Room rental as an alternative to student rooms

A quantitative study of the relationship between housing satisfaction and room rental and investigation into most appropriate household for room rental in the Netherlands

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ABSTRACT

The Netherlands is experiencing increasing pressure on the housing market. Increased demand for housing is seen due to for example elderly living at home longer, an increase in single-person households and immigration. Moreover, on the supply side, there is lack of space, long construction times and insufficient personnel at both municipalities and construction companies. This makes it impossible to build enough housing in the short term. Therefore, it is essential to use the existing housing stock intensively, one possibility for this is room rental. Room rental refers to renting out a room in a house where the lessor will also have his main residence. The importance, however, is that housing satisfaction is not compromised. Therefore, this research aims to analyze the relationship between room rental and the housing satisfaction of the lessor. It also examines for which households renting out a room is most appropriate. Quantitative research is performed based on the mediator effect. The Ordered and Binary Logistic Regression results indicate that room rental has a positive effect on the housing satisfaction of the lessor and that it is, most appropriate for households that are somewhat older, highly educated, owning a house, and having a large house. This allows the government to encourage and incorporate room rental into policy, for example, by providing greater accessibility through facilitating opportunities for tenants to rent out a room. The interpretation of the question whether people rent out rooms in the WoON2018 dataset is up for debate (§3.2).

Key words: Housing satisfaction, Shared housing, Hospitaverhuur, Housing market

PREFACE

The thesis presented is written as a completion of the master Real Estate Studies. A master that contributed greatly to my development in (international) real estate, but certainly was not always easy. Fortunately, the writing of this thesis proceeded quite smoothly. The topic caught my attention right from the beginning of my studies and the necessary data were available. Due to the actual topic and various related reports in the news, my interest only increased. The interest of my supervisor Prof. Dr. Ed Nozeman also motivated me. I considered the contact via email and the meetings (even in times of corona) as very valuable. I can really appreciate the quick and clear response via email, but especially emails out of interest to the progress is what makes a professor outstanding. With Ed's vast experience in both the real estate and the academic world, his feedback was always in place, and he did not hesitate to look for new opportunities. In addition to sharing points of attention and ideas regarding the thesis, there was also room for exchange of ideas about my future career. Prof. Dr. Ed Nozeman thank you! Furthermore, I would like to thank my family and friends who have supported me during the process.

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GLOSSARY

Table 1 Glossary

Term	Definition
Shared housing/Home sharing	"Shared housing involves two or more people who share a communal kitchen, bathroom, and lounge, with individual bedrooms generally off limits to other housemates. Equal responsibility for rent and housework are assumed" (Clark et al., 2018, p. 2).
Doubling up and Flatting	In these residential situations, several people share a house, which usually does not involve family relations. Doubling up refers to two or more adults or families residing in the same housing unit (Bush & Shinn, 2017). Flatting is shared housing of most of the time young adults. Flatting involves two or more people who share a communal kitchen, bathroom, and lounge, with individual bedrooms (Williamson, 2006).
Room rental	Renting out a room in a house (by both main occupants of owned and leased properties) where the (sub)lessor will also have his main residence (author).
Hospitaverhuur	Renting a room in a house in which the lessor himself has his main residence with a nine-month rental trial period (Article 7:232(3) Dutch Civil Code).

1. INTRODUCTION

1.1 Motivation

The Dutch housing market is overheated. Outbidding more than €50.000 on a property has become normal (Kraniotis, 2021a). Private sector rents have increased by more than 50% nationwide in recent years (Nieuwsuur, 2021). The construction of social housing has lagged due to the landlord levy that corporations have had to pay for eight years (De Jong & Kraniotis, 2021), this has caused waiting lists for social housing to be enormous (Rubio, 2020). The government is encouraging elderly to live longer in their homes. In 1975, 75% of over-75s lived independently; in 2017, approximately 92% lived independently. This implies limited housing market flow (Daalhuizen et al., 2019). It is being claimed that elderly occupy large houses, however alternatives offered such as flats are often inadequate or not available at all due to scarcity in the housing market (NOS, 2021a). Furthermore, there is a significant growth of the number of households, including a dramatic increase in the number of single-person households (CBS, 2021a). There is only one person living in 40% of the houses (Klaveren et al., 2021). Research indicates continuing growth over the next 15 years, requiring more and more houses (CBS, 2021b). The number of students has also increased. Students typically cohabit in shared houses. In fall 2021, there was a shortage of housing for 22,000 students in the Netherlands (NOS, 2021b).

Great frustrations among people looking for housing leads to various protests, it is being claimed that it is up to the government to ensure sufficient supply (NOS, 2021c). However, solving this problem is a challenging process. It is remarkable that the government is mainly considering solutions such as, adding more housing, increasing the pace of construction, and shortening procedures. Consequently, this was reflected in the ‘Actieagenda Wonen' provided in February 2021. The agenda aims to realize 120,000 new houses a year (Actieagenda Wonen, 2021). However, building space is scarce in the Netherlands, current land policy does not allow the community to benefit from increased appreciation (Bongenaar, 2022). In addition, the shortage of qualified personnel in the construction industry and lack of capacity of municipalities to make plans concrete and issue permits, makes the realization of the construction goal unachievable (Vastgoed Actueel, 2022). Likewise, aspects such as PFAS issue (harmful chemicals in (construction)soils), energy transition and sustainability must be considered, making construction a complex task (Bouwend Nederland, nd; NOS, 2020).

