**Erasmus University Rotterdam**

Erasmus School of Economics

Master Thesis [Behavioural Economics]

The Extent of Rationality in Consumers' Choices and Behaviour in the Housing Sector and Mortgage Market

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Abstract

In this paper the Critical Cost Efficiency Index scores of individuals are compared with their behaviour and choices in the housing sector and mortgage market. The created dataset allows for a combination of laboratory and real word data. Consumers' choices and behaviour in the housing sector and mortgage market cannot significantly be explained by rationality. Nevertheless, some individual characteristics and the average national mortgage interest rate seem to have an influence on consumers' choices and behaviour. The tested models indicate that a larger dataset might improve the results.

JEL-Classification: D12, D14, D84, D91, G21, G41

Keywords: Critical Cost Efficiency Index, financial behaviour, choices, mortgages, housing sector

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Chapter 1: Introduction

These days, house prices in Amsterdam seem to increase by the minute and in the rest of the Netherlands house prices are also increasing rapidly. This trend is not only confined to the Dutch housing sector: cities all over the world experience rapidly increasing house prices. This global trend could be explained by the increase of house price synchronization between countries and cities due to their exposure to global financial conditions. This synchronization of house prices can be seen on both advanced and emerging market economies and was detected in 40 countries and 44 major cities (International Monetary Fund [IMF], 2018). Even so, in cities like London, Stockholm and Sydney house prices are beginning to stagnate or even decline. Consequently, in the near future, this could be an indication of a shift in house prices on the Dutch market. As a result of the stagnating prices in the aforementioned cities, global investors might decrease their investments in the global housing sector due to increased risk (RaboResearch, 2018a).

Meanwhile, the Netherlands are experiencing historically low interest rates on mortgages, due to the low European Central Bank (ECB) interest rate. Accompanied by low interest rates on bank savings and the increasing housing prices buying a house could be seen as a profitable investment for Dutch citizens as opposed to renting a house. However, the Governing Council of the ECB recently announced that it will start phasing down the crisis policies of the past few years, ending the net purchases under the asset purchase programme at the start of 2019. At least until the end of the summer of 2019, the Council intends to keep the ECB interest rate unchanged (ECB, 2018). Even so, in a year the ECB interest rate and subsequently the mortgage interest rate might gradually increase, whilst prices in the housing sector might stagnate. In addition, spillovers in the housing sector may play a prominent role in a future crisis (IMF, 2018).

Recently, the Netherlands Bureau for Economic Policy Analysis (CPB) announced that the situation in the Dutch housing sector is "*characteristic for a period of non-problematic overheating*". The real prices of houses are still 13 per cent lower than at the start of 2008. However, the nominal house prices in the Netherlands have just reached the 2008 level. This high nominal level of house prices could be explained by the low interest rates and the shortage of new build houses. Although the CPB claims that a bubble on the housing sector does not exist at this moment, they acknowledge that most instruments used to

measure the existence of a bubble can only be used after the event. They also acknowledge that a housing sector bubble could happen in the near future (CPB, 2018).

Finally, the expected growth rate of the Dutch gross domestic product (GDP) is slowly decreasing. This is caused by the growing tensions within the European Union (EU), resulting from the migration crisis in Europe. In addition, the ongoing negotiations between the EU and the United Kingdom about Brexit and the trade tensions between the United States and the EU and China are slowing down the Dutch GDP (RaboResearch, 2018b)

With the next financial crisis waiting anxiously around the corner and consumers being able to receive mortgages for relatively low interest rates while buying relatively expensive houses, a collapse of consumers' purchase power will be inevitable. Under these circumstances, it is important to learn how consumers behave on the mortgage market. Since the previous crisis a lot of research has been done on the housing sector and its consumers. However, to the best of my knowledge there has not yet been research done to link the level of rationality of individuals to their behaviour in the housing sector. Therefore, in this paper I will test whether consumers' choices and behaviour in the housing sector and mortgage market could be explained by rationality. In this paper rationality will be defined as the behaviour of consumers that is consistent with maximising utility.

Chapter 2: Literature Review

Before analysing the literature on rationality in the housing sector and introducing the hypotheses, the concept of utility maximisation will be briefly explained. Then the development of the measurements of rationality will be discussed to give some insights into the reasons for the chosen definition of rationality. This is followed by an examination of some of the criticisms of measuring rationality through utility maximisation and of the use of the critical cost efficiency index. This section will be concluded with a review of the literature on consumers' behaviour in the mortgage market.

2.1. Utility maximisation

In order to understand what causes an individual's behaviour to be rational, one should be familiar with the concept of utility. In economics utility is the level of welfare an individual receives from consuming a certain number of goods. A utility function reflects the different preferences of a certain bundle of goods while being subject to a budget constraint. The discussed utility function in this paper is assumed to satisfy the following properties: non-satiation, monotonicity, concavity and continuity.

Non-satiation means that there will always be a bundle of goods that the consumer will prefer over another bundle of goods. Monotonicity means that, all else being equal, having more of one good will always result in a higher utility (strong monotonicity) or at least not in a lower utility (weak monotonicity). A continuous utility function means that a sufficiently small change in the bundle of goods causes an arbitrarily small change in utility. A utility function has a concave form which reflects the diminishing marginal rates of substitution. Utility functions could have different shapes, but these are not relevant within the context of this paper.

2.2 Rationality

The Dutch mortgage market is quite complex for measuring the rationality of consumers' behaviour. Within the mortgage market there are many active mortgage providers and consumers can choose from different types of mortgages. For example, a consumer can choose between mortgages with monthly amortisations, aside from the paid interest, and mortgages where the consumer does not pay amortisations until the end term of the mortgage or when the consumer sells the house. In addition, mortgage providers use different

guidelines to decide the maximum mortgage a consumer could receive. Under these circumstances it might be difficult for consumers to compare the available mortgages.

When a market is in equilibrium all the information that consumers and firms need is captured in the prices of the goods in that market. In earlier classical microeconomic models the above described problem would be defined as one where information for consumers is costly and firms decide on their own prices. An equilibrium with these dispersed prices (mortgage providers decide on their own prices based on their guidelines) could still be possible with identical and rational consumers on the demand side and firms on the supply side (Burdett & Judd, 1983). However, consumers are not identical and do not necessarily behave rationally. Consequently, the early microeconomic models are not appropriate for testing rationality in the housing sector. With the preference-based approach and choice-based approach (described below) economists are able to not only assume rationality of consumers, but are also able to measure rationality.

2.2.1 The preference-based approach

The preference-based approach originates from the theory of revealed preferences. In the theory of revealed preferences the rationality of a consumer depends on the preference of a certain bundle of goods. This preference is based on the costs of the goods at different price levels. In order to maximize utility consumers would clearly prefer a certain bundle of goods to another bundle of goods (Samuelson, 1938). Later the theory of revealed preferences has been evolved to model individual choice behaviour.

According to the preference-based approach the preference relation $(\succsim)$[1] is rational when it has the properties of completeness and transitivity[2] (Mas-Collell et al., 1995). However, in the aforementioned mortgage market these properties are difficult to hold. For example, the property of completeness could be violated, since consumers are unlikely to be familiar with all the different mortgage packages the mortgage providers offer. This causes consumers to be unable to correctly state their preference of one mortgage package over another mortgage package. Also, the property of transitivity could be violated, since consumers might wrongly rank the different mortgage packages. This could be caused by an incomplete comprehension of the distinctions between the different mortgage packages.

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[1] The preference relation consists of the strict preference ration ($x \succ y \Leftrightarrow x \succsim y$ but not $y \succsim x$) and the indifference relation ($x \sim y \Leftrightarrow x \succsim y$ and $y \succsim x$) (Mas-Collell et al., 1995).
[2] Completeness can be defined as for al x and y, we have either x≥y, y≥x or both. Transitivity can be defined as for all x, y and z we have if x≥y and y≥z then x≥z.

In conclusion, the preference-based approach might not be the best way to measure utility maximisation and rationality on the mortgage market, since it is difficult for consumers to correctly state their preferences. The choice-based approach has better futures to measure the rationality of consumers on the discussed market.

2.2.2 The choice-based approach

The choice-based approach also originates from the theory of revealed preferences. Instead of being based on assumptions of unobservable preferences, the choice-based approach assumptions are based on directly observable choice behaviour. Furthermore, it enables economists to construct more general forms of individual behaviour as opposed to the preference-based approach (Mas-Collell et al., 1995). Afriat (1967) showed how utility functions from expenditure data could be constructed using the revealed preference theory. This way utility maximisation can be derived from a finite number of individual's choices, overcoming the violation of the property of completeness.

For the choice-based approach the weak axiom of revealed preference (WARP) is an important assumption. The WARP could be defined by: *"If x is revealed at least as good as y, then y cannot be revealed preferred to x"* (Mas-Collell et al., 1995). It continues from the third postulate of Samuelson's (1938) revealed preference theory. Namely the consistency if a consumer prefers a certain price and quantity at a certain income level the consumer could never prefer another combination at the same time.

The introduction of demand behaviour in WARP that, with a nonparametric approach, new price configurations could be anticipated has led to the assumption of the general axiom of revealed preferences (GARP). GARP is a sufficient and necessary condition to measure utility maximisation and to recover the underlying preferences in a variety of formats. With the use of GARP there are no ad hoc specifications needed for the functional forms of the demand functions (Varian, 1982). Nevertheless, GARP is still an exact test of utility maximisation and it does not leave room for individual error. This causes consumers to be either rational or irrational depending on whether they violate the assumption of GARP. Furthermore, the property of transitivity can still not be guaranteed on the aforementioned mortgage market.

In order to overcome these issues the critical cost efficiency index (CCEI) can be used as a measure of the rationality of consumers. The CCEI measures "the fraction by which all budget constraints must be shifted in order to remove all violations of GARP" (Choi et al.,

2014). The CCEI originates from the cost-efficacy and cost-efficiency ratios. The cost-efficacy ratio "expresses the actual output as a fraction of the maximum output attainable for the actual input cost". The cost-efficiency ratio "expresses the minimum input cost with which the actual output is attainable, as a fraction of actual input costs" (Afriat, 1972). The CCEI is a number between one and zero and the closer a person's score is to one, the less improvements his/her budget line requires in order to remove all violations of GARP and the closer his/her data is to satisfying GARP (Choi et al., 2014).

Given that the CCEI provides an individual with a rationality score, it is not necessary to directly test choice data for utility maximisation on the mortgage market. This makes it possible to use the CCEI scores of consumers and link these results to the behaviour of these consumers elsewhere, for example on the mortgage market. And so, using CCEI, the problems related to the complicated Dutch mortgage market can be overcome.

2.2.3 Criticism of utility maximisation theories

Although this paper is focused on CCEI, there is quite some criticism towards the usage of this index and the corresponding expected utility theory. For example, if individuals face uncertain situations (probabilities are unknown) they tend to suffer from heuristics (like representativeness, availability of instances or adjustments from an anchor), which influence their judgements and decisions (Tversky & Kahneman, 1974). Furthermore, new theories have been developed for decisions under risk (probabilities are known) or uncertainty (prospect theory [Kahneman & Tversky, 1979], rank-dependent utility [Quiggin, 1982] and cumulative prospect theory [Tversky & Kahneman, 1992]).

In addition, consumers might be subjected to preference reversal, this is independent of violations of the expected utility theory (Tversky & Thaler, 1990). The phenomenon of preference reversal could be described as when "*The preference measured one way is the reverse of preference measured another and seemingly theoretically compatible way*" (Grether & Plott, 1979). It occurs when individuals are asked to choose between two bets with different probabilities and different revenues. The higher probability bet is often preferred over the higher revenue bet. At the same time, when individuals are asked to attach a monetary value to these two bets, the higher revenue bet receives a higher monetary value than the higher probability bet. This phenomenon does not only occur with bets, but also in other situations (Tversky & Thaler, 1990).

Furthermore, some criticism towards utility maximisation is based on the fact that it could be adapted to fit any situation, which is rather seen as a sign of weakness than a sign of strength. This accusation is based on the idea that utility cannot be observed and that utility is a universal concept. These properties cause utility to fail to focus on specific elements of socio-economic systems, causing utility maximisation unfit to explain human behaviour (Hodgson, 2012). Accordingly, one should keep these criticisms in mind and be careful when using and interpreting the scores of CCEI.

Nevertheless, the CCEI and utility maximisation theories have been proven successful in explaining human behaviour. And researchers in the field of choice behaviour and utility maximisation are critical of themselves and look for ways to improve the used methods. For example, Heufer (2012) showed how to reduce the power of the GARP test against random behaviour. Also, Andreoni et al. (2013) unify the goodness-of-fit measures with new indices of power to increase the ability to draw correct conclusions from models testing maximising behaviour. Finally, the CCEI can easily be improved by demonstrating the importance and frequency of violations in experiments, explaining how choices are made in economic settings, which are encountered in practice, and using larger datasets in order to overcome pooling of data (Choi et al. 2007a).

2.3 Rationality in the housing sector

Choi et al. (2014) found in their research of Dutch citizens that there is an interesting relationship between the CCEI and decisions with respect to home ownership. Higher CCEI scores seem related to home ownership and to larger fractions of a household's wealth invested in a house. Since there is a favourable tax treatment for owner-occupied housing in the Netherlands (this favourable tax treatment is disappearing nowadays, but was still present at the time of the used data) the researchers linked this behaviour to high decision-making quality in financial choices.

