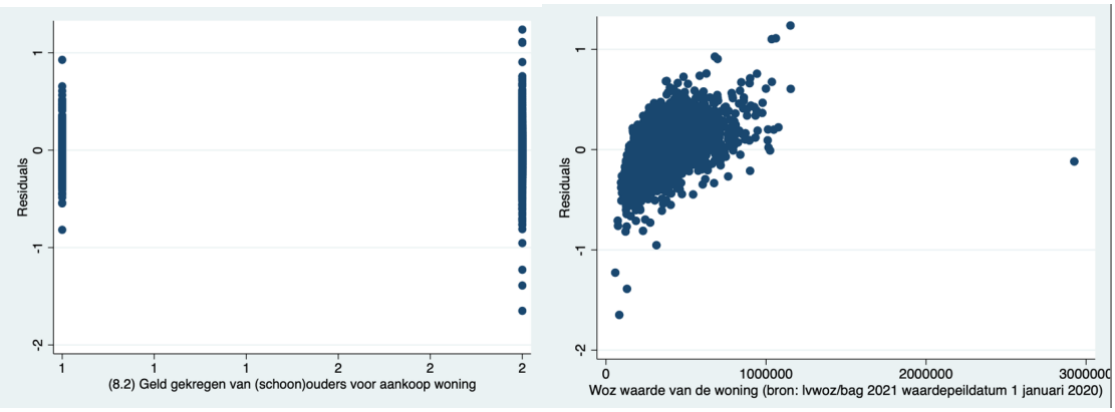
Mean VIF	4.27	.

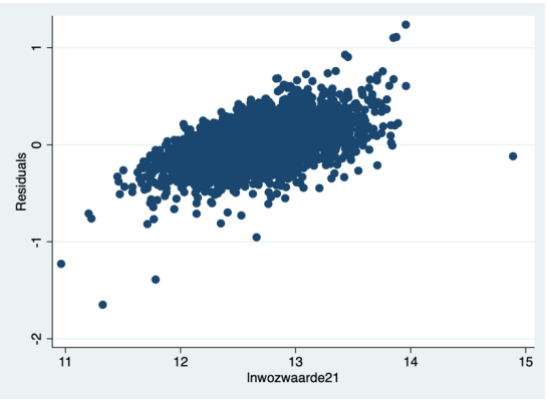
B-2. Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) lnwozvalue	1.000											
(2) binary_jubelton	-.0166	1.000										
(3) cars	.0537	.1038	1.000									
(4) children	.3685	.1188	.1783	1.00								
(5) energylabel	-.1818	-.0632	-.0416	-.1059	1.000							
(6) environment	.0222	.1044	.2705	.1217	-.0794	1.000						
(7) income	.5762	.0600	.1019	.2763	-.1039	.0089	1.000					
(8) rooms	.4267	.0765	.2397	.4118	-.0493	.2481	.3211	1.000				
(9) monthlypayment	.6916	.0895	.0630	.2346	-.0627	.0204	.4865	.3499	1.000			
(10) sqm	.5453	.1377	.2891	.4360	-.1935	.3015	.3898	.6502	.4294	1.000		
(11) prov	.1320	-.0351	-.0414	.0084	.0135	.0070	.0752	.0159	.0933	.0117	1.000	
(12) debt	.5167	.0659	.0489	.2605	-.0397	.0368	.3299	.2847	.5181	.3292	.0543	1.000

Appendix C – ASSUMPTIONS TESTING OLS MODEL

C-1. Assumption: Indepence of Errors, residuals and binary_jubelton, wozvalue2021 and lnwozvalue21





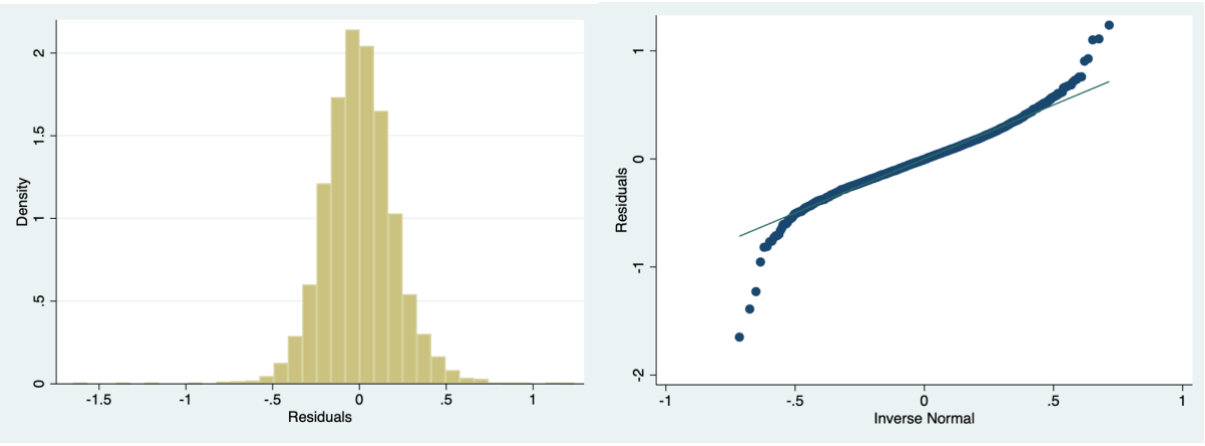
C-2. Assumption: Homoskedasticity, Hettest and Imtest before using ,robust in regression

```
H0: Constant variance

     chi2(1) =  23.18
Prob > chi2 = 0.0000
```

Source	chi2	df	p
Heteroskedasticity	943.10	713	0.0000
Skewness	61.83	40	0.0149
Kurtosis	7.59	1	0.0059
Total	1012.53	754	0.0000

C-3. Assumption: Normality of Residuals, hist e and qnorm e


Density
0
.5
1
1.5
2
-1.5
-1
-.5
0
.5
1
Residuals
Residuals
-2
-1
0
1
-1
-.5
0
.5
1
Inverse Normal