In the absence of immediate solutions for elevated demand, alternatives may be considered (Kraniotis, 2021b). Changes in demand, according to Buchanan (1929), can be traced back to the extensive or the intensive margin. The extensive margin entails that an increase in the

demand for space can be met by expanding the amount of land. The intensive margin implies that the same amount of land is used more intensively (Evans, 2004, p. 31). As mentioned, since land is scarce in the Netherlands, it is worth looking at the intensive margin, where the density of utilizing land can be increased. A variety of ways to do this are, for example, building houses in gardens (Evans, 2004, p. 39), replacing existing low-rise by high-rise buildings, and adding an additional building layer to existing buildings (Evans, 2004, p. 34). One alternative, where building is excluded, is to place more people in existing houses. To accomplish this, individuals or households without relationship ties will have to live together. This is commonly referred to as shared housing. Shared housing can be divided into two categories. First, individuals or households who occupy housing in a similar way, they all rent a part of the house from the owner and share, for example, the living room and kitchen. There are several terms that designate this type of shared housing, for example, doubling up and flatting. Second, renting a part of a property where the landlord also has his or her primary residence. The landlord may be the owner or the main tenant of the dwelling. Here the dwelling sharers are interrelated by a tenure agreement. This thesis focuses on the latter category, which is a small niche in the housing market, referred to as ‘room rental’.

Renting out a room was quite common in the older days, hence the term ‘hospitaverhuur’ originated in the Netherlands, which entails for renting a room in a house in which the lessor himself has his main residence. Hospitaverhuur is described in article 7:232(3) of the Dutch Civil Code. Where stated, hospitaverhuur is a nine-month rental trial period, during which the rental can easily be terminated by the lessor. After nine months, the tenant receives rent protection. Despite the nine-month exemption, rent protection is a reason why many people are reluctant to rent out a room. Hospitaverhuur is covered within room rental. Although widespread support is lacking nowadays, attention to the issue in politics and media is growing. The (former) Minister of BZK, Ollongren, came up with the notion of maximizing the use of the existing housing stock in February 2020. She asked to conduct further research on ‘Cohousing’ (Klaveren et al., 2021). The Dik-Faber motion also calls for an improvement agenda for communal living (Dik-Faber, 2020). A motion by Krol calls explicit attention to removing policies and regulations that prevent shared housing (Krol, 2019).

Elderly who are living at home longer, single person households and parents whose children have moved out often have one (or more) bedroom(s) left in their house. One way still being able to utilize this space in the housing crisis is, by renting out rooms. Room rental could be an opportunity to address, for example, the tightness of the market for student rooms, which is the case in most cities. Students, starters and singles could (temporarily) rent a room from households.

In a recently published article in the newspaper Trouw, three professors affiliated with the University of Maastricht provide their perspective on more effectively utilizing the housing stock through shared housing. One aspect highlighted is the significant number of people living alone and the size of their houses, which are often large enough to share with an additional person. Housing corporations Portaal and De Alliantie are experimenting with allowing tenants to rent out a room within social housing. A foundation called Ouderenhuisvesting Rotterdam commissioned a survey on the willingness of their residents to share their houses, which showed that one out of five residents is willing to do so (Eichholtz et al., 2022). However, it remains to be seen how many of these will actually proceed to rent out a room. Many people are reluctant to rent out a room for various reasons, for example due to the expectation of losing privacy. Research indicates that in 1991 about 80,000 households rented out rooms, which corresponds to 1.5% of all Dutch households (Beijering, 1991). It is expected that this percentage has only decreased (Kraniotis, 2021b). What is the exact reason for this low percentage of households? By examining the relationship between room rental and housing satisfaction, it can be determined whether people's assumed reluctance to rent out a room is (un)justified. In this thesis, the definition of housing satisfaction is the following: the feeling of satisfaction when, with regard to the physical housing, one has achieved what one desired or wished for (aspects are, for example, a nice bathroom, a leakproof roof and a kitchen to one's taste), combined with satisfaction with one's living conditions and enjoyment of living (aspects are, for example, sociability in one's house, emotional stress or conflicts that living or aspects of living entails) (author). A relationship with housing satisfaction rather than, for example, the more general aspects of 'happiness' or 'overall life satisfaction' will be used since Thomsen & Eikemo's (2010) research indicates that there is a relationship between sharing facilities and housing satisfaction. Sharing facilities is therefore a factor of an individual's housing satisfaction, moreover, with room rental you also share facilities, therefore it is assumed that room rental is a factor that determines individual's housing satisfaction. Housing satisfaction is part of (a specific domain) overall satisfaction (Vera-Toscano & Ateca-Amestoy, 2008). By using housing satisfaction, the study focuses more specifically on housing than if happiness or general life satisfaction was considered. It is also relevant to understand the characteristics of people who are renting rooms, this will help determine for which target group room rental is most appropriate.

1.2 Academic relevance

Several researchers have conducted studies concerning shared housing. Remarkably, the scope of these studies focuses on all kinds of home sharing, except room rental. Besides the fact that literature on shared housing indicates conflicting results regarding housing satisfaction, the results also do not directly relate to room rental. The special feature of room

rental is that the landlord also lives in the property, which creates mutually different interests compared to other forms of shared housing. Apart from a few exceptions, there is no research related to renting out a room in a house where the (sub)lessor himself also continues to live[1]. Therefore, no information is available on which group of people participates in renting out a room and what the effects are on their housing satisfaction. This research will expand the existing literature on shared housing in the area of room rental.

1.3 Research aim

The aim of this research is to investigate whether there is a relationship between housing satisfaction and room rental, in addition, it analyzes for which population group renting out a room is most appropriate in the Netherlands. This will enable municipalities to specifically approach households that may want to contribute to room rental. This could lead to more people willing to rent out a room. In this way, there is an opportunity to slightly reduce the number of people looking for a room by increasing the density of the country, without building.

1.4 Research questions

Main question

From the motivation and the research aim, the following main question emerges:

To what extent is room rental related to housing satisfaction, and, for which (types of) households is it most appropriate?

Sub-questions

1. Which factors influence housing satisfaction? (Literature research)

2. Does room rental affect the housing satisfaction of the lessor?

3. To what extend differ households renting out a room from households not renting out a room?

1.5 Structure of the research

The remainder of this thesis is organized as follows. Section 2 describes the existing literature, hypotheses and is answering sub-question 1. Section 3 is focusing on the use of available data and the method; section 4 analyses the results and is answering sub-questions 2 and 3 including discussion. In the final section (section 5) the conclusion on the main question can be found together with recommendations for policy and further research.