In addition, in the Netherlands parents have the possibility to qualify for a grant exemption in order to help their children purchase or renovate a house. This grant exemption is tax free where parents donate up to €100,000. However, the government is changing these rules in order to make it less attractive for parents to donate. As a result, it will become more difficult for young people to buy a house. Furthermore, new starters on the job market rarely receive a permanent contract and with temporary contracts it is more difficult to obtain a sufficient mortgage. These credit constraints could delay a household's first house purchase,

as well as force prospective home owners, who are able to buy a house, to buy a smaller house than they would like (Ortalo-Magné & Rady, 2006).

Previous literature of analyses of the housing crisis in 2007 does not focus on the behaviour of consumers, but are focussed on banking or macroeconomic perspectives (Duca et al., 2010). At the same time literature shows the increased importance of financial education (Kaiser & Menkhoff, 2017) and financial literacy (Allgood & Walstad, 2015) on financial behaviour. Individuals nowadays are faced with increasingly difficult financial decision, while at the same time the impact of these decisions on their own lives and the economy is greater than ever. On the other hand financial institutions are taking advantage of unsophisticated consumers (Campbell, 2016).

Especially in the mortgage market brokers are known to abuse their knowledge about the rules and regulations, leading unsophisticated consumers to pay high prices for brokers' (in reality inexpensive) services (Woodward & Hall, 2012). Furthermore, literature on consumers' choices of mortgages and prices of mortgages (Brueckner, 1994), as well as why different mortgage packages exist (Kau & Keenan, 1987 and Stanton & Wallace, 1998) date from well before the previous financial crisis. Consequently, this needs further research in the behaviour and knowledge of Dutch citizens in the housing sector.

In this paper use is made of data of the Dutch Central Bank (DNB) Household Survey (DHS), an annually conducted survey by CentER panel. With DHS both the economic and psychological aspects of financial behaviour of 2,000 Dutch households can be studied. In this paper results of the survey on living conditions and mortgages will be used. CentER panel is a non-profit research institution for data collection and research and with their database representatives of the Dutch-speaking population in the Netherlands can be reached. Participants of the CentER panel surveys can be linked to different pieces of research. Choi et al, (2014) conducted their experiment with 1,182 randomly selected adult participants from the entire CentER panel sample. Therefore, participants from both the survey and Choi et al.'s experiment can be linked.

In the DHS respondents were asked about their beliefs on developments in the housing sector, mortgage market and the value of their own house in the past two years and the following two years. The experiment of Choi et al. (2014) was conducted in 2009 one year after the outbreak of the financial crisis. This enables the possibility to derive 'correct answers' for the questions about the developments in the housing sector and mortgage market

as the housing sector behaved, on average, the same throughout the Netherlands. The 'correct answer' to a question will be based on data of Statistics Netherlands (CBS, 2016), see Data section for a more detailed explanation. The created data set makes it possible to apply data from a laboratory research that directly tested choice data for utility maximisation to the behaviour (Choi) and choices of the same participants in the real world (DHS). This has led to the first hypothesis: *CCEI scores have a positive effect on consumers' correct interpretation of movements in the housing sector and mortgage market.*

Individuals' CCEI scores are based on budgetary problems participants in experiments are represented with. Combined with the possible positive relation between CCEI scores and decisions with regard to home ownership (Choi et al., 2014), it can be assumed that CCEI scores are in some way related to financial literacy and/or knowledge. This indicates that individuals with higher CCEI scores could have a better knowledge of, for example, the housing sector. Therefore, in this paper it is assumed that a higher CCEI score positively relates to a correct interpretation of the movements in the housing sector.

Furthermore, in the questionnaire on living conditions and mortgages respondents are asked more direct questions with respect to their knowledge, choices and behaviour on the house and mortgage market. This enables the possibility to test the effect of rationality on respondents' choices in the housing sector. For example, in the questionnaire respondents were asked if they would have bought a more expensive house if they had been able to receive a higher mortgage loan based on their income at that time, thereby increasing their mortgage expenses. This has led to the second hypothesis: *CCEI scores have a negative effect on consumers' wishes for a more expensive house, while their income level remains equal.*

In a similar manner as for hypothesis 1, it is assumed that CCEI scores could be related to financial knowledge and/or literacy. Better financial knowledge (Kaiser & Menkhoff, 2017) and better financial literacy (Allgood & Walstad, 2015) might influence financial behaviour around debt positively. Therefore, it is assumed that a higher CCEI score negatively relates to a consumer's wish for a more expensive house.

In addition, in the questionnaire respondents were asked whether they have a National Mortgage Guarantee (NMG) on their mortgage. A NMG is a guarantee that ensures home owners have a mortgage that meets their income. In 2009 the NMG covered house prices up to a cost price of €265,000 (this value could change over the years). If a consumer at a certain point in his/her life is not able to pay the mortgage, the government will help the consumer to

remain living in his/her house. Furthermore, if a consumer in the end is not able to remain living in his/her house and has to sell the property for less than the value of the outstanding mortgage the NMG will cover the difference in payments. This has led to the third hypothesis: *CCEI scores have a positive effect on a consumer's choice for the National Mortgage Guarantee.*

A parallel argument as for hypothesis 2 results in the assumption that a higher CCEI score positively relates to a consumer's choice for the NMG.

Chapter 3: Data and methodology

3.1 Data

In this section the data from the DNB household survey and the paper of Choi et al. (2014) used to answer the hypotheses will be explained. After which the development of different variables based on these two sources will be explained.

3.1.1 Data DHS

The research of Choi et al. (2014) was conducted in 2009. Therefore, the sample used in this paper consists of individuals who participated in their research and answered the DHS on living conditions and mortgages in 2008, 2009 or 2010. This way the CCEI scores will ally to the highest degree with their answers on the survey of living conditions and mortgages. Resulting in a sample with 578 home owners, 431 of these home owners have a mortgage on their current and most important accommodation. Of this latter group 67.3 per cent has at least one mortgage and 24.8 per cent has at least two mortgages on their current and most important accommodation. Since 92.1 per cent does not have more than two mortgages only the first two mortgages will be taken into account for the econometric models in this paper.

In order to answer the first hypothesis five different questions of the DHS will be taken into account. The first question refers to how respondents think the value of property has changed over the past two years. The second question refers to how respondents think the prices of properties will change in the next two years. The third question refers to how respondents think the price of their own house will develop in the following two years. The fourth question refers to how respondents think the interest rate will develop in the following two years. The fifth question refers to what level respondents think that the prices of the housing market are consistent with the value of houses.

The correct answers to these questions are based on a published table by CBS about the development of the value of houses and the price index of houses in the Netherlands (CBS, 2016). In this paper the correct answers to the aforementioned questions will be based on the year 2009 in this table. However, one should keep in mind that there was a financial crisis, so respondents could have had a better knowledge about the developments on the housing sector and mortgage market relative to other years not dominated by a financial crisis due to increased media attention on the developments in the housing sector. Therefore, the results should be interpreted with caution.

For the first question the correct answer should have been that the value of property has increased over the past two years, 46.7 per cent of the respondents in the sample gave the correct answer. The correct answer to the second question should have been that the prices of property will decrease in the next two years, 47.2 per cent gave the correct answer. The correct answer to the third question should have been that the prices of respondents own houses will decrease in the next two years, 27.9 gave the correct answer. The correct answer to the fourth question should have been that the mortgage interest rate will decrease in the next two years, 15.6 gave the correct answer. The correct answer to the final question should have been that houses are overestimated at the moment, 63.3 per cent gave the correct answer. Only 1.7 per cent of the correspondents in this sample gave the correct answer to all the questions.

The second hypothesis is based on the question asking whether respondents would have bought a more expensive house if they had been able to receive a larger mortgage loan on the basis of their income at that time. In this paper it is assumed that mortgage providers base the maximum mortgage height consumers can receive objectively on the information the consumer provides and is therefore unimpeachable and consumers should not wish for a higher mortgage. Unfortunately, this is not a perfect measure, since in the Dutch mortgage market different mortgage lenders use different guidelines. Thus it could be that a consumer would be able to receive a higher mortgage, based on the same income level, at a different mortgage provider.

The seemingly irrational behaviour of respondents when answering that they would like to buy a more expensive house is then explained by respondents' knowledge of the ability to receive a higher mortgage at a different mortgage provider. Thus, the results for this hypothesis should be interpreted carefully. In this sample 12.5 per cent of the respondents would have bought a more expense house if they had the possibility.

The third hypothesis will be split into two parts, one for part for respondents who have a NMG on their first mortgage and another part for participants who have a NMG on both their first and second mortgage. Since the purchase price of a house to be eligible for a NMG is limited, not everyone is eligible to be able to receive a NMG. From the available data it is not clear which respondents were eligible for a NMG but choose not to use it. Therefore, it will be assumed that all the respondents who did not choose a NMG were eligible to receive the NMG, but choose not to get one. This might not be a correct

assumption about the respondents, so the results should be interpreted carefully. In our sample 35 per cent of the respondents has a NMG on their first mortgage, 16.7 per cent has a NMG on their second mortgage, while only 4 per cent has a NMG on both mortgages.

3.1.2 Data Choi

As aforementioned in the literature section, in order to measure the extent of rationality of the participants the CCEI scores will be used that where computed by Choi et al. (2014). In this paper the researchers propose to measure the decision-making quality of participants, based on the consistency of the participants' choices with GARP. The researchers use wealth as the outcome of interest, because they believe that decision problems in an experiment concerning wealth reflect a more general form of the decision-making ability. Their experiment consists out of an economic choice experiment, with 25 decision problems under risk, which they use to measure the participants' utility maximisation. In the end of the experiment, the computer randomly selects one decision round to pay-out to the participant.

For each decision problem a two dimensional budget line is randomly selected by the computer. These budget lines are independently chosen from the previous received budget lines. All the budget lines have at least one intersect with the axes at 50 or more points, but no intercept exceeding 100 points. The choices the participants face are restricted to allocations on this budget line. The actual payoffs of a particular choice are determined by the allocation of either the x or the y accounts, corresponding to the horizontal and vertical axes. Each point is worth €0.25 in the payoff. Participants are can express their choice by moving the pointer on the computer screen to the desired point and then clicking the mouse or hitting the enter key.

From figure 1 can be seen that if the slope of the budget line is smaller than -1 and the allocation is above the 45-degree line (between point A and C), the expected payoff is higher than the allocation with a certain outcome (point C). The allocation above the certainty outcome can be seen as risky, since allocation x will give a lower payoff and allocation y a higher payoff than at the certainty outcome. An allocation between point B and C, thus under the certainty outcome will give a lower expected payoff than the certainty point. Participants who choose an allocation at the certainty outcome can be seen as risk averse, while participants who choose an allocation on the cheaper account can be seen as risk neutral. The same line of reasoning can be used when the slope of the budget line is greater than 1, but then it will be the other way around.

Based on the outcomes of the experiment the researchers employed the GARP to see if their results might be rationalized by a utility function. Then they assessed how the individual choice behaviour complied with GARP using CCEI.[3] The mean CCEI scores of their participants divided in different categories can be found in appendix A. The results led them to conclude that there are economically and significantly correlations between CCEI scores and decisions regarding home ownership. This makes their dataset perfect for testing choices of the participants in the housing sector.
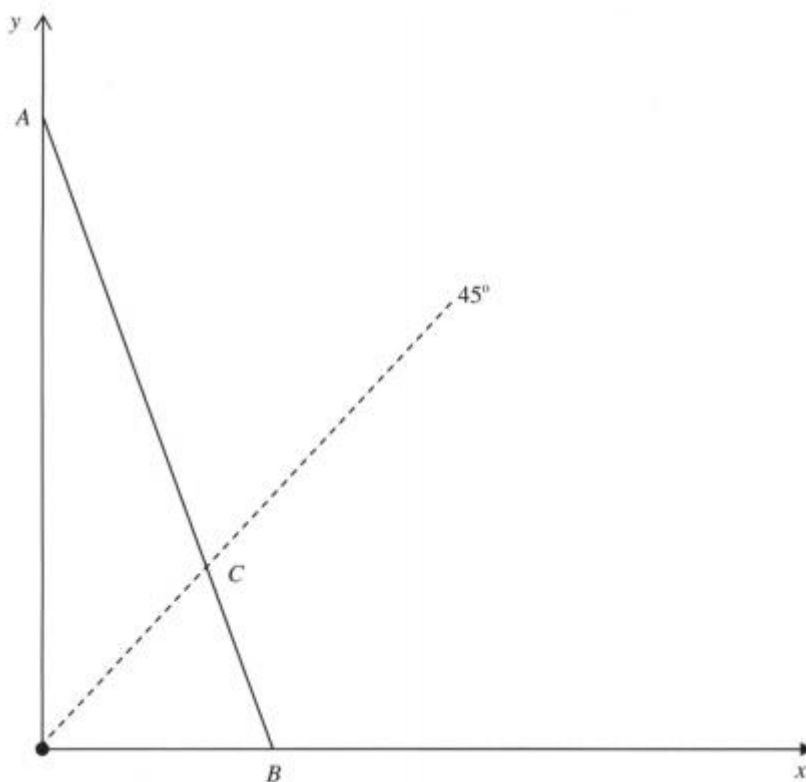
Figure 1: An illustration of the budget line

3.1.3 Variables

Many of the DHS respondents did not answer or did not know the answer to every questions of the survey on living conditions and mortgages. This decreases the number of observations for each hypothesis significantly, thereby influencing the results. Having no knowledge about questions regarding your living conditions and mortgage is assumed to be irrational behaviour. In order to account for these missing observations as a measure for rationality a dummy variable is added to test. This dummy variable will be based on respondents' answer for the questions about the WOZ-value, what they think their house is worth and their total monthly expenses and interest rate for the first mortgage. Answers to questions about the

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[3] For more information on how this experiment was conducted I would like to refer you to the papers of Choi et al. (2007b) and Choi et al. (2014).

second mortgage will not be taken into account as not every respondent has a second mortgage on their house. In addition, knowledge about the first mortgage is assumed to be a good indication of respondents' knowledge about the second mortgage.