Appendix D: RESULTS

D-1. Results model (1)

```
. reg lnwozwaarde21 i.schenkaankoop
```

Source	SS	df	MS		
Model	.164679247	1	.164679247	Number of obs	= 3,649
Residual	595.820754	3,647	.163372842	F(1, 3647)	= 1.01
				Prob > F	= 0.3154
Total	595.985434	3,648	.1633732	R-squared	= 0.0003
				Adj R-squared	= 0.0000
				Root MSE	= .40419

lnwozwaarde21	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
schenkaankoop						
nee	-.0193584	.0192815	-1.00	0.315	-.0571619	.0184451
_cons	12.64378	.0178805	707.13	0.000	12.60872	12.67883

D-2. Results model (2)

Linear regression

Number of obs	=	3,649
F(39, 3609)	=	242.39
Prob > F	=	0.0000
R-squared	=	0.7272
Root MSE	=	.21223

lnwozwaarde21	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
schenkaankoop						
ja	.0859736	.0104511	8.23	0.000	.0654829	.1064643
kamers	.0214039	.0037313	5.74	0.000	.0140882	.0287197
lnmaand	.2336722	.0205421	11.38	0.000	.1933969	.2739475
aantautohh	-.0153301	.0051909	-2.95	0.003	-.0255075	-.0051526
sch_uit_r	2.84e-07	3.23e-08	8.79	0.000	2.21e-07	3.48e-07
hwmbrt						
buiten-centrum	-.0875888	.0200785	-4.36	0.000	-.1269552	-.0482225
groen-stedelijk	-.0828206	.0217205	-3.81	0.000	-.1254062	-.040235
centrum-dorps	-.1204965	.0207618	-5.80	0.000	-.1612025	-.0797904
landelijk wonen	-.0811618	.0234557	-3.46	0.001	-.1271497	-.035174
energieklasse						
B	-.053324	.0112101	-4.76	0.000	-.0753029	-.0313452
C	-.1028159	.0102997	-9.98	0.000	-.1230097	-.0826221
D	-.0855994	.0119394	-7.17	0.000	-.109008	-.0621907
E	-.0945523	.0138991	-6.80	0.000	-.1218032	-.0673014
F	-.0616964	.0155649	-3.96	0.000	-.0922133	-.0311795
G	-.107847	.0196858	-5.48	0.000	-.1464434	-.0692506

inkmod5_r						
1 tot 1,5 keer modaal	-.0011956	.0222114	-0.05	0.957	-.0447438	.0423526
1,5 tot 2 keer modaal	.0344205	.0220638	1.56	0.119	-.0088383	.0776794
2 tot 3 keer modaal	.1116374	.022828	4.89	0.000	.0668803	.1563944
vanaf 3 keer modaal	.2141587	.0248976	8.60	0.000	.1653439	.2629736
aantkind4						
1 kind	.0368311	.0097902	3.76	0.000	.0176361	.0560261
2 kinderen	.0767961	.0097612	7.87	0.000	.0576581	.0959341
3 of meer kinderen	.0519013	.0145746	3.56	0.000	.023326	.0804766
oppwon7						
50-69 m2	.0411388	.0332293	1.24	0.216	-.0240113	.1062888
70-89 m2	.1060551	.0318403	3.33	0.001	.0436284	.1684818
90-119 m2	.1907199	.0324549	5.88	0.000	.127088	.2543517
120 -149 m2	.2797161	.0336765	8.31	0.000	.2136893	.345743
150- 199 m2	.4027037	.0358321	11.24	0.000	.3324504	.4729569
200 m2 of meer	.5516962	.0409115	13.49	0.000	.4714842	.6319082
prov						
friesland	.0045699	.0335509	0.14	0.892	-.0612106	.0703505
drenthe	-.0351519	.0334805	-1.05	0.294	-.1007945	.0304907
overijssel	.0872929	.0290567	3.00	0.003	.0303237	.1442621
flevoland	.0599223	.0336822	1.78	0.075	-.0061157	.1259603
gelderland	.1580985	.0291977	5.41	0.000	.1008528	.2153441
utrecht	.3476132	.0294431	11.81	0.000	.2898863	.40534
noord-holland	.3749215	.030811	12.17	0.000	.3145128	.4353301
zuid-holland	.2278238	.0288097	7.91	0.000	.1713389	.2843087
zeeland	.0355222	.0380025	0.93	0.350	-.0389864	.1100307
noord-brabant	.1746276	.0290981	6.00	0.000	.1175772	.2316781
limburg	-.0069732	.0312437	-0.22	0.823	-.0682304	.054284
_cons	10.44652	.1337418	78.11	0.000	10.1843	10.70873

D-3. Results model (3)

Linear regression

Number of obs	= 511
F(41, 469)	= 61.76
Prob > F	= 0.0000
R-squared	= 0.7853
Root MSE	= .19399

lnwozwaarde21	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
schenkhoev						
25.000 - 53.000 euro	.0593863	.021999	2.70	0.007	.0161576	.1026151
53.000 - 100.000 euro	.1122441	.0268909	4.17	0.000	.0594025	.1650857
100.000 euro of meer	.1761691	.0315221	5.59	0.000	.114227	.2381111
kamers	.0112363	.0072302	1.55	0.121	-.0029714	.0254439
lnmaand	.1751446	.0298914	5.86	0.000	.116407	.2338822
aantautohh	-.0192389	.0147358	-1.31	0.192	-.0481952	.0097175
sch_uit_r	2.67e-07	3.23e-08	8.27	0.000	2.03e-07	3.30e-07
hwmbrt						
buiten-centrum	-.07202	.0450491	-1.60	0.111	-.1605431	.0165031
groen-stedelijk	-.0755367	.0510818	-1.48	0.140	-.1759141	.0248408
centrum-dorps	-.1039465	.0498791	-2.08	0.038	-.2019606	-.0059324
landelijk wonen	-.0864204	.055959	-1.54	0.123	-.1963818	.023541