[1] No existing literature has been found by using the searching machines SmartCat (the library catalogue of the Library of the University of Groningen) and Google Scholar, by using the terms: 'Hospitaverhuur', 'Landlady rental', 'Kostgangers', 'Huis delen', 'Home sharing', 'Shared housing', 'Collectieve woonvormen', 'Spare room rental', 'Doubling up', 'Cohousing', 'Collectief wonen', 'Communal Living', 'Unrelated households', 'Accessory dwelling units' and 'Flatting'.

2. THEORY, LITERATURE REVIEW & HYPOTHESES

The main concepts of the research question will be discussed by use of existing literature. First, aspects that affect housing satisfaction will be addressed, after which the first sub-question can be answered. Second, advantages and disadvantages of shared housing will be described. Third, the characteristics of people sharing houses will be analyzed. As well, the expected relationship between the concepts will be investigated and visualized in a conceptual model.

2.1 Aspects affecting housing satisfaction

To answer sub-question 1, 'What factors influence housing satisfaction?', a literature review is conducted. An understanding of the concept of housing satisfaction is presented, followed by a discussion of the relation to home sharing, finally the individual and housing characteristics associated with housing satisfaction are highlighted.

Satisfaction is defined as a situation in which a person has no more desires (Van Dale, 2022). Housing satisfaction is related to the dwelling, for example, satisfaction with; size, amenities, neighbors, physical state, and location (Dekker et al., 2011). Thomsen & Eikemo report the following regarding housing satisfaction, "In general, housing satisfaction depends on such personal factors as different phases of life, social and cultural background, financial situation, and expectations, but also on the architectural characteristics of a building or a dwelling. People evaluate their housing satisfaction by comparing their preferences to their actual housing situation. If these differ greatly, they are likely to be dissatisfied with where they are living (Gifford 2002)" (Thomsen & Eikemo, 2010, p. 274). Each person interprets the degree of housing satisfaction in a way that seems right for him or her at that particular moment. It is important to identify factors that influence housing satisfaction; through satisfaction, immobility can be predicted (Speare,1974). Dissatisfied people are more likely to abandon a property (Feijten & Van Ham, 2009). Furthermore, Lu (1999) determined that understanding the factors that influence housing satisfaction can be important in designing successful housing policies. The literature indicates that there are relationships between housing satisfaction, and individual and household characteristics (Amerigo & Aragones, 1997; Chapman & Lombard, 2006). People's expectations at certain points in their lives affect their housing satisfaction (Clark et al., 2006; Feijten & Van Ham, 2009; Vale, 1997).

First, literature as mentioned earlier indicates that sharing facilities in a house affects the degree of housing satisfaction a person experiences. Research by Aftenposten (2001) and Dagsavisen (2005) in Norway both indicated that students prefer not to share bathrooms and

kitchens. Research by Brattbakk & Medby (2004) also indicates that houses in which facilities such as bathroom(s) and kitchen(s) must be shared are less desirable and thus less easy to find tenants. More recent research by Thomsen & Eikemo (2010) focuses on the effect of different forms of living (alone or with others) on housing satisfaction. This research demonstrates in contrast to previously mentioned research that having one's own facilities and living alone does not provide as much added value as was thought.

Individual characteristics

First, household composition appears to be closely related to housing satisfaction (Adams & Gilder, 1976; Clark & Onaka, 1983; Clark et al., 2006). Depending on the house one resides in and the composition of one's household, people are more or less satisfied. For example, couples are more satisfied in a flat than families with children. Households with children are more satisfied in a house with a garden. Thus, the amenities for children are important to parents and as a result, the presence or absence is influential on the housing satisfaction. A negative relationship was found between the time children play outside and on which floor they live, a factor that also determines parental satisfaction (Morville, 1969). Furthermore, research has additionally shown that children play an important role in connecting with neighbors and other local people (Campbel & Lee, 1992; Guest & Wierzbicki, 1999). Which is influential given the fact that research also demonstrates that the more social interactions and contacts lead to greater housing satisfaction (Amerigo & Arragones, 1997; Dekker & Bolt, 2005; Skifter Andersen, 2008). For single person households being more positive about their housing may be related to the fact that they are more mobile and often consider a residence to be temporary, perceiving the residence as a stopover in their housing career (Musterd & Van Kempen, 2007). Second, age, research demonstrates that younger people are less satisfied with their houses than older people. This is also due to the notion that younger people often consider their houses as a temporary residence, striving toward a house they cannot afford until later in life (Lu, 1999). Third, income is a complicated factor related to housing satisfaction. The effect of income on housing satisfaction can be twofold. When income is low and a person is ‘forced to stay’, this can lead to a negative reaction regarding housing satisfaction, however, the situation can also lead to high housing satisfaction as the individual may already be happy with the fact that there is an opportunity to stay. Low-income households have high housing satisfaction if their rent is low enough. When income is high there are more opportunities, which may lead to either acceptance or negative feelings at current housing (Dekker & Bolt, 2005; Lee & Campbell, 1999). Fourth, education level, lower educated people tend to be more satisfied with their houses (Dekker et al., 2004).