In order to test the hypotheses two control variables will be generated that could not directly be obtained from the questionnaire about living conditions and mortgages. The first variable corresponds to how participants value their house compared to the WOZ-value of their house. The WOZ-value is the official value of the owner's house, which is determined by the municipality. This variable will be generated in an absolute and a normal form. In the absolute form the higher value the variable has, the greater the difference between their value of their house and the WOZ-value. In the normal form a negative value corresponds to the participant undervaluing the house, while a positive number corresponds to the participant overvaluing the house. The second variable is the participants' total monthly expenses for their first and second mortgage, which includes the interest expenses, potential amortisations and other mortgage payments participants could have.

In addition, use will be made of the variables that reflect a gift, the mortgage interest rate on the first mortgage and the national average mortgage interest rate as control variables. The variable gift corresponds to the question whether participants received a gift from their parents or someone else to help finance the purchase or interior of their current house (5.5 per cent of the respondents in this sample received a gift). The mortgage interest rate on the first mortgage is based on respondents' current interest rate of their mortgage. The variable national average mortgage interest rate is the average interest rate that banks wield for providing new mortgages in a certain year, based on statistics provided by the DNB (2018). In this paper the average mortgage interest rate of the year the participants engaged in the experiment will be used.

In order to test the hypotheses the demographic variables in this paper are equal to the variables of Choi et al. (2014), see table 1. The differences in percentages between the participants in this research and that of Choi et al. (2014) could be explained by the nature of the questionnaire about living conditions and mortgages. The questionnaire is quite extensive and has many detailed questions. This might cause the questionnaire to be more attractive for males rather than females. In addition, this might cause relatively older individuals (with an age above 34) and individuals with a relatively higher education to be more interested in

filling in this survey. This in turn could explain the on average higher monthly household income and the on average higher percentage of individuals with paid work or being retired.

	Intersection Choi and CentER	Sample Choi et al. (2014)
Female	25.26	45.43
Age		
16-34	9.86	18.53
35-49	27.85	26.14
50-64	39.97	35.62
65+	22.32	19.71
Education		
Low	25.48	33.59
Medium	29.46	29.70
High	45.06	36.72
Household Monthly Income		
€0-2,500	16.61	22.76
€2,500-3,499	26.47	25.55
€3,500-4,999	33.22	29.29
€5000+	23.70	22.50
Occupation		
Paid work	63.15	53.13
House work	3.81	11.59
Retired	26.82	20.90
Others	6.23	14.38
Household Composition		
Partner	81.31	80.88
Number of Children	0.76	0.84
Observations	578	1,182

Table 1: Comparison of the demographic control variables.

Choi et al. (2014) based the occupation and completed education categories on the classifications of Statistics Netherlands. A low education level corresponds with primary or prevocational secondary education. A medium education level corresponds with pre-university secondary education or senior vocational training. A high level of education corresponds with vocational college or university education. The household monthly gross income level categories are based on an approximately equal deviation of participants in each category. Finally, the age of 65 was in 2009 the retirement age in the Netherlands. After the

age of retirement it becomes more unlikely for participants to be able to receive a mortgage. Nowadays, the retirement age follows the life expectancy of individuals in the Netherlands.

3.2 Methodology

In this section the different econometric models that will be used to answer the hypotheses will be discussed. There are relatively many control variables relative to the number of observations in this dataset. Hence, the significance of the different variables will be tested. The variable *Knowledge* turned out to suffer from collinearity in all models and will not be taken into account in the underlying models. The control variables will be divided in the demographic and the non-demographic variables. The demographic control variables are *Gift, Gender, Age, Educ* (education level)*, Hginc* (household gross monthly income level)*, Occup* (Occupation)*, Partner* and *Nkids*. The non-demographic control variables are *Abs_house_guess, House_guess, Tot_monthly_exp, Hy31* (interest rate on the first mortgage) and *Mortgageinterestrate* (average mortgage interest rate of year respondents participated).

3.2.1 First hypothesis

CCEI scores have a positive effect on consumers' correct interpretation of movements in the housing sector and mortgage market.

In order to answer the hypothesis the following models have been constructed, based on the available data:

a) $Know\_prop\_past = \beta_1 + \beta_2 * CCEI + \gamma_i * Control\ Variables$

b) $Know\_prop\_fut = \beta_1 + \beta_2 * CCEI + \gamma_i * Control\ Variables$

c) $Know\_own\_fut = \beta_1 + \beta_2 * CCEI + \gamma_i * Control\ Variables$

d) $Know\_mort\_fut = \beta_1 + \beta_2 * CCEI + \gamma_i * Control\ Variables$

e) $Know\_market\_con = \beta_1 + \beta_2 * CCEI + \gamma_i * Control\ Variables$

In the models *a* to *e* the dependent variable is a categorical variable. The order of the categories is designed in such a manner that the above described models are fit to be ordered logit models. Having no knowledge about a question is assumed to be the worst possible outcome. For the reason that the respondents of the DHS survey are faced with a multiple choice question, filling in 'do not know' seems to correspond with the least amount of knowledge. The best possible outcome in these models is assumed to be the correct answer based on the statistics of CBS (2016).

The dependent variable in model *a* contains the following categories: Category 1 corresponds with do not know/no knowledge, category 2 with a decrease, category 3 with no change and category 4 with an increase. Model *b* to *d* have the same order of categories. Category 1 corresponds with a decrease category 2 with no change, category 3 with an increase and category 4 with do not know/no knowledge. In model *e* category 1 corresponds with overestimated houses, category 2 with consistent houses, category 3 with underestimated houses and category 4 with do not know/no knowledge.

The dependent variable *Know_prop_past* refers to how respondents think the value of property has changed over the past two years. *Know_prop_fut* refers to how respondents think the prices of properties will change in the next two years. *Know_own_fut* refers to how respondents think the price of their own house will develop in the following two years. *Know_mort_fut* refers to how respondents think the interest rate of mortgages will develop in the following two years. Finally, *Know_market_con* refers to what level respondents think that the prices of the housing market are consistent with the value of houses.

Model a: After testing the significance of all the control variables with the explanatory variable in the ordered logit model they turn out to be jointly insignificant at the 10 per cent level. When testing the non-demographic variables they are jointly significant at the 1 per cent level. Even so, variables are individually tested. The variable for the average mortgage interest rate of the year the participants engaged in the experiment is individually significant at the 1 per cent level. While the variable for the normal value of the house guess is individually significant at the 5 per cent level and the variable for the total monthly expenses is individually significant at the 10 per cent level. The combination of the variables for the average mortgage interest rate and the normal value of the house guess results together with *CCEI* in the best jointly significant model at the 1 per cent level.

In the demographic control variable model the variables are jointly insignificant at the 10 per cent level. When excluding the variable *Gift* the remaining variables become jointly significant at the 1 per cent level. Hence, the control variables in this model are *House_guess, Mortgageinterestrate, Gender, Age, Educ, Hginc, Occup, Partner* and *Nkids*. After testing the final model the jointly significance level of the control variables is at the 1 per cent level.

A higher CCEI score is expected to increase the probability of a respondent answering that the development of property increased in the past two years. A higher rationality score is

expected to result in a correct knowledge of the development of property in the past two years.

Model b: After testing the significance of all the control variables with the explanatory variable in the ordered logit model they turn out to be jointly insignificant at the 10 per cent level. When testing the non-demographic control variables they are jointly significant at the 1 per cent level. Even so, variables are individually tested. The variable for the normal value of the house guess is individually significant at the 10 per cent level and the variable for the average mortgage interest rate of the year the participants engaged in the experiment is individually significant at the 1 per cent level. Despite that the variables for total mortgage expenses and the interest rate of the first mortgage are individually insignificant at the 10 per cent level, they decrease the p-value of *CCEI* to a significance level of 5 and 10 per cent respectively. As a result, a combination of the variable for total mortgage expenses and the average mortgage interest rate results in the best jointly significant model at the 1 per cent level.

In the demographic control variable model the variables are jointly significant at the 1 per cent level. Although, the variable *Gift* decreases the number of observations significantly its inclusion also decreases the p-value of *CCEI* tremendously to a significant level of 5 per cent. Hence, the control variables in this model are *Tot_monthly_exp, Mortgageinterestrate, Gift, Gender, Age, Educ, Hginc, Occup, Partner* and *Nkids.* After testing the final model jointly significance level of the control variables is at the 1 per cent level.

A lower CCEI score is expected to decrease the probability of a respondent answering that the prices of property will decrease in the next two years. A higher rationality score is expected to result in a correct knowledge of the development of property in the following two years.

Model c: After testing the significance of all the control variables with the explanatory variable in the ordered logit model they turn out to be jointly insignificant at the 10 per cent level. When testing the non-demographic control variables they are jointly significant at the 1 per cent level. Even so, the control variables are individually tested. The variable for the normal value of the house guess and the variable for the average mortgage interest rate of the year the participants engaged in the experiment are individually significant at the 1 per cent level. Consequently, a combination of these two variables with *CCEI* results in the best jointly significant model at the 1 per cent level.

In the demographic control variable model the variables are jointly significant at the 1 per cent level. The exclusion of the variable *Gift* increases the number of observations and it also decreases the p-value of *CCEI*, yet it remains insignificant at the 10 per cent level. Hence, the control variables in this model are *House_guess, Mortgageinterestrate, Gender, Age, Educ, Hginc, Occup, Partner* and *Nkids*. After testing the final model the jointly significance level of the control variables is at the 1 per cent level.

A lower CCEI score is expected to decrease the probability of respondents answering that the price of their own house will decrease in the next two years. A higher rationality score is expected to result in a correct knowledge of the development of an individual's house in the following two years.

Model d: After testing the significance of all the control variables with the explanatory variable in the ordered logit model they are jointly significant at the 10 per cent level. The demographic and non-demographic control variables models will be tested to see if it will increase the number of observations and improve the significance of the p-value of the variables. When testing the non-demographic control variables they are jointly significant at the 5 per cent level. Even so, variables are individually tested. Only the variable for the average mortgage interest rate of the year the participants engaged in the experiment is individually significant at the 1 per cent level. Despite that the variables for total mortgage expenses is individually insignificant at the 10 per cent level, the variable decrease the p-value of *CCEI* significantly. As a result, a combination of the variable for total mortgage expenses and the average mortgage interest rate results in the best jointly significant model at the 1 per cent level.

In the demographic control variable model the variables are jointly insignificant at the 10 per cent level. The exclusion of the variable *Gift* increases the jointly significance to a 1 per cent level. Hence, the control variables in this model are *Tot_monthly_exp, Mortgageinterestrate, Gender, Age, Educ, Hginc, Occup, Partner* and *Nkids*. After testing the final model the jointly significance level of the control variables is at the 1 per cent level.

A lower CCEI score is expected to decrease the probability of a respondent answering that the mortgage interest rate will decrease in the next two years. A higher rationality score is expected to result in a correct knowledge of the development of the mortgage interest rate in the following two years.

Model e: After testing the significance of all the control variables with the explanatory variable in the ordered logit model they are jointly insignificant at the 10 per cent level. When testing the non-demographic control variables they are jointly insignificant at the 10 per cent level. The variables for total mortgage expenses and the average mortgage interest rate of the year the participants engaged in the experiment are individually significant at the 10 per cent level. In spite of their individually significance they are jointly less significant. As a result, a combination of the variable for total mortgage expenses and the average mortgage interest rate results in the best jointly significant model at the 1 per cent level.

In the demographic control variable model the variables are jointly insignificant at the 10 per cent level. The exclusion of the variable *Gift* increases the jointly significance to be at a 10 per cent level. In combination with the demographic control variables model the combination of the variables for total mortgage expenses and the average mortgage interest rate lead to the best jointly significant model. Hence, the control variables in this model are *Tot_monthly_exp, Mortgageinterestrate, Gender, Age, Educ, Hginc, Occup, Partner* and *Nkids.* After testing the final model the jointly significance level of the control variables is at the 1 per cent level.

A lower CCEI score is expected to decrease the probability of a respondent answering that the value of houses is overestimated. A higher rationality score is expected to result in a correct knowledge of the consistency of the value of houses with house prices.

3.2.2 Second hypothesis

CCEI scores have a negative effect on consumers' wish for a more expensive house, while their income level remains equal.

In order to answer the hypothesis, the following model has been constructed, based on the available data:

f) $Exp\_house = \beta_1 + \beta_2 * CCEI + \gamma_i * Control\ Variables$

In this model *Exp_house* is a binary variable, where 1 refers to respondents that would have bought a more expensive house if they had the possibility and 0 to respondents that would have not.

After testing the significance of all the control variables with the explanatory variable in the logit model they turn out to be jointly insignificant at the 10 per cent level. This could be due to the relative high number of variables relative to the number of observations. In

order to see which variables are significant and which are not the model will be split in to two parts.