energieklasse						
B	-.0345234	.0360082	-0.96	0.338	-.1052807	.036234
C	-.0783094	.0254998	-3.07	0.002	-.1284173	-.0282014
D	-.0682023	.0285243	-2.39	0.017	-.1242535	-.012151
E	-.1062779	.0295188	-3.60	0.000	-.1642834	-.0482724
F	-.071036	.0336472	-2.11	0.035	-.137154	-.004918
G	-.1005665	.0459585	-2.19	0.029	-.1908765	-.0102564
inkmod5_r						
1 tot 1,5 keer modaal	-.0206711	.0415565	-0.50	0.619	-.1023311	.0609889
1,5 tot 2 keer modaal	.0648839	.0435143	1.49	0.137	-.0206232	.150391
2 tot 3 keer modaal	.1193488	.0422651	2.82	0.005	.0362965	.2024012
vanaf 3 keer modaal	.2280492	.0444654	5.13	0.000	.1406732	.3154251
aantkind4						
1 kind	.0047725	.0262461	0.18	0.856	-.046802	.056347
2 kinderen	.0994306	.0279816	3.55	0.000	.0444458	.1544155
3 of meer kinderen	.0351213	.0460995	0.76	0.447	-.0554658	.1257083
oppwon7						
50-69 m2	.1374205	.0595591	2.31	0.021	.0203848	.2544562
70-89 m2	.1834724	.0610979	3.00	0.003	.0634129	.3035318
90-119 m2	.2932137	.0640319	4.58	0.000	.1673887	.4190386
120 -149 m2	.3831809	.0690026	5.55	0.000	.2475883	.5187734
150- 199 m2	.5978186	.0730984	8.18	0.000	.4541778	.7414594
200 m2 of meer	.7026862	.0921393	7.63	0.000	.5216292	.8837432
prov						
friesland	.1181428	.1035382	1.14	0.254	-.0853133	.321599
drenthe	.0184449	.0958798	0.19	0.848	-.1699623	.206852
overijssel	.1606582	.0790222	2.03	0.043	.0053769	.3159396
flevoland	.2607552	.0884509	2.95	0.003	.0869462	.4345642
gelderland	.1874531	.0779169	2.41	0.017	.0343437	.3405625
utrecht	.4139263	.0745439	5.55	0.000	.2674449	.5604076
noord-holland	.5621758	.0797439	7.05	0.000	.4054763	.7188754
zuid-holland	.3600706	.0763251	4.72	0.000	.2100891	.510052
zeeland	.0455161	.0941028	0.48	0.629	-.1393992	.2304313
noord-brabant	.2830871	.0754781	3.75	0.000	.13477	.4314041
limburg	.0300507	.0944115	0.32	0.750	-.1554712	.2155726
_cons	10.68199	.2017316	52.95	0.000	10.28558	11.0784

D-4. Results model (4)

Linear regression

Number of obs	511
F(29, 481)	56.36
Prob > F	0.0000
R-squared	0.7391
Root MSE	.21118

lnwozwaarde21	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
schenkhoev						
25.000 - 53.000 euro	.0930912	.023425	3.97	0.000	.0470632	.1391192
53.000 - 100.000 euro	.1134297	.0284906	3.98	0.000	.0574482	.1694112
100.000 euro of meer	.19084	.0330124	5.78	0.000	.1259735	.2557064
kamers	.0181732	.008274	2.20	0.029	.0019156	.0344308
lnmaand	.2313814	.0331813	6.97	0.000	.1661832	.2965796
sch_uit_r	3.01e-07	4.10e-08	7.33	0.000	2.20e-07	3.82e-07
energieklasse						
B	-.0255428	.0394364	-0.65	0.517	-.1030316	.0519461
C	-.0945133	.0275654	-3.43	0.001	-.1486767	-.0403499
D	-.0727766	.0303314	-2.40	0.017	-.132375	-.0131782
E	-.0981019	.0331555	-2.96	0.003	-.1632495	-.0329544
F	-.08142	.0350123	-2.33	0.020	-.150216	-.012624
G	-.1050404	.0499427	-2.10	0.036	-.2031732	-.0069076
oppwon7						
50-69 m2	.1756126	.0613285	2.86	0.004	.0551077	.2961174
70-89 m2	.2128059	.0603783	3.52	0.000	.094168	.3314438
90-119 m2	.3536758	.0635932	5.56	0.000	.2287209	.4786306
120 -149 m2	.4523473	.0684549	6.61	0.000	.3178397	.5868548
150- 199 m2	.6753567	.0743447	9.08	0.000	.5292762	.8214373
200 m2 of meer	.7878873	.0911252	8.65	0.000	.6088347	.9669399
prov						
friesland	.0490559	.1094002	0.45	0.654	-.1659056	.2640173
drenthe	-.0450158	.0987183	-0.46	0.649	-.2389883	.1489567
overijssel	.0663744	.0869678	0.76	0.446	-.1045093	.237258
flevoland	.1622063	.0936116	1.73	0.084	-.0217318	.3461445
gelderland	.0952757	.0874997	1.09	0.277	-.0766531	.2672046
utrecht	.385053	.0834579	4.61	0.000	.2210658	.5490401
noord-holland	.5279644	.0903515	5.84	0.000	.3504319	.7054969
zuid-holland	.3202207	.0856311	3.74	0.000	.1519633	.488478
zeeland	-.0607438	.101771	-0.60	0.551	-.2607145	.1392269
noord-brabant	.1920453	.0840629	2.28	0.023	.0268695	.3572212
limburg	-.0549624	.1038812	-0.53	0.597	-.2590794	.1491545
_cons	10.28602	.2148388	47.88	0.000	9.863883	10.70816