Housing characteristics

Many countries are striving for as much homeownership as possible, this policy stems from the idea that owning a property has a positive effect on housing satisfaction, self-esteem, and affiliation with the community (Elsinga & Hoekstra, 2005). Part of the reason is that homeowners often have higher incomes than renters and this provides more housing opportunities (Deurloo et al., 1994). It is also claimed that rental houses are of lower quality than owned properties and owners assume more responsibility for their houses (Saunders, 1990). Furthermore, research indicates that the longer people live somewhere, the less satisfied they are (Dekker et al., 2011). Dekker & Van Kempen (2004) also concluded that people living in poorer neighborhoods with lots of social rental housing, have more worries and pessimistic feelings. Many countries endeavor to establish a mixed population in neighborhoods to combat demolishing and ensure a safe environment (Musterd, 2008; Van Beckhoven & Van Kempen, 2003; Dekker et al., 2011). One other point that has been proven is that people who lived in poor neighborhoods were eager to leave, the outflow of those who could afford it simply created even more poorer neighborhoods (Musterd & Van Kempen, 2007). As opposed to striving for mixed population, it has been discovered that people prefer to live in a neighborhood with people who have similar characteristics, herein they are more satisfied because they recognize their self (Bobo & Zubrinsky, 1996; Clark, 1991, 1992; Feijten & Van Ham, 2009). In addition, studies in the United States claim that white people prefer to live in white neighborhoods (Clark, 1992). This stems from negative thoughts regarding races, crime, and disorder (Crowder, 2000; Ellen, 2000). Location is another important factor for many people, however, no clear conclusion can be drawn on this, for example, one person likes to live in an urban area with various amenities and another person prefers to live in a rural area (Boyle et al., 1998; Barcus, 2004; Plock & Cook, 1982; Williams & Jobes, 1990). The characteristics of a house itself also play into the level of satisfaction (Baker, 2008; Clark & Onaka, 1983; Fuller, 1995). The appearance of buildings affects housing satisfaction (Hastings & Dean, 2003; Rowlands et al., 2009). The size of the house contributes to the level of satisfaction; people with larger homes tend to be more satisfied (Rossi, 1980). Furthermore, people are more satisfied after renovation (Dekker et al., 2011). In addition, the quality of the property is very important, which is often related to the price of housing; the higher the quality, the higher the (rental) price. Various studies have shown that the quality of the house contributes very strongly to housing satisfaction (Bird, 1976; Kintrea & Clapham, 1986). Available amenities in the area also play a role in the level of satisfaction, for example, playgrounds, schools, green space, public transportation, arterial roads, and stores (Wilson et al., 1995). Harris (1999) concluded that problems related to dirt, drugs, criminality, and vandalism create dissatisfaction. This creates a feeling of insecurity and motivates the desire to move (Atkinson & Kintrea, 2000).

By conducting the literature about housing satisfaction, sub-question 1 (Which factors influence housing satisfaction?) can be answered. **Table 2** identifies the factors that according to previous research influence housing satisfaction. These factors could be potential independent variables in the remainder of this thesis.

Table 2 Factors which influence housing satisfaction

Factor	**Authors**
Shared facilities/housing	Aftenposten, 2001; Dagsavisen, 2005; Brattbakk & Medby, 2004; Thomsen & Eikemo, 2010
Individual characteristics	**Authors**
Household composition	Adams & Gilder, 1976; Clark & Onaka, 1983; Clark et al., 2006
Age	Lu, 1999
Income	Dekker & Bolt, 2005; Lee & Campbell, 1999
Education level	Dekker et al., 2004
People's expectations at certain points in their lives	Clark et al., 2006; Feijten & Van Ham, 2009; Vale, 1997
Housing characteristics	**Authors**
Tenure type	Elsinga & Hoekstra, 2005; Deurloo et al., 1994
Quality of housing/Physical state/Appearance of buildings	Saunders, 1990; Bird, 1976; Kintrea & Clapham, 1986; Dekker et al., 2011; Hastings & Dean, 2003; Rowlands et al., 2009
The number of years living at the same place	Dekker et al., 2011
Neighborhood composition	Dekker & Van Kempen, 2004; Musterd, 2008; Van Beckhoven & Van Kempen, 2003; Dekker et al., 2011; Musterd & Van Kempen, 2007; Bobo & Zubrinsky, 1996; Clark, 1991, 1992; Feijten & Van Ham, 2009
Location	Boyle et al., 1998; Barcus, 2004; Plock & Cook, 1982; Williams & Jobes, 1990

Size	Dekker et al., 2011; Rossi, 1980
Amenities (e.g., playgrounds, schools, green space, public transportation, arterial roads, and stores)	Dekker et al., 2011; Wilson et al., 1995
Security (e.g., dirt, drugs, criminality, and vandalism)	Atkinson & Kintrea, 2000; Harris, 1999

2.2 Advantages and disadvantages of shared housing

To answer the second sub-question '*Does room rental affect the housing satisfaction of the lessor?*', a literature review is conducted prior to quantitative research. To identify whether room rental has a positive or negative effect on the housing satisfaction of the lessor, the literature is reviewed to determine the advantages and disadvantages of room rental. Since room rental is a form of shared housing, and considering the limited literature regarding room rental, literature research on the advantages and disadvantages of shared housing is also conducted.

A study from 1991 conducted by Beijering examined whether new government policies could help to increase the number of people willing to rent out a room in the Netherlands. In this paper, reasons for the unwillingness to rent out a room are investigated. One notable reason is being curtailed on unemployment benefits or rental subsidies due to the additional income that renting out a room provides. Furthermore, loss of privacy, a house that is not big enough, fear of rent protection for the tenant, and restrictions in the lease and mortgage are mentioned as reasons for the unwillingness to rent out a room (Beijering, 1991). However, the Dutch government has a special arrangement for the income of renting out a room. No income tax must be paid, which in Dutch is called 'kamerverhuurvrijstelling'. This exemption applies up to rental income of €5,711 per year (Rijksoverheid, 2021a). Furthermore, it is quite simple to start room rental, no permission is needed from the municipality and the tenant has no rent protection for the first nine months. In most instances, research shows that not wanting to rent out a room is not attributable to one specific reason, but to a combination of reasons (Beijering, 1991). **Table 3** presents the advantages and disadvantages of renting out a room.