Firstly, the non-demographic control variables are tested all together and then individually. When tested all together and separately the variables turn out to be in both cases insignificant. Although the variables for the absolute value of the house guess and the average mortgage interest rate of the year the participants engaged in the experiment decrease the insignificant p-value of *CCEI* significantly. When testing the combination of these three variables they are still jointly insignificant, although their significance level increased. As a result variables for the absolute value of the house guess and the average mortgage interest rate will be included in the model.

Secondly, the demographic control variables are tested. When tested all together they are jointly significant at the 5 per cent level. Despite this, the inclusion of the variable *Gift* decreases the number of observations tremendously. In addition, when testing this model without the variable for a gift the jointly significance level increases to a 1 per cent level. Hence, the control variables in this model are *Abs_house_guess, Mortgageinterestrate, Gender, Age, Educ, Hginc, Occup, Partner* and *Nkids*. After testing the final model the joint significance level is just at the 1 per cent level.

A higher CCEI score is expected to decrease the probability of an individual wanting to buy a more expensive house, compared to an individual with a lower CCEI score. This is the case, because a higher CCEI score is assumed to be related with better financial behaviour. A higher value of *Abs_house_guess* is expected to increase the probability of an individual wanting to buy a more expensive house, compared to an individual with a lower *Abs_house_guess* value. The larger the difference is between the WOZ-value and the value individuals assign to their house, the less knowledge an individual is assumed to have about their own house and respectively the housing sector. This might result in worse financial behaviour by wishing to buy more expensive house. A higher average mortgage interest rate is expected to decrease the probability of an individual wanting to buy a more expensive house, compared to when there is a lower average mortgage interest rate. If the average mortgage interest rate increases individuals should be less likely to buy a more expensive house, since the costs of this wish have increased.

3.2.3 Third hypothesis

CCEI scores have a positive effect on a consumer's choice for the National Mortgage Guarantee.

In order to answer the hypothesis the following models have been constructed, based on the available data:

  g) *NMG_first = β_1 + β_2*CCEI + γ_i*Control Variables*
  h) *NMG_both = β_1 + β_2*CCEI + γ_i*Control Variables*

In this model *NMG* is a binary variable, where 1 refers to respondents that have a NMG and 0 to respondents that have not. The first model refers to a NMG on the first mortgage, the second model to a NMG on both mortgages.

Model g: When testing the significance of all the control variables with the explanatory variable in the logit model they turn out to be jointly significant at the 1 per cent level. Even so, the number of observations for this complete model is low and the p-values of the variables are insignificant. On account of this occurrence the model will be divided in the demographic and non-demographic variables once again to see whether the number of observations could increase with less variables.

In spite of the significance level of the whole model, when testing for the non-demographic variables separately their combination tested jointly insignificant at the 5 per cent level. After testing the variables individually only the variables for the absolute value of the house guess and the average mortgage interest rate of the year the participants engaged in the experiment are individually significant at the 5 per cent level. Combining these two variables with the variable *CCEI* results in a joint significance at the 1 per cent level.

Granted that the non-demographic variables did not induce the number of observations to be that low, the demographic variables are tested also for their significance. The joint significance of all variables is at the 1 per cent level, but the variable *Gift* decreases the number of observations. Despite this *Gift* decreases the insignificance of the p-value of *CCEI* momentously. Consequently, none of the demographic variables will be excluded from the model. Also, with the exclusion of some non-demographic variables the number of observations has slightly increased. Hence, the control variables in this model are *Abs_house_guess, Mortgageinterestrate, Gift, Gender, Age, Educ, Hginc, Occup, Partner* and *Nkids*. After testing the final model the jointly significance level is at the 1 per cent level.

Model h: When testing for the jointly significance of all the control variables with the explanatory variable in the logit model they turn out to be insignificant at the 10 per cent level. This could be due, again, to the relative high number of variables relative to the number of observations. Furthermore, the variable *Gift* is omitted due to collinearity. For these two reasons the model will be split in a model with demographic control variables and a model with non-demographic control variables.

In the non-demographic model the variables, when tested all together and individually, are jointly insignificant at the 10 per cent level. Nevertheless, the variable for the normal value of the house guess causes the p-value of *CCEI* to be significant at the 10 per cent level. Hence, this variable will be included in the model. In the demographic model the variables, when tested all together are jointly insignificant at the 10 per cent level. Since the variable *Gift* was omitted for collinearity in the first test model, this variable will be excluded from the demographic model. This exclusion results in a joint significance at the 10 per cent level for the remaining variables. Hence, the control variables in this model are *House_guess, Gender, Age, Educ, Hginc, Occup, Partner* and *Nkids* After testing the final model the joint significance level of the control variables is at the 10 per cent level and lower than the jointly significance level of just the demographic variables.

A higher CCEI score is expected to increase the probability of an individual choosing to have a NMG, in both models, compared to an individual with a lower CCEI score. A higher rationality score should increase the willingness of individuals to have a mortgage that fits their income and that has a safety net in less fortunate years, because it is assumed to be related with better financial behaviour. A higher value of *House_guess* is expected to increase the probability of an individual choosing to have a NMG, in both models, compared to an individual with a lower *House_guess* value. The higher the values of House_guess the more likely individuals overestimate the value of their own house. Since houses were overestimated in 2009, this could be linked to a correct knowledge of the housing sector. And having financial knowledge is assumed to be related to better financial behaviour. Hence, this should increase their willingness to have a mortgage that fits their income and that has a safety net in less fortunate years, as they know that the value of their house will eventually decrease.

Chapter 4: Results

4.1 First hypothesis

CCEI scores have a positive effect on consumers' correct interpretation of movements in the housing sector and mortgage market.

In order to answer this hypothesis five different models have been developed. In the first model, model *a*, the effect of rationality and the control variables will be used to test if they could explain an individual's answer for the development of the value of houses in the past two years. In the second model, model *b*, the effect of rationality and the control variables will be used to test if they could explain an individual's answer for the development of the prices of houses in the next two years. In the third model, model *c*, the effect of rationality and the control variables will be used to test if they could explain an individual's answer for the development of the their own house in the next two years. In the fourth model, model *d*, the effect of rationality and the control variables will be used to test if they could explain an individual's answer for the development of the interest rate of mortgages in the next two years. The final model, model *e,* the effect of rationality and the control variables will be used to test if they could explain an individual's answer for the consistency of house values with house prices.

In Appendix B the results of the original models can be found. In both in the appendix and in the discussed tables below versions 1, 2 and 3 are based on ordered logit models, where version 2 is with robust standard errors. The same holds for versions 4, 5 and 6, which are based on ordered probit models, where version 5 is with robust standard errors. The versions with robust standard errors are generated to see if heteroscedasticity might cause the results to be insignificant. Furthermore, in version 3 and 6 only the CCEI scores are regressed on the dependent variable, to see if an increase in observations might cause the insignificance of the model to drop. In all the discussed models ceteris paribus is assumed.

Model a:　　In table 2 the results are shown for the marginal effects of the participant's answer that the value of houses has increased in the past two years. Versions 1, 2, 4 and 5 have 512 observations and versions 3 and 6 have 578 observations due to missing observations in the variables *Mortgageinterestrate* and *House_guess.*

The ordered logit and probit models with and without robust standard errors are quite similar in significance. Although the regressions with robust standard errors seem to cause

the model to become more insignificant. The same holds when only the variable *CCEI* is regressed. The latter might result from the fact that the difference in observations is not that large, which could indicate that the variable *CCEI* is not enough to explain the answer of the participants to the question. In the end, the p-value of the variable *CCEI* is the lowest in the complete ordered logit model without robust standard errors, so version 1 will be discussed.

Despite that the CCEI scores seem not to be related to the answers of the question about the development of the value of houses in the past two years, some demographic variables seem to negatively influence the probability of answering that the value of houses has increased in the past two years. If respondents become older the probability of giving the correct answer decreases with an increased significance level. The probability decreases with 14.2 percentage points at a 10 per cent significance level for respondents between 50 and 64 years old and with 26.8 percentage points at a 1 per cent significance level if respondents are older than 65, both compared to being between 16 and 34 years old. Being female decreases the probability of giving the correct answer by 12.1 percentage points at a 1 per cent significance level.

Model b: In table 3 the results are shown for the marginal effects of the participant's answer that the prices of houses will decrease in the following two years. Versions 1, 2, 4 and 5 have 215 observations and versions 3 and 6 have 578 observations, mostly due to missing observations in the variable *Gift*.

The ordered probit models have a higher significance than the ordered logit models. The probit model with and without robust standard errors are quite similar in significance. Although, the ordered probit model with robust standard errors has a slightly higher significance level, so version 5 will be discussed. The versions were just the variable *CCEI* is regressed, the significance level decreases. This could indicate that variable *CCEI* is not enough to explain the answer of the participants to the question.

Against expectations a higher CCEI score decreases the probability of answering that the prices of property will decrease in the next two years by 46.3 percentage points at a 5 per cent significance level. According to expectations, a higher average mortgage interest rate decreases with 60.3 percentage points and a higher level of education increases 17.7 percentage points the probability of answering that the prices of property will decrease in the next two years at a 1 and 5 per cent significance level significant level. A higher average

mortgage interest rate tends to increase the prices of houses. And higher education level could contribute to a better knowledge of the housing sector.

Model c: In table 4 the results are stored for the marginal effects of the participant's answer that the price of their own house will decrease in the next two years. Versions 1, 2, 4 and 5 have 512 observations and versions 3 and 6 have 578 observations due to missing observations in the variables *Mortgageinterestrate* and *House_guess.*

The ordered logit and probit models with and without robust standard errors are quite similar in their insignificance levels. When only the variable *CCEI* is regressed this increases the significance level of the model. This could indicate that relatively more observations would increase the significance level of the results. In the end, the p-value of the variable *CCEI* is the lowest in the ordered logit model with robust standard errors, so version 2 will be discussed.

It is interesting to see that the results between model *b* and *c* differ a lot, while the two questions only differed in referring to participant's own house price or house prices in general. A higher average mortgage interest rate now decreases the probability of answering that the prices of their own property will decrease in the next two years by 42.4 percentage points at a 1 per cent significance level. Furthermore, an increase in income level seem to increase the probability of giving the correct answer with 13.9 percentage points at an income level between €2,500-3,499 and 15.4 percentage points at an income level above €5,000+, both at the 1 per cent significance level. With the exemption of participants in the in-between income level, belonging to that category, compared to belonging to the lowest income category, increases the probability of giving the correct answer by 10.4 percentage points at a 5 per cent significance level.

Model d: In table 5 the results are stored for the marginal effects the participant's answer that the interest rate of mortgages will decrease in the next two years. Versions 1, 2, 4 and 5 have 399 observations and versions 3 and 6 have 578 observations due to missing observations in the variable *Tot_monthly_exp*.

The ordered logit and probit models are quite similar in their insignificance levels. Although, the versions with robust standard errors seem to preform worse. In the p-value of the variable *CCEI* is the lowest in the ordered probit model, so version 4 will be discussed. When just the variable *CCEI* is regressed this decreases the significance level. This could indicate that variable *CCEI* is not enough to explain the answer of the participants to the

question. The insignificance of the rest of the variables could be caused by the small percentage of respondents who gave the correct answer (only 15.6 per cent gave the correct answer).

Only being female seems to influence the probability of answering that the interest rate of mortgages will decrease in the following two years, namely it decreases the probability by 0 percentage points at the 1 per cent significance level

Model e: In table 6 the results are stored for the marginal effects of participants' answer that the value of houses is overestimated at the moment. Versions 1, 2, 4 and 5 have 399 observations and versions 3 and 6 have 578 observations due to missing observations in the variable *Tot_monthly_exp*.

The ordered logit models seem to perform better than the ordered probit models. Where the versions with robust standard errors do not seem to influence the results significantly. When only the variable *CCEI* is regressed this increases the significance level in the ordered probit model, but decreases the significance in the ordered logit model. In the end, the p-value of the variable *CCEI* is the same in the ordered logit model with and without robust standard errors, so version 1 will be discussed.

Being female decreases the probability of answering that the values of houses are overestimated by 11.0 percentage points at a 10 per cent significance level. And being retired, compared to having a paid job, increases the probability of giving the correct answer by 22.9 percentage points at a 1 per cent significance level.

In conclusion, CCEI scores seem to have a non-significant effect on consumers' correct interpretation of movements in the housing sector and mortgage market, except for model *b,* where CCEI scores seem to have a negative effect on consumer's interpretation of the housing sector. One could wonder whether the designed models are proper for answering this hypothesis. Nevertheless, some versions of the tested models indicate that a larger data set might help to improve the results. Of the non-demographic control variables, the results for the average mortgage interest rate are in line with what would be expected. A higher mortgage interest rate leads to higher expectations of housing prices. Of the demographic variables being female seems to negatively affect a consumer's interpretation in most models. Having a retirement age or being retired seems to positively influence a consumer's interpretation of the future, but negatively of the past.