Appendix E : STATA DO-FILE

```
*STATA do-file final Master Thesis S5138701 Viënna van Holsteijn Jubelton

*working directory and import sav

 cd "/Users/viennavanholsteijn/Documents/Master Thesis Real Estate Studies/1678799752308-Woononderzoek_Nederland_2"

 log using MT_RES_Jubelton.log, replace

import spss "WoON2021_e_1.0.sav", clear

*872 variables, 46,658 observations

*DV: wozwaarde or wozvalue2021

*main IV: i.binary_jubelton (4,420 observations) (8.2) & i.categorical_jubelton (681 observations)

*Potential Control Variables (on households level) cars (number of cars), aantbromhh (number of motors), i.children (number of children), i.zonpaneeng (dummy solar penals), i.bjaarbag (building year), i.bouwlaag (building floor), i.energylabel (energylabel), i.environment (living environment and current living place), i.i_lfthkw7_r (age person main source of income), i.income (income times modal), i.inttoe (lving room, kitchen, sanitair, bedroom, yes/no), rooms (number of rooms), i.lift (lift yes/no), monthlypayment (mortgage costs per month), i.sqm (living space), percwelvaart (1-100 percentage welfare), i.prov (province), i.rijbewijshh (household has driving license), debt (debt per household)

*Final CV (due to testing adjusted R-squared, significance, tabulate and so on (you could find this underneath as well)): cars i.children i.energylabel i.environment i.income rooms lnmonthly payment i.sqm i.prov debt

*Not CV: education level (education is not on household level), ppadres (persons per adress, only 1,495 observations), i.srtwonandrs (sort living, too much relatble to i.environment), aantzonpan (too little observations (993) and zonpaneeng is better (yes/no)) bobnan (only 2,312 observations)

*used tabulate to see the variables independently and also cor to see the correlation between possible control variables

*LN wozvalue2021

hist wozvalue2021

g lnwozvalue21 = ln(wozvalue2021)

hist lnwozvalue21

*LN Monthly_payment

Hist monthlypayment

g lnmonthlypayment = ln(monthlypayment)

hist lnmonthlypayment

*Data cleaning

drop if binary_jubelton ==.
```

*42,238 observations deleted

drop if wozvalue2021==.