Table 3 Advantages and disadvantages to the landlord of renting out a room

Advantages	**Disadvantages**
Additional income and ‘Kamerverhuurvrijstelling’ (no tax)	Being curtailed on unemployment benefits or rental subsidies
No permission needed	Loss of privacy
No rent protection in the first nine months	Loss of space
	Fear of rent protection

Since little is known about the advantages and disadvantages of renting out a room besides the article mentioned above, other forms of living that may potentially overlap with renting out a room are examined (shared housing). For example, the phenomena of 'doubling up', 'flatting' and ‘collective living arrangements’. Since in these residential situations, similar to room rental, several people live together and consequently interact, the advantages and disadvantages of these residential situations could also apply to room rental.

Pauly (2015) of the Faculty of Philosophy at the University of Groningen examined the pros and cons of collective living arrangements. The following findings derived; living together allows for cheaper living, even issues such as paying for food and maintenance together saves costs. Besides preventing loneliness, living together also contributes to social and personal development. Disadvantages, however, are, the loss of privacy, reduced personal space and conflicts within the house which can greatly affect individual lives and housing satisfaction.

One of the main reasons for home sharing is to ease the economic burden of housing (Despres, 1993, 1991). People with low incomes and, as a result, forced to participate in home sharing, are more likely to live in overcrowded homes (Koebel & Murray, 1999). Furthermore, crowdedness at home can lead to a lack of silence, which in turn can lead to a lack of concentration on (school) work (Gove et al., 1979). Sharing a house can lead to emotional tension (Mitchell, 1971). Research demonstrates that shared housing is stigmatized by society, and that home sharing is linked to negative effects on mental health and self-esteem (Hemmens et al., 1996). Home sharing can lead to stress and conflict within the household (Halpern, 1995). Evans et al. (2005) indicated that home sharing can also have negative effects on children. Since home sharing is often accompanied by a more chaotic living environment such as noise, lack of structure and lack of privacy, this creates instability in children's lives which can also have harmful, long-term effects (Bronfenbrenner & Evans, 2000). Research by Kemp and Rugg (1998) indicates that living with strangers can involve risk, insecurity, and loneliness. Some people are bothered by noise, foul odors, and messiness

from roommates (Heath et al., 2018). Research by Bush & Shinn (2017) identified that home sharing was generally a negative experience for families in their sample, this can be attributed to, e.g., lack of personal space and privacy.

However, there are also positive aspects related to home sharing. “The lifestyle has been popularised in US based TV shows such as Friends, Big Bang Theory, and Super Fun Night, where shared households are represented as sources of fun, companionship and mutual support in coping with the vicissitudes of daily life” (Clark et al., 2018, p. 2). For single people, it can be comfortable to hear another person in the house, this contributes to the feeling of comfort and security (Heath et al., 2018). According to Clark et al. (2017), home sharing alleviates loneliness, in part because it can provide emotional support from fellow residents (Despres, 1991; Hemmons et al., 1996). Living with roommates who share a similar style of life is considered enjoyable and can boost social life (Clark et al., 2017). Research suggests that home sharing can also contribute positively to a child's development (Koebel & Murray, 1999; Koebel & Rives, 1993). Low-income families who share housing can live together in better quality housing, safer neighborhoods, allowing children to feel safer and play outside (Despres, 1991; Evans et al., 2003). **Table 4** summarizes the advantages and disadvantages of shared housing.

Table 4 Advantages and disadvantages of shared housing

Advantages	**Disadvantages**
Cheaper housing	Less privacy
Prevents loneliness	Reduced own space
Contributes to social and personal development	Conflicts greatly affect individual lives and residential enjoyment (Emotional tension)
Fun and companionship	Lack of silence
Mutual support	Negative effects on mental health, self-esteem, and stress
Feel of security and comfort	More chaotic living (can have a negative effect on children)
Can boost social life	Lack of structure
More interaction can contribute to a child’s development	Risk of living with strangers (insecurity)
By sharing costs, people can live in better quality housing and neighborhood	Messiness and foul odors from roommates

Landlords are often reluctant to allow home sharing, as there are several requirements imposed by the Dutch government. There are requirements regarding noise, fire safety and the size of the living room. Furthermore, a landlord must apply for a permit while this is not required when renting to a family or a couple (Woon informatie en advies, nd). Housing sharing will also be financially more complicated for landlords.

2.3 Characteristics of house sharers

Prior to the quantitative research in order to answer the third sub-question *'To what extend differ households renting out a room from households not renting out a room?*', it is relevant to analyze the existing literature regarding the characteristics that house sharers possess in order to implement in the quantitative research.

Research by Heath & Cleaver (2003) concludes that home sharing is primarily done by people who are single, unrelated, childless, employed and geographically flexible. In contrast, data from the American Housing Survey indicates that people choose to share a home regardless of income, age, race, or marital status (Bush & Shinn, 2017).

Single-parent households would be more likely to choose to share a home since single-parent households rarely own a home and have a high degree of residential mobility (Norton & Glick, 1986). Other research confirms this conclusion by seeing that single mothers often engage in home sharing, as they tend to be young and low-skilled (Bush & Shinn, 2017).

Income emerges in almost all studies as the biggest driver behind home sharing (Kemp & Rugg, 1998; Natalier, 2003). Especially for people whose financial situation is unstable, with a limited budget, home sharing is a good alternative (Day, 2016). This idea is supported by the fact that in the US an increase in home sharing was observed during the time of the economic recession (Eggers & Moumen, 2013). Despite this, it is also said that home sharing is increasingly common among households at all income levels (Bush & Shinn, 2017). Due to the housing shortage, more and more young adults are continuing to live with their parents. Home sharing is an affordable alternative to enable young people to leave the parental house (Burn & Szoek, 2016). Furthermore, it is mentioned that people are often not open to house sharing later in life, because at some point people want to have their own place (Clark, 2017).