Model a	(1)	(2)	(3)	(4)	(5)	(6)
CCEI	-0.176	-0.176	-0.004	-0.150	-0.150	0.030
	(0.151)	(0.165)	(0.147)	(0.144)	(0.154)	(0.133)
House_guess	0.001	0.001		0.000	0.000	
	(0.000)	(0.000)		(0.000)	(0.000)	
Mortgageinterestrate	0.662***	0.662***		0.623***	0.623***	
	(0.129)	(0.133)		(0.122)	(0.126)	
Female	-0.121**	-0.121***		-0.120**	-0.120***	
	(0.049)	(0.046)		(0.048)	(0.046)	
Age						
35-49	0.033	0.033		0.053	0.053	
	(0.079)	(0.083)		(0.076)	(0.079)	
50-64	-0.142*	-0.142*		-0.131*	-0.131	
	(0.078)	(0.084)		(0.074)	(0.080)	
65+	-0.268***	-0.268***		-0.254***	-0.254***	
	(0.098)	(0.101)		(0.095)	(0.097)	
Education						
Medium	-0.031	-0.031		-0.028	-0.028	
	(0.056)	(0.057)		(0.053)	(0.054)	
High	-0.082	-0.082		-0.079	-0.079	
	(0.053)	(0.056)		(0.051)	(0.052)	
Income						
€2,500-3,499	-0.113*	-0.113		-0.117*	-0.117*	
	(0.067)	(0.07)		(0.064)	(0.064)	
€3,500-4,999	-0.012	-0.012		-0.019	-0.019	
	(0.068)	(0.069)		(0.066)	(0.065)	
€5,000+	-0.054	-0.054		-0.046	-0.046	
	(0.074)	(0.074)		(0.071)	(0.069)	
Occupation						
House work	-0.044	-0.044		-0.017	-0.017	
	(0.116)	(0.105)		(0.116)	(0.102)	
Retired	0.034	0.034		0.044	0.044	
	(0.07)	(0.066)		(0.068)	(0.063)	
Others	0.141*	0.141*		0.149*	0.149*	
	(0.087)	(0.084)		(0.085)	(0.083)	
Household composition						
Partner	-0.026	-0.026		-0.023	-0.023	
	(0.057)	(0.058)		(0.054)	(0.055)	
Number of children	-0.017	-0.017		-0.018	-0.018	
	(0.022)	(0.022)		(0.021)	(0.021)	

Table 2: The marginal effects of a respondent's answer that the value of property increased in the past two years (1-3 ordered logit model, 4-6 ordered probit model).

*** Significant at the 1 per cent level
** Significant at the 5 per cent level
* Significant at the 10 per cent level

Model b	(1)	(2)	(3)	(4)	(5)	(6)
CCEI	-0.431*	-0.431*	-0.111	-0.463**	-0.463**	-0.067
	(0.231)	(0.241)	(0.146)	(0.223)	(0.220)	(0.134)
House_guess	-0.000	-0.000		-0.000	-0.000	
	(0.000)	(0.000)		(0.000)	(0.000)	
Mortgageinterestrate	-0.701***	-0.701***		-0.603***	-0.603***	
	(0.181)	(0.198)		(0.170)	(0.169)	
Gift	-0.073	-0.073		-0.045	-0.045	
	(0.116)	(0.116)		(0.117)	(0.108)	
Female	-0.035	-0.035		-0.051	-0.051	
	(0.073)	(0.081)		(0.07)	(0.073)	
Age						
35-49	-0.004	-0.004		-0.006	-0.006	
	(0.079)	(0.079)		(0.077)	(0.074)	
50-64	0.138	0.138		0.130	0.130	
	(0.095)	(0.102)		(0.091)	(0.094)	
65+	-0.129	-0.129		-0.13	-0.13	
	(0.224)	(0.236)		(0.22)	(0.217)	
Education						
Medium	0.093	0.093		0.118	0.118	
	(0.082)	(0.090)		(0.079)	(0.081)	
High	0.174**	0.174*		0.177**	0.177**	
	(0.077)	(0.092)		(0.072)	(0.081)	
Income						
€2,500-3,499	0.050	0.050		0.064	0.064	
	(0.099)	(0.110)		(0.092)	(0.102)	
€3,500-4,999	0.066	0.066		0.101	0.101	
	(0.097)	(0.105)		(0.091)	(0.094)	
€5,000+	0.078	0.078		0.12	0.12	
	(0.103)	(0.111)		(0.097)	(0.099)	
Occupation						
House work	0.293*	0.293**		0.282*	0.282**	
	(0.151)	(0.119)		(0.155)	(0.120)	
Retired	0.3	0.3		0.295	0.295	
	(0.229)	(0.246)		(0.22)	(0.222)	
Others	0.040	0.040		0.057	0.057	
	(0.143)	(0.147)		(0.140)	(0.141)	
Household composition						
Partner	-0.035	-0.035		-0.031	-0.031	
	(0.092)	(0.108)		(0.085)	(0.095)	
Number of children	-0.016	-0.016		-0.014	-0.014	
	(0.031)	(0.035)		(0.029)	(0.014)	

Table 3: The marginal effects of a respondent's answer that the prices of property will decrease in the next two years (1-3 ordered logit model, 4-6 ordered probit model).

*** Significant at the 1 per cent level
** Significant at the 5 per cent level
* Significant at the 10 per cent level

Model c	(1)	(2)	(3)	(4)	(5)	(6)
CCEI	0.036	0.036	0.042	0.018	0.018	0.038
	(0.129)	(0.127)	(0.119)	(0.124)	(0.119)	(0.111)
House_guess	-0.001**	-0.001		-0.001**	-0.001*	
	(0.000)	(0.000)		(0.000)	(0.000)	
Mortgageinterestrate	-0.424***	-0.424***		-0.404***	-0.404***	
	(0.111)	(0.116)		(0.102)	(0.103)	
Female	-0.042	-0.042		-0.033	-0.033	
	(0.043)	(0.041)		(0.042)	(0.041)	
Age						
35-49	-0.036	-0.036		-0.036	-0.036	
	(0.056)	(0.056)		(0.055)	(0.053)	
50-64	0.083	0.083		0.083	0.083	
	(0.059)	(0.062)		(0.057)	(0.057)	
65+	0.178**	0.178**		0.167**	0.167**	
	(0.089)	(0.087)		(0.085)	(0.082)	
Education						
Medium	0.033	0.033		0.040	0.040	
	(0.048)	(0.049)		(0.045)	(0.046)	
High	0.016	0.016		0.017	0.017	
	(0.046)	(0.05)		(0.043)	(0.046)	
Income						
€2,500-3,499	0.139***	0.139***		0.136***	0.136***	
	(0.049)	(0.049)		(0.047)	(0.047)	
€3,500-4,999	0.104**	0.104**		0.101**	0.101**	
	(0.047)	(0.050)		(0.045)	(0.047)	
€5,000+	0.154***	0.154***		0.162***	0.162***	
	(0.055)	(0.055)		(0.053)	(0.052)	
Occupation						
House work	-0.039	-0.039		-0.029	-0.029	
	(0.091)	(0.082)		(0.091)	(0.076)	
Retired	-0.040	-0.040		-0.024	-0.024	
	(0.060)	(0.058)		(0.06)	(0.056)	
Others	0.013	0.013		0.017	0.017	
	(0.08)	(0.083)		(0.075)	(0.076)	
Household composition						
Partner	-0.192***	-0.192***		-0.188***	-0.188***	
	(0.057)	(0.06)		(0.054)	(0.056)	
Number of children	0.018	0.018		0.018	0.018	
	(0.019)	(0.020)		(0.018)	(0.019)	

Table 4: The marginal effects of a respondent's answer that the price of their own house will decrease in the next two years (1-3 ordered logit model, 4-6 ordered probit model).

*** Significant at the 1 per cent level
** Significant at the 5 per cent level
* Significant at the 10 per cent level

Model d	(1)	(2)	(3)	(4)	(5)	(6)
CCEI	-0.069 (0.103)	-0.069 (0.115)	0.163 (0.073)	-0.070 (0.102)	-0.070 (0.114)	0.021 (0.757)
Tot_monthly_exp	0.000 (0.000)	0.000 (0.000)		0.000 (0.000)	0.000* (0.000)	
Mortgageinterestrate	-0.1169 (0.083)	-0.1169 (0.080)		-0.116 (0.085)	-0.116 (0.081)	
Female	-0.079*** (0.027)	-0.079*** (0.028)		-0.09*** (0.028)	-0.09*** (0.028)	
Age						
35-49	0.005 (0.042)	0.005 (0.046)		-0.001 (0.043)	-0.001 (0.046)	
50-64	0.072 (0.046)	0.072 (0.05)		0.074 (0.047)	0.074 (0.05)	
65+	-0.007 (0.061)	-0.007 (0.063)		-0.011 (0.064)	-0.011 (0.065)	
Education						
Medium	0.039 (0.037)	0.039 (0.039)		0.040 (0.038)	0.040 (0.039)	
High	0.018 (0.034)	0.018 (0.036)		0.016 (0.035)	0.016 (0.036)	
Income						
€2,500-3,499	-0.028 (0.052)	-0.028 (0.059)		-0.026 (0.050)	-0.026 (0.054)	
€3,500-4,999	-0.031 (0.052)	-0.031 (0.059)		-0.030 (0.051)	-0.030 (0.055)	
€5,000+	-0.043 (0.055)	-0.043 (0.06)		-0.034 (0.055)	-0.034 (0.057)	
Occupation						
House work	-0.054 (0.055)	-0.054 (0.053)		-0.041 (0.064)	-0.041 (0.063)	
Retired	0.039 (0.057)	0.039 (0.055)		0.044 (0.059)	0.044 (0.056)	
Others	0.059 (0.073)	0.059 (0.065)		0.067 (0.076)	0.067 (0.068)	
Household composition						
Partner	0.052 (0.032)	0.052 (0.033)		0.044 (0.035)	0.044 (0.044)	
Number of children	-0.011 (0.015)	-0.011 (0.016)		-0.010 (0.015)	-0.010 (0.010)	

Table 5: The marginal effects of a respondent's answer that interest rate of mortgages will decrease in the next two years (1-3 ordered logit model, 4-6 ordered probit model).

*** Significant at the 1 per cent level
** Significant at the 5 per cent level
* Significant at the 10 per cent level

Model e	(1)	(2)	(3)	(4)	(5)	(6)
CCEI	0.079	0.079	0.041	0.040	0.040	0.062
	(0.181)	(0.181)	(0.142)	(0.175)	(0.171)	(0.135)
Tot_monthly_exp	-0.000**	-0.000***		-0.000**	-0.000***	
	(0.000)	(0.000)		(0.000)	(0.000)	
Mortgageinterestrate	0.378**	0.378**		0.312**	0.312**	
	(0.149)	(0.156)		(0.141)	(0.145)	
Female	-0.110*	-0.110*		-0.11*	-0.11*	
	(0.060)	(0.060)		(0.058)	(0.057)	
Age						
35-49	0.024	0.024		0.023	0.023	
	(0.075)	(0.072)		(0.075)	(0.071)	
50-64	-0.014	-0.014		-0.016	-0.016	
	(0.076)	(0.071)		(0.075)	(0.070)	
65+	-0.142	-0.142		-0.149	-0.149	
	(0.128)	(0.126)		(0.123)	(0.12)	
Education						
Medium	-0.053	-0.053		-0.042	-0.042	
	(0.067)	(0.068)		(0.064)	(0.066)	
High	-0.027	-0.027		-0.026	-0.026	
	(0.065)	(0.068)		(0.063)	(0.065)	
Income						
€2,500-3,499	0.057	0.057		0.078	0.078	
	(0.086)	(0.099)		(0.080)	(0.091)	
€3,500-4,999	0.06	0.06		0.093	0.093	
	(0.087)	(0.099)		(0.081)	(0.09)	
€5,000+	0.029	0.029		0.058	0.058	
	(0.093)	(0.105)		(0.088)	(0.097)	
Occupation						
House work	-0.106	-0.106		-0.057	-0.057	
	(0.146)	(0.138)		(0.141)	(0.13)	
Retired	0.229***	0.229***		0.22***	0.22***	
	(0.083)	(0.080)		(0.083)	(0.079)	
Others	0.243**	0.243**		0.224**	0.224**	
	(0.094)	(0.108)		(0.097)	(0.108)	
Household composition						
Partner	0.001	0.001		0.013	0.013	
	(0.068)	(0.072)		(0.065)	(0.069)	
Number of children	0.003	0.003		-0.003	-0.003	
	(0.025)	(0.026)		(0.024)	(0.025)	

Table 6: The marginal effects of a respondent's answer that the value of houses is overestimated (1-3 ordered logit model, 4-6 ordered probit model).

*** Significant at the 1 per cent level
** Significant at the 5 per cent level
* Significant at the 10 per cent level

4.2 Second hypothesis

CCEI scores have a negative effect on consumers' wishes for a more expensive house, while their income level remains equal.

In table 7 the results are stored for the marginal effects of a consumer's wish to be able to buy a more expensive house. In Appendix B the results of the original models can be found. In both in the appendix and in the discussed tables below versions 1, 2 and 3 are based on logit models, where version 2 is with robust standard errors. The same holds for versions 4, 5 and 6, which are based on probit models, where version 5 is with robust standard errors. The versions with robust standard errors are generated to see if heteroscedasticity might cause the results to be insignificant. In addition, in version 3 and 6 only the CCEI scores are regressed on the dependent variable, to see if an increase in observations might cause the insignificance of the model to drop. The different goodness of fit measures can be found in Appendix C. In the discussed model ceteris paribus is assumed.

Versions 1, 2, 4 and 5 have 492 observations and versions 3 and 6 have 578 observations due to missing observations in the variables *Abs_house_guess* and *Mortgageinterestrate*. Based on the goodness of fit measures the probit and logit model do not differ that much, although the probit model scores slightly better. The p-values of the variable *CCEI* are the least insignificant in the probit models, with the lowest p-value is in version 6. This could indicate that if there would have been more data at least the variable to measure the level of rationality would be more significant. The models with robust standard errors improve the p-value of the variable *CCEI* as well, indicating that there might be some heteroscedasticity in the model. Therefore, version 5 will be used to interpret the results of the significant variables.