*0 observations deleted

*drop unnecessary variables

drop inttoe aantrijbewijshh wozwaarde aantbromhh bjaarbag rijbewijshh i_lfthkw7_r percwelvaart zonpaneeng respnr weegpers hweegwon gweegwon weega_u weegv_u weega_m weegv_m weega_t weegv_t sample stratum eighuura eighuurb eighuurc gratis typhrcontr hropzeg mrhhipd hhadres ppadres hhverhur hhvhkam hhonderh jrgekocht bestndwon prtopdr1 benbuur srtwon srtapp bobnan msapfl srtwonandrs typwon srtflat bouwlaag lift exttoe aanttrap aantalwon_n ongaantalwon_n alleenkoop alleenhuur aanthuurkoop vveactief srtactvve1 srtactvve2 srtactvve3 srtactvve4 srtactvve5 srtactvve6 huurvve vveperbijdr vvepbong vvewelkkosten1 vvewelkkosten2 vvewelkkosten3 vvewelkkosten4 vvewelkkosten5 vvewelkkosten6 vvewelkkosten7 percgrondh belangenerg balktuin1 balktuin2 balktuin3 balktuin4 balktuin5 balktuin6 garcarp parkeer keukeniw badiw toiletiw opphfdwv opphfdw2 woonvrd vhcap srtvrz1 srtvrz2 srtvrz3 srtvrz4 srtvrz5 srtvrz6 srtvrz7 vrznodig oudwon oudvwd1 oudvwd2 oudvwd3 bejwlos aantlos srtbejwon bjarhs gebrdi1 gebrdi2 gebrdi3 gebrdi4 gebrdi5 gebrdi6 gebrdi7 gebrdi8 wieverh servkost sk_bedrag sk_soort1 sk_soort2 sk_soort3 sk_soort4 sk_soort5 sk_soort6 sk_soort7 sk_soort8 sk_soort9 huurenerg aankprs famlen hypwon wanhypafg nhg_n shv_linan shv_spaarbeleg shv_aflosvrij spaarbeleg inlegspbel opbvermnu_n afloseind_n restschuld extraaflos hoevexaf schenkaf redenaf verkwaar kwheff verwwon1 verwwon2 verwwon3 verwwon4 verwwon5 verwwon6 verwwon7 verwwon8 verwwater1 verwwater2 verwwater3 verwwater4 verwwater5 verwwater6 verwwater7 verwwater8 verwwater9 typcolwarm kostcolw kostcolwong ngeiser afvbuit invbuit nafvbuit ninvbuit haard typhaard1 typhaard2 typhaard3 typhaard4 typhaard5 typhaard6 freqhout kosthout kosthoutong zonpanmeerg stroomzonpan m2zonpan aantzonpan ventilatie rookkool rookkoolver_n huurinst1 huurinst2 huurinst3 huurinst4 huurinst5 huurinst6 huurinst7 huurinst8 huurinst9 huurinst10 huurinst11 huurinst12 huurinst13 kosthuurinst kosthuurinstong isolatie1 isolatie2 isolatie3 isolatie4 isonabouw1 isonabouw2 isonabouw3 isonabouw4 typgeveliso1 typgeveliso2 typgeveliso3 typgeveliso4 typglaswoonk typglasslaapk bezeauto thuislad hoevkilom deelthuislad enerzmaat1 enerzmaat2 enerzmaat3 enerzmaat4 enerzmaat5 enerzmaat6 enerzmaat7 redgeenem1 redgeenem2 redgeenem3 redgeenem4 redgeenem5 redgeenem6 redgeenem7 redgeenem8 redgeenem9 belangener betvve betzelf1 betzelf2 betzelf3 betzelf4 betzelf5 betzelf6 investenerg investzelf investvve ondhbuit1 ondhbuit2 ondhbuit3 ondhbuit4 ondhbuit5 ondhbuit6 ondhbuit7 ondhbin1 ondhbin2 ondhbin3 ondhbin4 ondhbin5 ondhbin6 epv kostepv kostepvong huurhoger twoning warm tocht schimmel sruimte1 sruimte2 sruimte3 sruimte4 sruimte5 sruimte6 sruimte7 sruimte8 sruimte9 shoeveel1 shoeveel2 shoeveel3 shoeveel4 shoeveel5 shoeveel6 shoeveel7 shoeveel8 soorzaak1 soorzaak2 soorzaak3 soorzaak4 soorzaak5 soorzaak6 smeldverh sredmrmeld1 sredmrmeld2 sredmrmeld3 sactieverh snietoplos tindelin tteklein ttegroot tonderho sfeer onvbuit twoonomg tbebouw tonderhbrt tvervele brtvhmog tgehecht brtthuis brtbewverh conbuur1 conbuur2 leefbarh brtpret gezelbuurt mensken tbevsams brtveilig jrkomwon mndkomwon voor2019 zelfdehh samhhvv op_hhk bleefacht bewukeus1 bewukeus2 bewukeus3 bewukeus4 vagvv wnpagvv vorbuurt1 vorbuurt2 redenhuur1 redenhuur2 redenhuur3 redenhuur4 redenhuur5 redenhuur6 redenhuur7 redfinnm1 redfinnm2 redfinnm3 redfinnm4 redfinnm5 redenkoop1 redenkoop2 redenkoop3 redenkoop4 redenkoop5 redenkoop6 redenkoop7 jaar maand inschrsoc jaar2 maand2 weig insochw inparhw redverh1 redenvh1 redenvh2 redenvh3 redenvh4 redenvh5 redenvh6 redenvh7 redenvh8 belangrdvh werknv finanvh woningnv omgevingvh1 omgevingvh2 omgevingvh3 omgevingvh4 omgevingvh5 omgevingvh6 omgevingvh7 omgevingvh8 ouderwvh1 ouderwvh2 ouderwvh3 ouderwvh4 ouderwvh5 ouderwvh6 ouderwvh7 ouderwvh8 veighuura veighuurb veighuurc vbenbuur vsrtwon vsrtapp vsrtwonandrs vtypwon vsrtflat vlift vexttoe vrooms vglkvls vbjaar vwieverh vhuurmnd_n vbeschik5_n vortekoop vverkocht_n beklabel_n labopstl geenlab vkoop aankprsv jrwoonv verhwens rednietvha1 rednietvha2 rednietvha3 rednietvha4 rednietvha5 rednietvha6 rednietvha7 rednietvhb1 rednietvhb2 rednietvhb3 rednietvhb4 rednietvhb5 rednietvhb6 rednietvhb7 rednietvhb8 inschrsochr jaar3 maand3 gedwverh termynmv samhhnv ggroothh toekhh optoekhh relatoek blijfacht ttekenc intrek tnedbl tpersoms tnest tredenvh1 tredenvh2 tredenvh3 tredenvh4 tredenvh5 tredenvh6 tredenvh7 tredenvh8 tbelangrdvh twerkvh tfinanvh twoningvh rednblyf tomgevingvh1 tomgevingvh2 tomgevingvh3 tomgevingvh4 tomgevingvh5 tomgevingvh6 tomgevingvh7 tomgevingvh8 tomgevingvh9 tomgevingvh10 tomgevingvh11 tomgevingvh12 tomgevingvh13 tomgevingvh14 gsrtwon gsrtwonandrs gwontyp goudwon gbejwlos goudwzlf kanantw gtuin_n gkamer_n gverdbeggr_n gperlift_n gbztrap_n ginttoe_n huurkoop_n hrkpvrk_n aftrek_n eigengld_n invest_n gkoop_n koopenerg_n gwoonuit_n hynetbru_n ghuur_n gihs_n huprklas_n gprior1_n gprior2_n gnieuw_n partopdr1_n archcat_n partopdr2_n gwaarwil_n gwaargev_n gprov_v_n ggrootpl_n2 gzkreigbrt_n gmiseigbrt_n alterbrt_n aanpwens_n awprijs_n awgroot_n gnwbwb_n gnwbwa_n glig_n gperbuurt_n gbrttypw_n srtbrt1_n srtbrt2_n srtbrt3_n srtbrt4_n srtbrt5_n srtbrt6_n srtbrt7_n srtbrt8_n srtbrt9_n afsboods_n afsschl_n afswinkl_n afsstad_n verhact zoekhrj jaar4 maand4 actiea1 actiea2 actiea3 actiea4 actiea5 actieb1 actieb2 actieb3 actieb4 actieb5 actieoverig1 actieoverig2 actieoverig3 actieoverig4 actieoverig5 actieoverig6 actieoverig7 niksgevnd1 niksgevnd2 niksgevnd3 niksgevnd4 niksgevnd5 niksgevnd6 niksgevnd7 niksgevnd8 bniksgevnd acpas tbeschik nuinschr jaar5 maand5 gezond langda belemact08 ktraplp kloopstp lphlpop1 lphlpop2 lphlpop3 lphlpop4 lphlpop5 lphlpop6 lphlpop7 lphlpop8 rolop langda_pa belemact08_pa pktraplp pkloopst lphlppa1 lphlppa2 lphlppa3 lphlppa4 lphlppa5 lphlppa6 lphlppa7 lphlppa8 rolpa leven ldl corop g4_2 g40_2 g4_3 wmabf31 wmregio vleugel stedgem stedbuurt arbmarktregio engtrsregio gemgrot7 aantalpp5 plhhop respkern partner kind aantover4 hhkern leeftijd lftpa7 lfthh3 lfthh7 lftjknd8 lftjknd6 lftjknd4 lftoknd8 lftoknd6 lftoknd4 samhh8 samhh5 hht hhtype8 gblop3 gblpa3 etniop3 etnipa3 etniop etnigop etnipa etnigpa oplnivact5kl oplnivact3kl oplnivhb5kl oplnivhb3kl oplnivact5kl_pa oplnivact3kl_pa oplnivhb5kl_pa oplnivhb3kl_pa o_bron o_bron_pa hvs huko h_woon bhvorm vorm vormbj woontype vormkam vormeig hoog won4 type31 kamer5 ruimte ruimte2 gebruiksopp oppkam7 bjaark8 huurpnt_imp wozwr7 aankp7 verkp7 tekoop aantalmndtekoop4 vraagprijs7 bjaantv nultr3_n nultr_n bjw6 nieuwb verhuisd vhmotief vhvs vhuko vvorm vvormkam vvormbj vbjaark vprov vgem vcorop vwmhand vvragsd verh gvhmotief ghvs ghuko gwmhand actie urggraad gvrag gvragsd wonvrag gvorm gvormkam_n gvormeig ghoog_n gkamer5_n gtoeg_n invest2 ggem gwmbrt gcorop h_bron khuur bhuurii_rn nhuur_rn maxhuur typeihs_rn vkhuur vbhuurii vnhuur vtypeihs gtypeihs hyp_r bkoopw_rn nkoopw_rn totwlw_rn ihsgrens elecv elecbm e_bron gasv gasbm g_bron waterv waterbm rioolm afvalm omshefm ingomsm verontm servkostbed s_bron sub_servkosten ozbm opstal bijk_r totgem totws_rn totener totopl_rn totbij_rn reservpost_rn vveperbijdr_mnd brutohh_r blibhh_t_r blibhht_iv_rn blibhh_iah_rn blibhh_t_zk_rn blibhh_r blibhh2_r blibhh3_r vromhh_r bestinkh_r pkalfthkw_r bbihj_r bronhkw_r bronpar_r fisco_r ihsmndbd2_r ihs_r aght agiah agtsh normni90_r grathuur nrquotn_rn nrq997_rn nkquotnw_rn nkqw997_rn nwqw_rn nwqw997_rn scheefgd_rn bankteg_r obl_aan_r tbezith_r vermogh_r w1210shyh vzafstandapotheek vzafstandhartspr vzaanthartspr01km vzaanthartspr03km vzaanthartspr05km vzafstandhartspost vzafstandziekhinclbp vzaantziekhinclbp05km vzaantziekhinclbp10km vzaantziekhinclbp20km vzafstandziekhexclbp vzaantziekhexclbp05km