2.4 Hypotheses

Based on the literature, hypotheses can be formulated, which will form the foundation for the statistical analysis that follows. All hypotheses must be viewed in the context of the Netherlands. The connection between the hypotheses is through the mediator effect, which is presented in conjunction with the conceptual model (section 2.5).

Hypothesis 1: There is a negative association between room rental and the housing satisfaction of the lessor.

This first hypothesis follows from considerable negative aspects that exist with respect to shared housing. For example, the research of Beijering (1991), which concluded several negative associations, such as, loss of privacy and fear of rent protection. Furthermore, studies have shown evidence that shared housing can result in overcrowding at home, lack of quiet, lack of concentration, emotional stress, negative effect on mental health and self-esteem, risk, uncertainty, stress, and conflict (Koebel & Murray, 1999; Gove et al., 1979; Mitchell, 1971; Hemmens et al., 1996; Halpern, 1995; Heath et al., 2018). As a result, it may be that the negative feelings surrounding home sharing could decrease housing satisfaction.

Hypothesis 2: Income and age of respondents who are renting out a room are lower than those who are not renting out a room.

The second hypothesis follows from the existing literature indicating that home sharing is driven by income (Kemp & Rugg, 1998; Natalier, 2003; Day, 2016) and age (Heath & Cleaver, 2003; Bush & Shinn, 2017; Clark, 2017). Home sharing is a good alternative for people with a limited budget (Day, 2016). Low-income earners are more likely to engage in home sharing, as renting out a room can generate additional income. Research provides evidence that home sharing is more appropriate for younger people since they are more mobile, sometimes single, unrelated, and childless (Heath & Cleaver, 2003; Bush & Shinn, 2017). Also, Clark (2017) shows that many people later in life are no longer open to home sharing.

2.5 Conceptual model

Figure 1 illustrates the conceptual model inferred from the hypotheses and associated academic literature. The study contains a mediation effect. Individual and housing characteristics have a direct effect on housing satisfaction, but this is (partly) explained by the fact that individual characteristics and housing characteristics also explain whether someone decides to rent out a room (the indirect effect). In a mediation approach, at least two analyses are performed:

1) The effect of X (individual characteristics and housing characteristics) and M (room rental) on Y (housing satisfaction).
2) The effect of X (individual characteristics and housing characteristics) on (M) the mediator room rental.

In this study, room rental is the mediator, housing satisfaction is the dependent variable and individual and housing characteristics are independent variables. The model indicates that the mediator variable room rental, will explain the dependent variable housing satisfaction. As various studies (Koebel & Murray, 1999; Gove et al., 1979; Mitchell, 1971; Hemmens et al., 1996; Halpern, 1995; Heath et al., 2018) cite many disadvantages related to housing sharing, it is expected that people who rent out a room experience lower levels of housing satisfaction. Furthermore, it presents that individual and housing characteristics affect housing satisfaction and that there is a relationship between renting out a room and individual and housing characteristics. For example, as argued by Heath & Cleaver (2003) and Bush & Shinn (2017) that younger people are more suited for sharing housing.

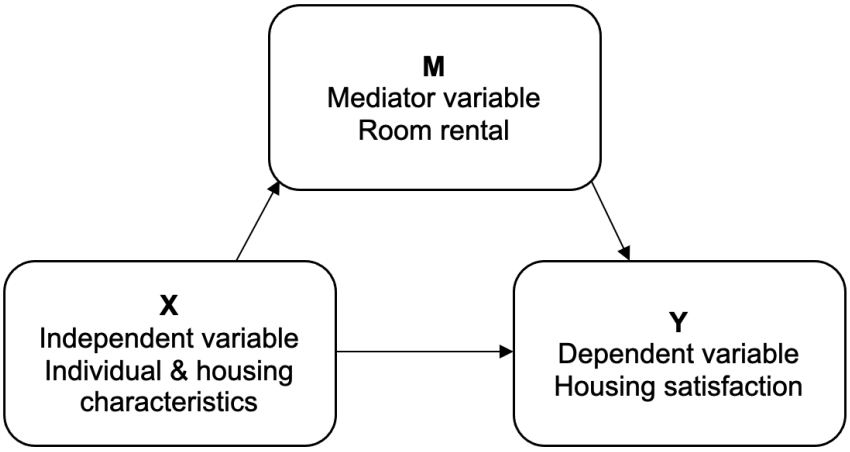

Figure 1. Conceptual model explaining the relationship between housing satisfaction, room rental, and individual and housing characteristics

3. DATA & METHODS

To answer the main question, a quantitative research approach is applied. This chapter discusses the methodical research framework. First the background of the dataset is described, followed by the variables with the descriptive statistics and finally the methodology.

3.1 Background of the dataset

To explore whether room rental is a factor that affects housing satisfaction and what the characteristics of people renting out a room are, quantitative research is done by use of secondary data. The dataset 'WoonOnderzoek Nederland 2018' (referred to as WoON2018 in the remainder of this thesis) has been used. WoON2018 derives from a government source, which is authorized to be used for market research. WoON2018 originates from a survey of housing quality and housing demand in 2018 in the Netherlands. This dataset was compiled by BKZ in cooperation with CBS and is conducted every three years. The survey topics include for example, housing situations, housing satisfaction, housing desires and quality of living. The WoON2018 dataset is chosen for the following reason. In recent years, problems in the housing market have become increasingly acute. As a result, other motivations compared to the past (e.g. in the WoON datasets of 2012 and 2015) for choosing to rent out a room might have become more important. In the current situation, it could be the case that people rent out a room less based on the idea of more income, and rather based on the idea of helping people get a place to live. By using WoON2018, the current dilemmas in the housing market are the focus. The government uses a systematic method of sampling when developing each WoON dataset. As a result, the datasets can be used independently of each other, and they all represent samples that are as representative as possible. Using only WoON2018 therefore does not introduce selection bias.