On average, at a 1 per cent significance level, being 65 years old or older, compared to being between 16 and 34 years old, decreases the probability of the wish to buy a more expensive house by 20.6 percentage points, ceteris paribus. In conclusion, CCEI scores do not have a significant effect on consumers' wish for a more expensive house, while their income level remains equal. As aforementioned a larger dataset might improve the results.

Model f	(1)	(2)	(3)	(4)	(5)	(6)
CCEI	0.125	0.125	0.174	0.124	0.124	0.173
	(0.126)	(0.119)	(0.112)	(0.123)	(0.114)	(0.108)
Abs_house_guess	-0.000	-0.000		-0.000	-0.000	
	(0.000)	(0.000)		(0.000)	(0.000)	
Mortgageinterestrate	-0.082	-0.082		-0.085	-0.085	
	(0.105)	(0.086)		(0.105)	(0.085)	
Female	-0.051	-0.051		-0.052	-0.052	
	(0.034)	(0.033)		(0.034)	(0.032)	
Age						
35-49	0.022	0.022		0.019	0.019	
	(0.079)	(0.085)		(0.076)	(0.079)	
50-64	-0.106	-0.106		-0.103	-0.103	
	(0.077)	(0.080)		(0.073)	(0.074)	
65+	-0.206***	-0.206**		-0.204***	-0.204***	
	(0.078)	(0.081)		(0.075)	(0.074)	
Education						
Medium	-0.060	-0.060		-0.065	-0.065	
	(0.045)	(0.048)		(0.044)	(0.045)	
High	-0.056	-0.056		-0.058	-0.058	
	(0.044)	(0.049)		(0.043)	(0.046)	
Income						
€2,500-3,499	0.045	0.045		0.037	0.037	
	(0.046)	(0.046)		(0.045)	(0.045)	
€3,500-4,999	0.083*	0.083*		0.08*	0.08*	
	(0.045)	(0.049)		(0.045)	(0.048)	
€5,000+	0.025	0.025		0.023	0.023	
	(0.046)	(0.048)		(0.046)	(0.048)	
Occupation						
House work	(.)	(.)		(.)	(.)	
Retired	0.055	0.055		0.051	0.051	
	(0.064)	(0.06)		(0.063)	(0.057)	
Others	-0.034	-0.034		-0.039	-0.039	
	(0.061)	(0.062)		(0.056)	(0.055)	
Household composition						
Partner	0.036	0.036		0.037	0.037	
	(0.039)	(0.038)		(0.039)	(0.037)	
Number of children	-0.014	-0.014		-0.013	-0.013	
	(0.016)	(0.016)		(0.016)	(0.016)	

Table 7: The marginal effects on a consumer's wish to buy a more expensive house (1-3 logit model, 4-6 probit model).

*** Significant at the 1 per cent level
** Significant at the 5 per cent level
* Significant at the 10 per cent level

4.3 Third hypothesis

CCEI scores have a positive effect on a consumer's choice for the National Mortgage Guarantee.

In order to answer this hypothesis two different models have been developed. In the first model, model *g*, the effect of rationality and the control variables will be used to test if they could explain a household's choice for a NMG on the first mortgage. In the second model, model *h*, the effect of rationality and the control variables will be used to test if they could explain a household's choice for a NMG on the first and second mortgage.

In Appendix B the results of the original models can be found. In both in the appendix and in the discussed tables below versions 1, 2 and 3 are based on logit models, where version 2 is with robust standard errors. The same holds for versions 4, 5 and 6, which are based on probit models, where version 5 is with robust standard errors. The versions with robust standard errors are generated to see if heteroscedasticity might cause the results to be insignificant. Furthermore, in version 3 and 6 only the CCEI scores are regressed on the dependent variable, to see if an increase in observations might cause the insignificance of the model to drop. The different goodness of fit measures can be found in Appendix C. In all the discussed models ceteris paribus is assumed.

Model g: In table 8 the results are stored for the marginal effects of a consumer's choice of a NMG on the first mortgage. Versions 1, 2, 4 and 5 have 201 observations and versions 3 and 6 have 431 observations. Based on the goodness of fit measures the probit and logit models do not differ that much, although the logit models scores slightly better. In addition, the p-values of the variable *CCEI* differ only slightly in the different versions, although the p-value worsens in version 3 and 6. The probit model with robust standard errors has the highest significance score, so version 5 will be discussed.

On average, at a 5 per cent significance level, a higher average mortgage interest rate decreases and being female increases the probability of a consumer choosing to have a NMG on the first mortgage by 36.6 and 16.1 percentage points respectively. At the same significance level, being older than 50 decreases, on average, the probability of a consumer choosing a NMG on the first mortgage. This is a decrease of 23.3 percentage points at an age between 50 and 64 years and a decrease of 35.9 percentage points at an age above 65 years, both compared to an age between 16 and 34 years. According to expectations, having an income level higher than €5,000, compared to the lowest income level, decreases on average

the probability of choosing a NMG by 38.8 percentage points. This could be expected, since individuals with higher income levels are less likely to be eligible for the NMG.

Model h: In table 9 the results are stored for the marginal effects of a consumer's choice of a NMG on both mortgages. Versions 1, 2, 4 and 5 have 391 observations and versions 3 and 6 have 578 observations. Based on the goodness of fit measures the probit and logit model do not differ that much, although the probit model scores slightly better. In addition, the p-values of the variable *CCEI* are the lowest in the probit models. The p-value of the variable *CCEI* decreases a lot in version 3, making it almost just as significant as in the probit models. The probit model with robust standard errors, version 5, seems to be the best model.

The low significance of this model could be due by the small percentage of respondents in this paper, who have a NMG on both mortgages (only 4 per cent has a NMG on both mortgages). This could in turn be explained by the regulations for being eligible for a NMG. A larger dataset containing more individuals, who would be eligible for a NMG, could help to improve the significance of the results.

In conclusion, CCEI scores do not have a significant effect on a consumer's choice for the National Mortgage Guarantee. However, being female has a positive effect on the choice of a NMG and being older than 50 or having an income level higher than €5,000 has a negative effect. In addition, the average mortgage interest rate seems to have a negative effect on the choice of a NMG, perhaps as it could increase house prices.

Model g	(1)	(2)	(3)	(4)	(5)	(6)
CCEI	0.213	0.213	0.079	0.204	0.204	0.079
	(0.232)	(0.226)	(0.173)	(0.226)	(0.243)	(0.172)
Abs_house_guess	-0.003***	-0.003**		-0.003***	-0.003***	
	(0.001)	(0.001)		(0.001)	(0.001)	
Mortgageinterestrate	-0.371*	-0.371**		-0.366*	-0.366**	
	(0.2)	(0.187)		(0.201)	(0.186)	
Gift	-0.157	-0.157		-0.158	-0.158	
	(0.099)	(0.101)		(0.099)	(0.1)	
Female	0.157**	0.157**		0.161**	0.161**	
	(0.074)	(0.073)		(0.075)	(0.073)	
Age						
35-49	0.015	0.015		0.023	0.023	
	(0.09)	(0.089)		(0.090)	(0.088)	
50-64	-0.225**	-0.225**		-0.233**	-0.233**	
	(0.104)	(0.094)		(0.105)	(0.095)	
65+	-0.371**	-0.371**		-0.359**	-0.359**	
	(0.155)	(0.145)		(0.166)	(0.153)	
Education						
Medium	0.057	0.057		0.063	0.063	
	(0.086)	(0.083)		(0.087)	(0.081)	
High	0.105	0.105		0.114	0.114	
	(0.082)	(0.083)		(0.081)	(0.080)	
Income						
€2,500-3,499	-0.154	-0.154		-0.158	-0.158	
	(0.107)	(0.101)		(0.109)	(0.102)	
€3,500-4,999	-0.101	-0.101		-0.102	-0.102	
	(0.107)	(0.1)		(0.11)	(0.102)	
€5,000+	-0.387***	-0.387***		-0.388***	-0.388***	
	(0.104)	(0.099)		(0.106)	(0.101)	
Occupation						
House work	-0.060	-0.060		-0.075	-0.075	
	(0.175)	(0.139)		(0.178)	(0.141)	
Retired	0.026	0.026		0.022	0.022	
	(0.211)	(0.189)		(0.212)	(0.188)	
Others	0.149	0.149		0.147	0.147	
	(0.138)	(0.134)		(0.141)	(0.133)	
Household composition						
Partner	0.088	0.088		0.08	0.08	
	(0.084)	(0.089)		(0.084)	(0.086)	
Number of children	0.047	0.047		0.045	0.045	
	(0.031)	(0.033)		(0.030)	(0.031)	

Table 8: The marginal effects on a consumer's choice of a NMG on the first mortgage

*** Significant at the 1 per cent level
** Significant at the 5 per cent level
* Significant at the 10 per cent level

Model h	(1)	(2)	(3)	(4)	(5)	(6)
CCEI	0.152	0.152	0.103	0.158	0.158	0.092
	(0.125)	(0.162)	(0.078)	(0.113)	(0.121)	(0.068)
House_guess	-0.001	-0.001*		-0.001	-0.001*	
	(0.001)	(0.000)		(0.000)	(0.000)	
Female	0.015	0.015		0.016	0.016	
	(0.029)	(0.028)		(0.03)	(0.026)	
Age						
35-49	-0.044	-0.044		-0.05	-0.05	
	(0.044)	(0.051)		(0.044)	(0.046)	
50-64	-0.047	-0.047		-0.051	-0.051	
	(0.045)	(0.052)		(0.045)	(0.048)	
65+	(.)	(.)		(.)	(.)	
Education						
Medium	-0.009	-0.009		-0.01	-0.01	
	(0.029)	(0.026)		(0.029)	(0.022)	
High	0.023	0.023		0.025	0.025	
	(0.033)	(0.027)		(0.033)	(0.025)	
Income						
€2,500-3,499	-0.036	-0.036		-0.038	-0.038	
	(0.05)	(0.05)		(0.049)	(0.044)	
€3,500-4,999	-0.027	-0.027		-0.028	-0.028	
	(0.051)	(0.051)		(0.05)	(0.046)	
€5,000+	-0.064	-0.064		-0.063	-0.063	
	(0.049)	(0.048)		(0.048)	(0.043)	
Occupation						
House work	0.006	0.006		0.021	0.021	
	(0.069)	(0.082)		(0.075)	(0.082)	
Retired	-0.012	-0.012		-0.009	-0.009	
	(0.046)	(0.048)		(0.045)	(0.043)	
Others	-0.013	-0.013		-0.010	-0.010	
	(0.044)	(0.043)		(0.045)	(0.041)	
Household composition						
Partner	-0.036	-0.036		-0.034	-0.034	
	(0.04)	(0.038)		(0.039)	(0.033)	
Number of children	0.016	0.016		0.016	0.016	
	(0.012)	(0.014)		(0.011)	(0.011)	

Table 9: The marginal effects on a consumer's choice of a NMG on both mortgages

*** Significant at the 1 per cent level
** Significant at the 5 per cent level
* Significant at the 10 per cent level

Chapter 5: Conclusion and discussion

5.1 Conclusion

In this paper the research question whether consumers' choices and behaviour in the housing sector and mortgage market could be explained by rationality in light of the financial crisis 2008 was investigated. A lot of research has been conducted with respect to governments and institutions after the financial crisis. However, research into the behaviour and choices of consumers in the housing sector has not been done, with any research that is available dating from far before the financial crisis. At the same time, there are signals from literature that financial literacy and knowledge have an important effect on financial behaviour.

The Dutch housing sector and mortgage market have some very interesting rules and regulations, which makes them fascinating for further investigation. Furthermore, the impact of the previous financial crisis lasted for a long time, until after 2013, which shows the importance of ensuring that the next financial crisis will not leave such a big impact on the Dutch economy. The next financial crisis is waiting anxiously around the corner, so it is important for consumers and the government to learn from mistakes made in the previous crisis.

This paper has been able to create an interesting dataset in which use is made of CCEI scores measured by Choi et al. (2014) and a Dutch survey on living conditions and mortgages (DHS). The influence of rationality on consumers' correct interpretation of movements in the housing sector and mortgage market, their desire for a more expensive house and choice for the NMG is insignificant in this model, resulting in the inability to answer the research question of this paper. A more extended dataset might help to improve the significance of the tested models and shed some light on the relationship between rationality and consumer's choices and behaviour in the housing sector.

Nevertheless, some individual characteristics and the average mortgage rate of the year that the participants answered the questionnaire are found to significantly influence consumers' choices and behaviour in the housing sector. Again a more extended dataset might help to improve and further investigate these found correlations. Further research could also be conducted to see what kind of influence these measurements have on other financial choices and behaviour of consumers.

5.2 Discussion

As a result of the intersection between the participants of the Choi et al. (2014) experiment and respondents of the CentER questionnaire about living conditions and mortgages the remaining sample has relatively few observations. This influences the results significantly and an important conclusion in this paper follows from this shortage of observations. Further research should be conducted to get a better view of the influence of rationality and individual characteristics on consumer's choices with respect to mortgages and other behaviour in the housing sector. The DHS is quite extensive and has enough possibilities for further research in consumers' behaviour on the topics discussed in this paper and on other areas.

The imperfections of the measurements of the independent variables in the models and the assumptions made in this paper have already been discussed throughout the paper. In order to improve this research it might be interesting to conduct an experiment where rationality and financial choices and behaviour of consumers could be measured at the same time. This will overcome the issue that the decision problems used to measure the level of rationality of participants is not significant to an individual's knowledge and rationality in the housing sector and mortgage market.