vzaantziekhexclbp10km vzaantziekhexclbp20km vzafstandbrandweerk vzafstandovdaglev vzaantovdaglev01km vzaantovdaglev03km vzaantovdaglev05km vzafstandgrsuperm vzaantgrsuperm01km vzaantgrsuperm03km vzaantgrsuperm05km vzafstandbasisond vzaantbasisond01km vzaantbasisond03km vzaantbasisond05km vzafstandkdv vzaantkdv01km vzaantkdv03km vzaantkdv05km vzafstandhotel vzaanthotel20km vzafstandrestau vzaantrestau01km vzaantrestau03km vzaantrestau05km vzafstandcafe vzaantcafe01km vzaantcafe03km vzaantcafe05km vzafstandoverstapst vzafstandoprith vzafstandtreinst vzafstandbiblio vzafstandmuseum vzaantmuseum05km vzaantmuseum10km vzaantmuseum20km vzafstandbioscoop vzaantbioscoop05km vzaantbioscoop10km vzaantbioscoop20km autohh brommerhh aantrijbewijshh cohesie lbm2014 lbm2018 lbm2020 lbm_fys14 lbm_fys18 lbm_fys20 lbm_onv14 lbm_onv18 lbm_onv20 lbm_soc14 lbm_soc18 lbm_soc20 lbm_vrz14 lbm_vrz18 lbm_vrz20 lbm_won14 lbm_won18 lbm_won20

*delete if observations not complete

global z "rooms binary_jubelton monthlypayment prov environment children sqm wozvalue2021 income debt energylabel cars lnwozvalue21"

foreach e in $z {

drop if `e'==.

}

*3,649 observations left

*categorical_jubelton: 511 observations

*This is all done before the exact model was chosen:

*Try regression with lnaankprs

****

*reg lnaankprs i.binary_jubelton cars aantbromhh i.children i.zonpaneeng i.bjaarbag i.bobnan i.bouwlaag i.energylabel i.environment i.i_lfthkw7_r i.income i.inttoe rooms i.lift monthlypayment i.sqm percwelvaart i.prov i.rijbewijshh debt

*no observations = too many CV with too little observations all together

*tabulate bobnan = only 2,312 observations, is if they have neighbors. Remove from regression. Also bouwlaag only 12,611 variables and not very interesting = removed. Tabulate lift = only 12,316 also will be removed because not too necessary.

****

*reg lnaankprs i.binary_jubelton cars aantbromhh i.children i.zonpaneeng i.bjaarbag i.energylabel i.environment i.i_lfthkw7_r i.income i.inttoe rooms monthlypayment i.sqm percwelvaart i.prov i.rijbewijshh debt

*3,038 osbervations Adjusted R-squared = 0.5707

*remove: monthlypayment

****

*reg lnaankprs i.binary_jubelton cars aantbromhh i.children i.zonpaneeng i.bjaarbag i.energylabel i.environment i.i_lfthkw7_r i.income i.inttoe rooms i.sqm percwelvaart i.prov i.rijbewijshh debt

*3,233 observations, adjusted R-squared = 0.4978

*Way higher adjusted R-squared with 'monthlypayment' so keep it.