The WoON2018 dataset has over 67,000 responses, the size of the dataset ensures that reliable statements can be provided (Janssen-Jansen, 2018). However, it is important to note that there are people who respond with socially desirable answers, who do not have sufficient command of the Dutch language and who cannot/will not reveal the truth out of financial considerations. When considering the latter point, for example, contemplate the implications of the question asked, ‘Do you rent out (a) room(s) in this house?’. Renting out rooms up to a previously mentioned point is declared tax-free, however, there could still be people who do not want the tax authorities to know about renting out rooms. Namely, because of the assumption many people have that additional income can provide a deduction in health care subsidies, rent subsidies and/or unemployment benefit. While this is not the case since rental income from room rentals is not required to be declared if it meets the following conditions:

1. the accommodation is not self-contained;
2. the rental is long-term (not for tourist purposes);
3. lessor and lessee must be registered with the municipality at the address;
4. the annual rent does not exceed € 5,711 (Belastingdienst, 2022).

As a result, the number of people renting out rooms might be higher than indicated in the dataset. Since this thesis mainly focuses on the relationship between renting out a room and housing satisfaction, it is unfortunate that data might be missing due to the above reason.

3.2 Sampling flow

Despite the fact that the WoON2018 dataset has a total of 67,000 responses, it is not possible to include all of them in this study. The question related to the dependent variable, housing satisfaction, was not responded by 8425 respondents; therefore, these respondents were not included in the study. The mediator variable, room rental, has significantly fewer respondents as a result of routing in the questionnaire, namely 1675 respondents. Based on the supplement of the WoON2018 survey, the routing of the questionnaire can be inferred. The WoON2018 survey documentation indicates the following: "Not all questions in the questionnaire need to be answered by every respondent. Depending on, for example, age, household position or desire to move, follow-up questions are asked accordingly" (Janssen-Jansen, 2018, p. 12). As a result, a range of respondents were not required to answer the question about room rental. The low number of responses to the question related to room rental stems from an introductory question asking whether any other households reside at the address where the respondent lives. All respondents who answered "no" here did not have to answer the follow-up question regarding renting out rooms. However, it is open to debate whether this way of asking questions was interpreted in the intended manner by all respondents. The question arises whether people who rent out a room in their house to a student, for example, consider the individual student as an additional household. CBS defines households as follows: “People are considered one household if they generally,

1. eat together, and;
2. share a main living area together, and;
3. bear the household expenses together.

If one of the three conditions is not answered yes, there is more than one household” (Branse, personal communication, 2022). Although CBS uses this definition, they indicate that the real assessment about the housing situation and household composition lies with the respondent himself. While CBS tries to manage this, it admits that it is not always possible to make it equally clear to all respondents. As a result, two seemingly similar situations (e.g., two students sharing a house together) may result in a different living situation in WoON2018 (i.e., as one household in pairs or as two separate households) (Branse, personal

communication, 2022). As the follow-up question is about room rental, this will cause the number of people who had to answer this question to be lower than the actual number. The independent variables, except for one, do not cause a reduction in the number of respondents. The variable age has a number of respondents (50) who say they do not know what level of education they have. These respondents were not included in the remainder of the study. The sample consists of 1625 respondents. **Table 5** shows the sampling flow.

Table 5 Sampling flow.

Cleaning the data	**Respondents**
Start	67523
Missing housing satisfaction	- 8425
Questionnaire routing room rental	- 57423
'Don't know' education level	- 50
Total	1625

3.3 Operationalizing variables

The *dependent variable* is housing satisfaction. The variable provides an answer to the following question: How satisfied are you with your current house? However, each respondent may have interpreted the question in his or her own way. WoON2018 did not provide a definition of housing satisfaction, which means that various people may have had a different understanding of this question. Respondents may not have immediately thought that housing satisfaction (satisfaction with the current house) also includes renting out a room or sharing a house. The responses to this question are represented in the dataset as an ordinal variable (based on a Likert-type scale) consisting of the following response categories, (1) very satisfied, (2) satisfied, (3) not satisfied, but also not dissatisfied (neutral), (4) dissatisfied, (5) very dissatisfied. **Table 6** lists the frequencies related to the variable housing satisfaction. The average score given to housing satisfaction over the entire dataset is 1.79, this is between very satisfied and satisfied, indicating a high score. The frequency table reveals that there are relatively few people who are dissatisfied or very dissatisfied. To interpret the variable in a more logical order in the analysis, the categories are recoded. Hereby, very dissatisfied is coded as number 1 and very satisfied as number 5.

Table 6 Frequency of housing satisfaction. Source: WoON2018.

Satisfaction with current house	Frequency	Percentage	Cumulative
Very satisfied	454	27.9	27.9
Satisfied	740	45.5	73.4
Not satisfied, but not dissatisfied either	307	18.9	92.3
Dissatisfied	96	5.9	98.2
Very dissatisfied	28	1.7	100.0
Total	1625	100.0	

The *mediator* is room rental. Room rental is surveyed in WoON2018 through the following question, 'Do you rent out (a) room(s) in this house?'. Two response options are available to this question, 'yes' and 'no'. There is the possibility that people may not answer honestly when asked if they rent out a room. For example, this may be when they are renting out a room illegally, CBS is a government agency and because of this, people may think that there will be consequences following from the survey. It is therefore debatable whether the questions are interpreted in the desired manner and completed truthfully. **Table 7** presents the frequencies regarding room rental.

Table 7 Frequency of room rental. Source: WoON2018.