In my opinion, the external validity of a research conducted like this one is sufficiently large due to the created data set in this paper, that allowed for an interesting combination of in laboratory obtained CCEI scores and real world behavioural choices of the participants. Especially in behavioural economics it is quite difficult to create a good lab experiment in which the participants will behave as they normally would do to ensure that the results can be used to explain real world events. On the other hand, in an experiment conducted in the real world it is difficult to control all the variables and to ensure that the results are not influenced by unwanted extraneous elements. A combination of these two methods might help to overcome the issues belonging to the two different methods and could help to better explain human behaviour from an economic perspective.

In conclusion, this paper was a useful preliminary investigation into the influence of rationality on consumers with respect to their behaviour and choices surrounding houses and mortgages. Although, most of the results turned out to be insignificant it was a good start to fill the void in the literature surrounding these topics. Furthermore, the data used leaves room for interesting further research.

Appendices

Appendix A: Mean CCEI scores of the participants, figure 3 of Choi et al. (2014)
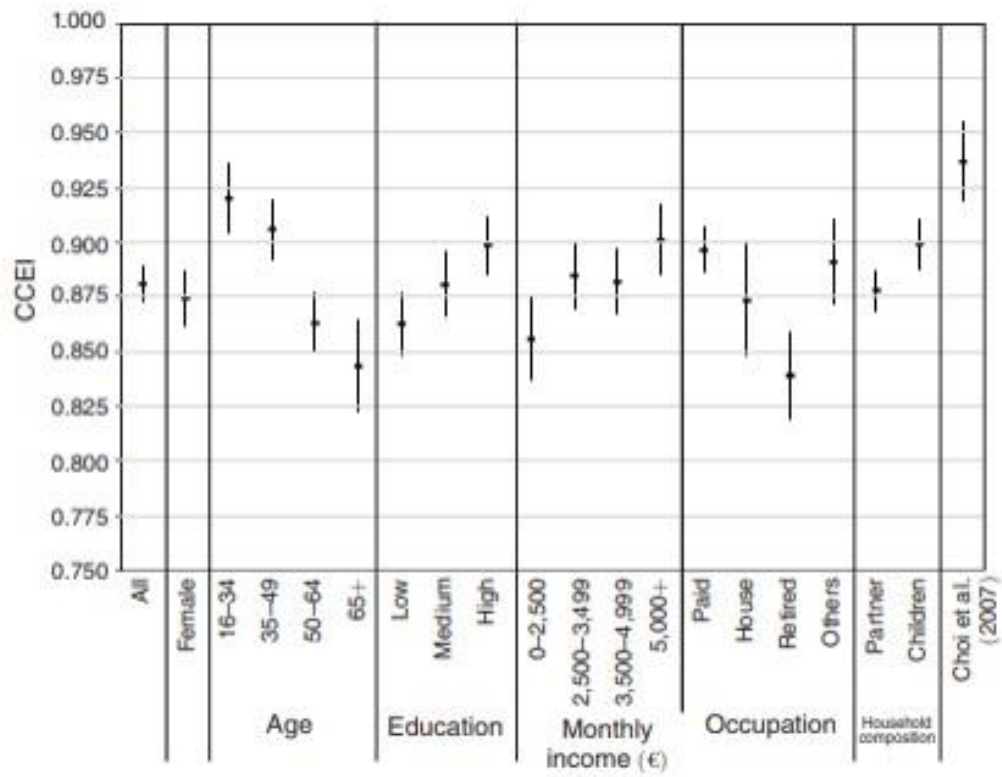
Appendix B: Results logit and probit models.

Model a	(1)	(2)	(3)	(4)	(5)	(6)
CCEI	-0.789	-0.789	-0.016	-0.413	-0.413	0.076
	(0.684)	(0.743)	(0.591)	(0.395)	(0.422)	(0.334)
House_guess	0.002	0.002		0.001	0.001	
	(0.002)	(0.002)		(0.001)	(0.001)	
Mortgageinterestrate	2.970***	2.970***		1.705***	1.705***	
	(0.616)	(0.635)		(0.351)	(0.361)	
Female	-0.555**	-0.555**		-0.335**	-0.335**	
	(0.233)	(0.220)		(0.138)	(0.133)	
Age						
35-49	0.148	0.148		0.145	0.145	
	(0.358)	(0.375)		(0.209)	(0.217)	
50-64	-0.620*	-0.620*		-0.352*	-0.352	
	(0.351)	(0.376)		(0.202)	(0.219)	
65+	-1.203***	-1.203**		-0.695***	-0.695**	
	(0.463)	(0.474)		(0.270)	(0.275)	
Education						
Medium	-0.140	-0.140		-0.077	-0.077	
	(0.247)	(0.253)		(0.145)	(0.147)	
High	-0.368	-0.368		-0.216	-0.216	
	(0.293)	(0.249)		(0.139)	(0.142)	
Income						
€2,500-3,499	-0.504*	-0.504*		-0.318*	-0.318*	
	(0.299)	(0.313)		(0.174)	(0.177)	
€3,500-4,999	-0.054	-0.054		-0.051	-0.051	
	(0.302)	(0.307)		(0.178)	(0.176)	
€5,000+	-0.242	-0.242		-0.125	-0.125	
	(0.328)	(0.331)		(0.194)	(0.189)	
Occupation						
House work	-0.202	-0.202		-0.047	-0.047	
	(0.538)	(0.488)		(0.322)	(0.282)	
Retired	0.153	0.153		0.121	0.121	
	(0.318)	(0.302)		(0.189)	(0.175)	
Others	0.642	0.642		0.413*	0.413*	
	(0.406)	(0.396)		(0.242)	(0.237)	
Household composition						
Partner	-0.118	-0.118		-0.062	-0.062	
	(0.254)	(0.259)		(0.148)	(0.152)	
Number of children	-0.078	-0.078		-0.048	-0.048	
	(0.100)	(0.099)		(0.059)	(0.057)	
Cut1	8.178***	8.178***	-3.573***	4.961***	4.961***	-1.850***
	(3.031)	(3.110)	(0.579)	(1.726)	(1.772)	(0.310)
Cut2	10.589***	10.589***	-1.857***	6.096***	6.096***	-1.028***
	(3.022)	(3.137)	(0.536)	(1.725)	(1.806)	(0.301)
Cut3	12.831***	12.831***	0.118	7.415***	7.415***	0.150
	(3.039)	(3.144)	(0.529)	(1.733)	(1.813)	(0.299)
Observations	512	512	578	512	512	578

Model b	(1)	(2)	(3)	(4)	(5)	(6)
CCEI	2.103*	2.103*	0.477	1.308*	1.308*	0.168
	(1.106)	(1.162)	(0.587)	(0.647)	(0.642)	(0.337)
Tot_monthly_exp	0.000	0.000		0.000	0.000	
	(0.000)	(0.000)		(0.000)	(0.000)	
Mortgageinterestrate	3.272***	3.272***			1.705***	1.705***	
	(0.896)	(0.970)		(0.503)	(0.496)	
Gift	0.351	0.351		0.130	0.130	
	(0.575)	(0.578)		(0.339)	(0.314)	
Female	0.165	0.165		0145	0145	
	(0.346)	(0.381)		(0.199)	(0.210)	
Age						
35-49	0.021	0.021		0.018	0.018	
	(0.375)	(0.374)		(0.221)	(0.212)	
50-64	-0.636	-0.636		-0.366	-0.366	
	(0.438)	(0.467)		(0.254)	(0.262)	
65+	0.667	0.667		0.398	0.398	
	(1.293)	(1.360)		(0.738)	(0.729)	
Education						
Medium	-0.463	-0.463		-0.351	-0.351	
	(0.419)	(0.465)		(0.239)	(0.250)	
High	-0.838**	-0.838*		-0.514**	-0.514**	
	(0.400)	(0.477)		(0.221)	(0.252)	
Income						
€2,500-3,499	-0.240	-0.240		-0.188	-0.188	
	(0.477)	(0.531)		(0.272)	(0.301)	
€3,500-4,999	-0.314	-0.314		-0.294	-0.294	
	(0.467)	(0.507)		(0.268)	(0.278)	
€5,000+	-0.370	-0.370		-0.344	-0.344	
	(0.494)	(0.529)		(0.286)	(0.289)	
Occupation						
House work	-1.386*	-1.386*		-0.801*	-0.801*	
	(0.786)	(0.627)		(0.473)	(0.369)	
Retired	-1.417	-1.417		-0.842	-0.842	
	(1.219)	(1.311)		(0.689)	(0.695)	
Others	-0.194	-0.194		-0.165	-0.165	
	(0.674)	(0.697)		(0.399)	(0.399)	
Household composition						
Partner	0.161	0.161		0.086	0.086	
	(0.424)	(0.500)		(0.238)	(0.267)	
Number of children	-0.073	-0.073		-0.040	-0.040	
	(0.145)	(0.163)		(0.083)	(0.090)	
Cut1	16.444***	16.444***	0.284	8.601***	8.601***	0.078
	(4.445)	(4.761)	(0.524)	(2.499)	(2.474)	(0.301)
Cut2	19.164***	19.164***	2.445***	10.203***	10.203***	1.353***
	(4.519)	(4.839)	(0.537)	(2.527)	(2.503)	(0.305)
Cut3	20.966***	20.966***	3.725***	11.103***	11.103***	01.964***
	(4.575)	(5.037)	(0.569)	(2.545)	(2.582)	(0.312)
Observations	215	215	578	215	215	578

Model c	(1)	(2)	(3)	(4)	(5)	(6)
CCEI	-0.194	-0.194	-0.209	-0.056	-0.056	0.114
	(0.687)	(0.675)	(0.593)	(0.394)	(0.376)	(0.331)
House_guess	0.004**	0.004		0.002**	0.002*	
	(0.002)	(0.002)		(0.001)	(0.001)	
Mortgageinterestrate	2.257***	2.257***		1.277***	1.277***	
	(0.592)	(0.614)		(0.328)	(0.325)	
Female	0.240	0.240		0.106	0.106	
	(0.240)	(0.238)		(0.138)	(0.134)	
Age						
35-49	0.232	0.232		0.136	0.136	
	(0.354)	(0.354)		(0.199)	(0.194)	
50-64	-0.460	-0.460		-0.271	-0.271	
	(0.354)	(0.354)		(0.199)	(0.194)	
65+	-0.911*	-0.911*		-0.514*	-0.514**	
	(0.470)	(0.465)		(0.269)	(0.258)	
Education						
Medium	-0.175	-0.175		-0.127	-0.127	
	(0.254)	(0.266)		(0.144)	(0.147)	
High	-0.089	-0.089		-0.054	-0.054	
	(0.247)	(0.270)		(0.138)	(0.148)	
Income						
€2,500-3,499	-0.821***	-0.821***		-0.473***	-0.473***	
	(0.308)	(0.310)		(0.174)	(0.172)	
€3,500-4,999	-0.637**	-0.637**		-0.364**	-0.364**	
	(0.312)	(0.326)		(0.173)	(0.177)	
€5,000+	-0.896***	-0.637*		-0.548***	-0.548***	
	(0.340)	(0.377)		(0.192)	(0.186)	
Occupation						
House work	0.213	0.213		0.094	0.094	
	(0.511)	(0.461)		(0.301)	(0.249)	
Retired	0.217	0.217		0.078	0.078	
	(0.334)	(0.321)		(0.193)	(0.180)	
Others	-0.068	-0.068		-0.051	-0.051	
	(0.407)	(0.427)		(0.231)	(0.231)	
Household composition						
Partner	0.931***	0.931***		0.551***	0.551***	
	(0.266)	(0.275)		(0.153)	(0.153)	
Number of children	-0.094	-0.94		-0.040	-0.040	
	(0.103)	(0.107)		(0.058)	(0.060)	
Cut1	9.616***	9.616***	-1.136	5.421***	5.421***	-0.688***
	(2.931)	(3.040)	(0.531)	(1.626)	(1.621)	(0.297)
Cut2	12.930***	12.930***	1.689***	7.366***	7.366***	1.011***
	(2.972)	(3.058)	(0.535)	(1.643)	(1.627)	(0.299)
Cut3	15.205***	15.205***	3.198***	8.420***	8.420***	1.740**
	(3.007)	(3.153)	(0.570)	(1.657)	(1.673)	(0.308)
Observations	512	512	578	512	512	578