*regression 'categorical_jubelton'

****

*reg lnaankprs i.categorical_jubelton cars aantbromhh i.children i.zonpaneeng i.bjaar bag i.energylabel i.environment i.i_lfthkw7_r i.income i.inttoe rooms monthlypayment i.sqm percwelvaart i.prov i.rijbewijshh debt

*356 observations and Adj R-Squared = 0,6651

*Try regression with lnwozwaarde

****

*reg lnwozwaarde i.binary_jubelton cars aantbromhh i.children i.zonpaneeng i.bjaarbag i.energylabel i.environment i.i_lfthkw7_r i.income i.inttoe rooms monthlypayment i.sqm percwelvaart i.prov i.rijbewijshh debt

*also 3,038 observations but higher adj R-squared = 0,7446

*reg 'categorical_jubelton'

****

*reg lnwozwaarde i.categorical_jubelton cars aantbromhh i.children i.zonpaneeng i.bjaarbag i.energylabel i.environment i.i_lfthkw7_r i.income i.inttoe rooms monthlypayment i.sqm percwelvaart i.prov i.rijbewijshh debt

*356 observations and Adj R-squared = 0,8162

*Regression lnwozvalue21

****

*reg lnwozvalue21 i.binary_jubelton cars aantbromhh i.children i.zonpaneeng i.bjaarbag i.energylabel i.environment i.i_lfthkw7_r i.income i.inttoe rooms monthlypayment i.sqm percwelvaart i.prov i.rijbewijshh debt

*3,038 observations and adj R-squared = 0,7576

****

*reg lnwozvalue21 i.categorical_jubelton cars aantbromhh i.children i.zonpaneeng i.bjaarbag i.energylabel i.environment i.i_lfthkw7_r i.income i.inttoe rooms monthlypayment i.sqm percwelvaart i.prov i.rijbewijshh debt

*356 observations and adj. R-squared = 0,8278

*Regression try-outs with lnwozvalue21 and possible control variables

****

*reg lnwozvalue21 i.binary_jubelton cars aantbromhh i.children i.bjaarbag i.energylabel i.environment i.i_lfthkw7_r i.income i.inttoe rooms monthlypayment i.sqm percwelvaart i.prov i.rijbewijshh debt

*without solar panels because many observations are lost Adj R-squared = 0,7641, so remove i.zonpaneeng

****

*reg lnwozvalue21 i.binary_jubelton cars aantbromhh i.children i.bjaarbag i.environment i.i_lfthkw7_r i.income i.inttoe rooms monthlypayment i.sqm percwelvaart i.prov i.rijbewijshh debt

*without energy label, adj R-squared is lowered to 0,759 so keep energy label

****

*reg lnwozvalue21 i.binary_jubelton cars aantbromhh i.children i.bjaarbag i.energylabel i.environment i.i_lfthkw7_r i.income i.inttoe rooms i.sqm percwelvaart i.prov i.rijbewijshh debt

*remove monthlypayment, also lower adj R-squared of 0,7228, so keep monthlypayment

****

*reg lnwozvalue21 i.binary_jubelton i.children i.bjaarbag i.energylabel i.environment i.i_lfthkw7_r i.income i.inttoe rooms monthlypayment i.sqm percwelvaart i.prov i.rijbewijshh debt

*number of cars and motors have almost no impact

*Regression with VIF tryouts

*cor with the not dummy's of the regression --> see thesis.

****

*reg lnwozvalue21 i.binary_jubelton cars aantbromhh i.children i.bjaarbag i.energylabel i.environment i.i_lfthkw7_r i.income i.inttoe rooms monthlypayment i.sqm percwelvaart i.prov i.rijbewijshh debt

*vif

*VIF = 8.22 is higher than 5 and thus to high. variables should be removed for the multicolinearity issue

****

*reg lnwozvalue21 i.binary_jubelton cars aantbromhh i.children i.energylabel i.environment i.income i.inttoe rooms monthlypayment i.sqm i.prov i.rijbewijshh debt

*vif

*removed = age of household breadwinner = i_lfthw7_r

*Adjusted R-squared is 0,7321 and vif = 4.11

****

*reg lnwozvalue21 i.binary_jubelton cars aantbromhh i.children i.energylabel i.environment i.income i.inttoe rooms monthlypayment i.prov i.rijbewijshh debt

*vif

*removed is i_lfthw7_r and sqm (square meters of house)

*Ajdusted R-squared is 0,6898 and vif = 3.14

****

*reg lnwozvalue21 i.binary_jubelton cars aantbromhh i.children i.energylabel i.environment i.inttoe rooms monthlypayment i.sqm i.prov i.rijbewijshh debt

*removed is income and i_lfthkw7_r

*Adjusted r-squared is 0,7103 and vif = 3.89

*chose for the regression with the vif of 4.11, because adjusted R-squared is the highest and VIF is under 5 so is okay.

*Correlation matrix

****

*cor lnwozvalue21 binary_jubelton cars aantbromhh children energylabel environment income inttoe rooms monthlypayment sqm prov rijbewijshh debt

*INTERACTION

*Interaction variables check

****

*reg c.lnwozvalue21##c.monthlypayment i.binary_jubelton cars aantbromhh i.children##i.sqm rooms i.energylabel i.environment i.income i.inttoe i.prov i.rijbewijshh debt

*Adjusted R-squared of 0,8409 = higher, but VIF = 33,72, so too high

****

*reg c.lnwozvalue21##i.income monthlypayment i.binary_jubelton cars aantbromhh i.children##i.sqm rooms i.energylabel i.environment i.income i.inttoe i.prov i.rijbewijshh debt

*Adjusted R-squared is 0,9617 but VIF = 222, so too high

****

*reg c.lnwozvalue21##c.debt monthlypayment i.binary_jubelton cars aantbromhh i.children##i.sqm rooms i.energylabel i.environment i.income i.inttoe i.prov i.rijbewijshh i.income

* Adjusted R-squared = 0,7547 and VIF = 26,90 so too high

*Remove insignificant variables

****

*reg lnwozvalue21 i.binary_jubelton cars aantbromhh i.children i.energylabel i.environment i.income i.inttoe rooms monthlypayment i.sqm i.prov i.rijbewijshh debt

*vif

* Adjusted R-squared = 0,7321 and vif = 4,11

*inttoe and rijbewijshh are insignificant with t = -1.77 and t = -1.29

*remove inttoe and rijbewijshh in next regression

****

*reg lnwozvalue21 i.binary_jubelton cars aantbromhh i.children i.energylabel i.environment i.income rooms monthlypayment i.sqm i.prov debt