Model d	(1)	(2)	(3)	(4)	(5)	(6)
CCEI	0.499	0.499	-0.124	0.288	0.288	-0.089
	(0.746)	(0.837)	(0.553)	(0.420)	(0.467)	(0.317)
Tot_monthly_exp	-0.000	-0.000		-0.000	-0.000*	
	(0.000)	(0.000)		(0.000)	(0.000)	
Mortgageinterestrate	0.866	0.866		0.476	0.476	
	(0.598)	(0.578)		(0.350)	(0.330)	
Female	0.638***	0.638***		0.405***	0.405***	
	(0.241)	(0.241)		(0.139)	(0.136)	
Age						
35-49	-0.038	-0.038		0.003	0.003	
	(0.347)	(0.379)		(0.197)	(0.207)	
50-64	-0.505	-0.505		-0.294	-0.294	
	(0.352)	(0.387)		(0.199)	(0.212)	
65+	0.062	0.062		0.053	0.053	
	(0.516)	(0.530)		(0.298)	(0.303)	
Education						
Medium	-0.282	-0.282		-0.165	-0.165	
	(0.274)	(0.292)		(0.156)	(0.163)	
High	-0.134	-0.134		-0.068	-0.068	
	(0.267)	(0.280)		(0.153)	(0.159)	
Income						
€2,500-3,499	0.193	0.193		0.101	0.101	
	(0.341)	(0.384)		(0.192)	(0.208)	
€3,500-4,999	0.214	0.214		0.120	0.120	
	(0.346)	(0.386)		(0.195)	(0.212)	
€5,000+	0.301	0.301		0.138	0.138	
	(0.373)	(0.399)		(0.213)	(0.222)	
Occupation						
House work	0.481	0.481		0.193	0.193	
	(0.576)	(0.563)		(0.334)	(0.333)	
Retired	-0.271	-0.271		-0.176	-0.176	
	(0.383)	(0.369)		(0.225)	(0.215)	
Others	-0.395	-0.395		-0.256	-0.256	
	(0.449)	(0.402)		(0.269)	(0.240)	
Household composition						
Partner	-0.403	-0.403		-0.188	-0.188	
	(0.274)	(0.286)		(0.158)	(0.159)	
Number of children	0.082	0.082		0.041	0.041	
	(0.106)	(0.116)		(0.060)	(0.064)	
Cut1	2.625	2.625	-1.800***	1.394	1.394	-1.091***
	(3.009)	(3.017)	(0.501)	(1.749)	(1.702)	(0.286)
Cut2	4.722	4.722	0.177	2.656	2.656	0.100
	(3.016)	(3.018)	(0.494)	(1.753)	(1.703)	(0.284)
Cut3	6.935**	6.935**	2.104***	3.899***	3.899***	1.211***
	(3.029)	(3.052)	(0.506)	(1.756)	(1.716)	(0.287)
Observations	399	399	578	399	399	578

Model e	(1)	(2)	(3)	(4)	(5)	(6)
CCEI	-0.357	-0.357	-0.175	-0.111	-0.111	-0.165
	(0.817)	(0.821)	(0.610)	(0.481)	(0.471)	(0.358)
Tot_monthly_exp	0.000**	0.000***		0.000*	0.000***	
	(0.000)	(0.000)		(0.000)	(0.000)	
Mortgageinterestrate	-1.710**	-1.710**		-0.857**	-0.857**	
	(0.691)	(0.724)		(0.393)	(0.404)	
Female	0.484*	0.484*		0.295*	0.295*	
	(0.263)	(0.263)		(0.153)	(0.153)	
Age						
35-49	-0.116	-0.116		-0.066	-0.066	
	(0.360)	(0.342)		(0.216)	(0.204)	
50-64	0.064	0.064		0.045	0.045	
	(0.357)	(0.337)		(0.215)	(0.201)	
65+	0.640	0.640		0.410	0.410	
	(0.597)	(0.585)		(0.349)	(0.338)	
Education						
Medium	0.240	0.240		0.116	0.116	
	(0.307)	(0.313)		(0.178)	(0.183)	
High	0.125	0.125		0.073	0.073	
	(0.302)	(0.317)		(0.175)	(0.182)	
Income						
€2,500-3,499	-0.254	-0.254		-0.209	-0.209	
	(0.381)	(0.437)		(0.214)	(0.243)	
€3,500-4,999	-0.265	-0.265		-0.252	-0.252	
	(0.383)	(0.432)		(0.217)	(0.239)	
€5,000+	-0.127	-0.127		-0.153	-0.153	
	(0.410)	(0.458)		(0.232)	(0.257)	
Occupation						
House work	0.444	0.444		0.149	0.149	
	(0.618)	(0.581)		(0.367)	(0.336)	
Retired	-1.116**	-1.116**		-0.638**	-0.638**	
	(0.473)	(0.459)		(0.275)	(0.259)	
Others	-1.204*	-1.204*		-0.654**	-0.654**	
	(0.618)	(0.674)		(0.333)	(0.372)	
Household composition						
Partner	-0.004	-0.004		-0.037	-0.037	
	(0.307)	(0.326)		(0.176)	(0.187)	
Number of children	-0.012	-0.012		0.008	0.008	
	(0.114)	(0.119)		(0.066)	(0.069)	
Cut1	-8.193**	-8.193**	0.392	-4.075**	-4.075**	0.195
	(3.440)	(3.511)	(0.545)	(1.974)	(1.980)	(0.320)
Cut2	-5.784*	-5.784*	2.342***	-2.750	-2.750	1.287***
	(3.426)	(3.477)	(0.559)	(1.969)	(1.965)	(0.323)
Cut3	-5.261	-5.261	2.650***	-2.510	-2.510	1.435**
	(3.430)	(3.439)	(0.556)	(1.971)	(1.948)	(0.324)
Observations	399	399	578	399	399	578

Model f	(1)	(2)	(3)	(4)	(5)	(6)
CCEI	1.201 (1.215)	1.201 (1.149)	1.604 (1.028)	0.647 (0.645)	0.647 (0.597)	0.846 (0.528)
Abs_house_guess	-0.003 (0.004)	-0,003 (0.005)		-0.002 (0.002)	-0.002 (0.002)	
Mortgageinterestrate	-0.793 (1.014)	-0.793 (0.826)		-0.445 (0.553)	-0.445 (0.445)	
Female	-0.551 (0.405)	-0.551 (0.397)		-0.297 (0.214)	-0.297 (0.203)	
Age						
35-49	0.131 (0.469)	0.131 (0.502)		0.065 (0.262)	0.065 (0.271)	
50-64	-0.790 (0.498)	-0.790 (0.518)		-0.430 (0.271)	-0.430 (0.275)	
65+	-2.582*** (0.823)	-2.582*** (0.805)		-1.334*** (0.427)	-1.334*** (0.400)	
Education						
Medium	-0.537 (0.391)	-0.537 (0.407)		-0.319 (0.213)	-0.319 (0.213)	
High	-0.487 (0.370)	-0.487 (0.408)		-0.278 (0.198)	-0.278 (0.210)	
Income						
€2,500-3,499	0.519 (0.564)	0.519 (0.577)		0.224 (0.289)	0.224 (0.292)	
€3,500-4,999	0.851 (0.542)	0.851 (0.587)		0.431 (0.275)	0.431 (0.295)	
€5,000+	0.307 (0.596)	0.307 (0.631)		0.147 (0.303)	0.147 (0.317)	
Occupation						
House work	0.000 (.)	0.000 (.)		0.000 (.)	0.000 (.)	
Retired	0.478 (0.517)	0.478 (0.483)		0.249 (0.288)	0.249 (0.263)	
Others	-0.393 (0.785)	-0.393 (0.804)		-0.245 (0.397)	-0.245 (0.382)	
Household composition						
Partner	0.378 (0.438)	0.378 (0.423)		0.207 (0.237)	0.207 (0.222)	
Number of children	-0.131 (0.154)	-0.131 (0.159)		-0.067 (0.084)	-0.067 (0.085)	
Constant	1.256 (5.048)	1.256 (4.141)	-3.379*** (0.936)	0.726 (2.749)	0.726 (2.323)	-1.905*** (0.477)
Observations	492	492	578	492	492	578

Model g	(1)	(2)	(3)	(4)	(5)	(6)
CCEI	1.281	1.281	0.349	0.726	0.726	0.213
	(1.408)	(1.536)	(0.763)	(0.807)	(0.869)	(0.465)
Abs_house_guess	-0.019***	-0.019***		-0.011***	-0.011***	
	(0.007)	(0.008)		(0.004)	(0.004)	
Mortgageinterestrate	-2.236*	-2.236*		-1.229*	-1.229*	
	(1.238)	(1.172)		(0.729)	(0.680)	
Gift	-1.033	-1.033		-0.611	-0.611	
	(0.744)	(0.754)		(0.435)	(0.438)	
Female	0.935**	0.935**		0.562**	0.562**	
	(0.447)	(0.440)		(0.265)	(0.255)	
Age						
35-49	0.078	0.078		0.070	0.070	
	(0.460)	(0.457)		(0.277)	(0.271)	
50-64	-1.255**	-1.255**		-0.779**	-0.779**	
	(0.592)	(0.524)		(0.354)	(0.316)	
65+	-2.526*	-2.526*		-1.393	-1.393*	
	(1.525)	(1.469)		(0.867)	(0.809)	
Education						
Medium	0.354	0.354		0.231	0.231	
	(0.536)	(0.514)		(0.319)	(0.298)	
High	0.633	0.633		0.409	0.409	
	(0.512)	(0.513)		(0.299)	(0.292)	
Income						
€2,500-3,499	-0.857	-0.857		-0.519	-0.519	
	(0.607)	(0.572)		(0.364)	(0.340)	
€3,500-4,999	-0.563	-0.563		-0.336	-0.336	
	(0.609)	(0.567)		(0.366)	(0.341)	
€5,000+	-2.365***	-2.365***		-1.404***	-1.404***	
	(0.704)	(0.686)		(0.413)	(0.396)	
Occupation						
House work	-0.379	-0.379		-0.280	-0.280	
	(1.132)	(0.894)		(0.693)	(0.549)	
Retired	0.157	0.157		0.079	0.079	
	(1.286)	(1.153)		(0.760)	(0.674)	
Others	0.888	0.888		0.516	0.516	
	(0.884)	(0.813)		(0.500)	(0.470)	
Household composition						
Partner	0.485	0.485		0.293	0.293	
	(0.542)	(0.572)		(0.319)	(0.327)	
Number of children	0.281	0.281		0.158	0.158	
	(0.190)	(0.208)		(0.110)	(0.114)	
Constant	9.846	9.846*	-0.927	5.710	5.710*	-0.573
	(6.010)	(5.556)	(0.684)	(3.566)	(3.284)	(0.417)
Observations	201	201	431	201	201	431

Model h	(1)	(2)	(3)	(4)	(5)	(6)
CCEI	3.130	3.130	2.716	1.592	1.592	1.085
	(2.527)	(3.272)	(1.977)	(1.126)	(1.190)	(0.785)
House_guess	-0.013	-0.013*		-0.006	-0.006*	
	(0.008)	(0.007)		(0.004)	(0.003)	
Female	0.285	0.285		0.157	0.157	
	(0.549)	(0.523)		(0.271)	(0.230)	
Age						
35-49	-0.723	-0.723		-0.403	-0.403	
	(0.633)	(0.708)		(0.318)	(0.318)	
50-64	-0.800	-0.800		-0.416	-0.416	
	(0.669)	(0.742)		(0.325)	(0.340)	
65+	0.000	0.000		0.000	0.000	
	(.)	(.)		(.)	(.)	
Education						
Medium	-0.242	-0.242		-0.120	-0.120	
	(0.722)	(0.669)		(0.347)	(0.274)	
High	0.440	0.440		0.233	0.233	
	(0.673)	(0.558)		(0.328)	(0.246)	
Income						
€2,500-3,499	-0.578	-0.578		-0.306	-0.306	
	(0.732)	(0.720)		(0.367)	(0.324)	
€3,500-4,999	-0.403	-0.403		-0.210	-0.210	
	(0.706)	(0.705)		(0.351)	(0.316)	
€5,000+	-1.322	-1.322		-0.624	-0.624*	
	(0.877)	(0.841)		(0.415)	(0.368)	
Occupation						
House work	0.110	0.110		0.185	0.185	
	(1.272)	(1.518)		(0.582)	(0.638)	
Retired	-0.277	-0.277		-0.099	-0.099	
	(1.141)	(1.190)		(0.509)	(0.489)	
Others	-0.305	-0.305		-0.112	-0.112	
	(1.126)	(1.105)		(0.521)	(0.473)	
Household composition						
Partner	-0.652	-0.652		-0.303	-0.303	
	(0.635)	(0.612)		(0.312)	(0.266)	
Number of children	0.337	0.337		0.162	0.162	
	(0.237)	(0.284)		(0.113)	(0.112)	
Constant	-4.457*	-4.457	-5.631***	-2.425**	-2.425**	-2.726***
	(2.470)	(3.368)	(1.829)	(1.102)	(1.224)	(0.719)
Observations	391	391	578	391	391	578

Appendix C: Goodness of fit measures

Model f	(1)	(2)	(3)	(4)	(5)	(6)
(Log-)likelihood	-171.089	-171.089	-215.947	-170.969	-170.969	-215.929
Efron's R^2	0.068	0.068	0.004	0.066	0.066	0.004
McFadden's R^2	0.091	0.091	0.006	0.092	0.092	0.006
AIC	376.178	376.178	435.895	375.939	375.939	435.857
Count R^2	0.872	0.872	0.875	0.872	0.872	0.875

Model g	(1)	(2)	(3)	(4)	(5)	(6)
(Log-)likelihood	-100.217	-100.217	-279.037	-100.215	-100.215	-279.038
Efron's R^2	0.288	0.288	0.000	0.285	0.285	0.000
McFadden's R^2	0.242	0.242	0.000	0.242	0.242	0.000
AIC	238.433	238.433	562.074	238.429	238.429	562.075
Count R^2	0.766	0.766	0.650	0.766	0.766	0.650

Model h	(1)	(2)	(3)	(4)	(5)	(6)
(Log-)likelihood	-74.004	-74.004	-95.555	-73.850	-73.850	-95.629
Efron's R^2	0.041	0.041	0.005	0.037	0.037	0.005
McFadden's R^2	0.096	0.096	0.012	0.098	0.098	0.011
AIC	180.008	180.008	195.109	179.700	179.700	195.258
Count R^2	0.946	0.946	0.960	0.946	0.946	0.960

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