* Adjusted R-squared = 0.7319 and vif = 4,19

* now aantbromhh is insignificant so also removed

****

*reg lnwozvalue21 i.binary_jubelton cars i.children i.energylabel i.environment i.income rooms monthlypayment i.sqm i.prov debt

* Adjusted R-squared = 0,7320 and vif = 4,27

* Now every variable is significant

```
*Try other functional forms (^2 and ^3)

*g cars2 = cars*cars

 *reg lnwozvalue21 i.binary_jubelton cars cars2 i.children i.energylabel i.environment i.income rooms monthlypayment i.sqm i.prov debt

 *now cars and cars2 are not significant, so drop cars2

 *drop cars2

 *reg lnwozvalue21 i.binary_jubelton cars i.children i.energylabel i.environment i.income rooms monthlypayment i.sqm i.prov debt

 *g children2 = children*children

 *reg lnwozvalue21 i.binary_jubelton cars i.children i.children2 i.energylabel i.environment i.income rooms monthlypayment i.sqm i.prov debt

 *vif

 *children2 is ommited, so drop children2

 *drop children2

 *reg lnwozvalue21 i.binary_jubelton cars i.children i.energylabel i.environment i.income rooms monthlypayment i.sqm i.prov debt

*g energylabel2 = energylabel*energylabel

 *reg lnwozvalue21 i.binary_jubelton cars i.children i.energylabel i.energylabel2 i.environment i.income rooms monthlypayment i.sqm i.prov debt

 *vif

 *energylabel2 = ommited, so drop

 *drop energylabel2

 *g environment2 = environment*environment

 *reg lnwozvalue21 i.binary_jubelton cars i.children i.energylabel i.environment i.environment2 i.income rooms monthlypayment i.sqm i.prov debt

 *vif

 *environment2 is ommited, so drop

 *drop environment2

 *g income2 = income*income

 *reg lnwozvalue21 i.binary_jubelton cars i.children i.energylabel i.environment i.income i.income2 rooms monthlypayment i.sqm i.prov debt

 *vif

 *income2 is ommited, so drop

 *drop income2

 *g rooms2 = rooms*rooms

 *reg lnwozvalue21 i.binary_jubelton cars i.children i.energylabel i.environment i.income rooms rooms2 monthlypayment i.sqm i.prov debt
```

*vif

*both rooms and rooms2 are significant, but vif is now above 5 (5,49), so not keep rooms2

*drop rooms2

*monthlypayment is already in logarithmic form, so not necessary to try the squared form of the variable monthlypayment

*g sqm2 = sqm*sqm

*reg lnwozvalue21 i.binary_jubelton cars i.children i.energylabel i.environment i.income rooms monthlypayment monthlypayment2 i.sqm i.sqm2 i.prov debt

*vif

*sqm2 = ommited so drop variable

*drop sqm2

*g prov2 = prov*prov

*reg lnwozvalue21 i.binary_jubelton cars i.children i.energylabel i.environment i.income rooms monthlypayment monthlypayment2 i.sqm i.prov i.prov2 debt

*vif

*prov2 = ommited, drop prov2

*drop prov2

*g debt2 = debt*debt

*reg lnwozvalue21 i.binary_jubelton cars i.children i.energylabel i.environment i.income rooms monthlypayment monthlypayment2 i.sqm i.prov debt debt2

*vif

*debt2 t= -2.33 is not significant, so drop debt2

*drop debt2

*so final regression:

reg lnwozvalue21 ib2.binary_jubelton cars i.children i.energylabel i.environment i.income rooms lnmonthlypayment i.sqm i.prov debt, robust

vif

*adjusted R-squared = 0.7272 and vif = 4.27

*Model (03) first regression

reg lnwozvalue21 i.categorical_jubelton rooms lnmonthlypayment cars debt environment energylabel income children sqm province, robust

vif

*Model (04) final regression

reg lnwozvalue21 i.categorical_jubelton rooms lnmonthlypayment debt energylabel sqm province, robust

vif

*check 5 OLS assumptions

*ass 1: Linearity and Functional Form. Error term has mean of 0.

*there is a constant, so is met

*Is already tested with changing wozvalue21 to lnwozvalue21 and lnmonthlypayment

*ass 2: Independence of Errors

predict e, res

twoway scatter e binary_jubelton

twoway scatter e wozvalue2021

twoway scatter e lnwozvalue21

*no pattern can be found, so ass 2 is met

*ass 3: Homoscedasticity

estat hettest

*Chi.2(1) = 23.18, this suggests evidence of heteroscedasticity, indicating that the assumption of constant variance in the error terms is violated.

estat imtest

*heteroscedasticity, skewness and kurtosis are all found. so assumption 3 is not met.

*so use, robust in the regression analysis to met assumption 3

*new regression:

reg lnwozvalue21 i.binary_jubelton cars i.children i.energylabel i.environment i.income rooms lnmonthlypayment i.sqm i.prov debt, robust

*R-squared = 0.7272 and vif = 4.27

*ass 4: Normality of Residuals:

*Histogram and normal probability plot: Generate residuals using predict e, residuals, then create a histogram and normal probability plot using histogram and qnorm commands, respectively.

hist e

qnorm e

*residuals look very normally distributed, so assumption 4 is met

swilk e

*using the Shapiro-Wilk W test, the assumption is violated with W = 0.97539 and Prob>z = 0.00000, however N schould be between 4 and 2000 for the Shapiro-Wilk W test to be reliable, and #observations = 3,649. Due to the histogram and qnorm seeming to be normally distributed, assumption 4 will be seen as met.

```
*ass 5: Multicollinearity:

*we have already used vif multiple times in tested regression models and vif is with the final model 4.64 which is underneath 5 and shows an accepted vif.

correlate lnwozvalue21 binary_jubelton cars children energylabel environment income rooms monthlypayment monthlypayment2 sqm debt

*already tested this and added interaction variables, but has not found any significant interaction variables so keep the model as it is.

*also VIF is okay, so assumption 5 is met

*END

log close;

exit;
```