Room rental	Frequency	Percentage	Cumulative
Yes	126	7.8	7.8
No	1499	92.2	100.0
Total	1625	100.0	

With the low response rate based on the method of questioning in the questionnaire, the issue is to assess whether the respondents who did respond to the question provide a representative representation of the overall respondent population of WoON2018. A new binary variable in which the respondents who did answer the question about room rental is set out against the respondents who did not answer the question. The new variable is plotted against two random variables of individual characteristics (household composition and age) and two random variables of housing characteristics (tenure type and size) using cross-tabulation and a Chi-square tests. The various Chi-Square tests all indicate a p-value <0.05, implying a significant difference. Based on the results, it must unfortunately be stated that the respondents who did answer are not a representative reflection of the total respondent population. With respect to the fact that there are no other data available regarding this study, the study will still be continued, however, this limitation is considered. Similarly, the respondents who answered yes

(126) were compared to those who answered no (1499) to the question regarding room rental. This test is a test prior to regression analysis to see if univariate significant differences are already visible. The various Chi-Square tests all indicate a p-value <0.05, implying a significant difference. In this equation, that is exactly what should be seen. This indicates that there is a difference between people who do and do not rent out a room. **Appendix A** presents the results of the tests.

The *independent variables* for both the analysis of the second and the third sub-question stem from the first sub-question, 'Which factors influence housing satisfaction?'. The factors are listed in **Table 2**. However, not all factors are included in the dataset WoON2018, consequently leaving out certain factors in the analyses. There are two groups of independent variables: individual characteristics and housing characteristics. **Table 8** represents the independent variables included in this thesis.

Table 8 Independent variables

Individual characteristics	**Housing characteristics**
Household composition	Tenure type
Age	Satisfaction with layout
Income	Satisfaction with maintenance
Education level	Size

The individual characteristics consist of household composition, age, income, and education level. Household composition is included in the study as a nominal variable consisting of two categories: single-person households and multi-person households. This selection is based on its consistency with the information obtained in the introduction and theoretical framework, which states that there is a significant number of single-person households in the Netherlands that continues to grow. The chosen distribution will enable to disclose the effect of room rental on single-person households. The age of respondents is divided into seven age groups, 17-24 years, 25-34 years, 35-44 years, 45-54 years, 55-64 years, 65-74 years, and 75+ years. Income is a variable measured at household level. The ordinal level income variable consists of five categories, below modal, up to 1.5 times modal, up to 2 times modal, up to 3 times modal and more than 3 times modal. Education level will be measured also as an ordinal variable, with three categories: low educated, middle educated and high educated. **Table 9** presents the corresponding education programs based on CBS education level standards.

Table 9 CBS education level standards

Education level	Education types
Low educated	1. Education at the level of primary education 2. Vmbo 3. The first three years of havo/vwo 4. Mbo-1
Middle educated	5. Havo/vwo 6. Mbo-2 7. Mbo-3 8. Mbo-4
High educated	9. College (hbo) 10. University

Source: CBS. (2019). *Opleidingsniveau*. Retrieved on 13-10-2022 from https://www.cbs.nl/nl-nl/nieuws/2017/26/ouderen-maken-inhaalslag-op-sociale-media/opleidingsniveau

The housing characteristics consists of tenure type, physical state of the building and the size of the house. Tenure type is divided into two possibilities, distributed into owner and tenant. The physical state of the building will be recurring among two variables, respectively, whether respondents are satisfied with their house interior/layout, and whether the dwelling is well maintained. These are both ordinal variables consisting of five categories from 'very satisfied' to 'very dissatisfied'. The size of the house is a categorical variable, measured in increments of 30 square meters. **Appendix B** explains how the data preparation and cleaning is performed. The study focuses on all households, both renters and homeowners. After cleaning the data there are 1625 observations left in the dataset. **Table 10** provides the descriptive statistics.

Table 10 Respondent characteristics, presented as % and (*n*)

Variable	**Households**	**Room rental**	
	Total	Yes	No
	100 (1625)	7.8 (126)	92.2 (1499)
Housing satisfaction			
Very satisfied	27.9 (454)	47.6 (60)	26.3 (394)
Satisfied	45.5 (740)	33.3 (42)	46.6 (698)
Neutral	18.9 (307)	13.5 (17)	19.3 (290)
Dissatisfied	5.9 (96)	3.2 (4)	

Very dissatisfied	1.7 (28)	2.4 (3)	6.1 (92)
			1.7 (25)
Household composition			
Single-person households	60.4 (982)	41.3 (52)	62.0 (930)
Multi-person households	39.6 (643)	58.7 (74)	38.0 (569)
Age			
17-24 years	29.1 (473)	10.3 (13)	30.7 (460)
25-34 years	24.5 (398)	14.3 (18)	25.4 (380)
35-44 years	9.5 (154)	10.3 (13)	9.4 (141)
45-54 years	10.9 (177)	27.0 (34)	9.5 (143)
55-64 years	10.5 (170)	15.1 (19)	10.1 (151)
65-74 years	10.0 (162)	20.6 (26)	9.1 (136)
75+ years	5.6 (91)	2.4 (3)	5.9 (88)
Income			
< modal	60.1 (977)	39.7 (50)	61.8 (927)
> modal < 1.5 times modal	17.7 (288)	23.8 (30)	17.2 (258)
> 1.5 times modal < 2 times modal	8.3 (135)	11.9 (15)	8.0 (120)
> 2 times modal < 3 times modal	9.0 (146)	15.9 (20)	8.4 (126)
> 3 times modal	4.9 (79)	8.7 (11)	4.5 (68)
Level of education			
Low educated	22.7 (369)	18.3 (23)	23.1 (346)
Middle educated	38.2 (621)	33.3 (42)	38.6 (579)
High educated	39.1 (635)	48.4 (61)	38.3 (574)
Tenure type			
Owner	30.9 (502)	67.5 (85)	27.8 (417)
Tenant	69.1 (1123)	32.5 (41)	72.2 (1082)
Satisfaction with layout			
Very satisfied	25.8 (419)	31.0 (39)	25.4 (380)
Satisfied	52.9 (860)	49.2 (62)	53.2 (798)
Neutral	12.7 (207)	11.1 (14)	12.9 (193)
Dissatisfied	6.7 (109)	6.3 (8)	6.7 (101)
Very dissatisfied	1.8 (30)	2.4 (3)	1.8 (27)
Satisfaction with maintenance			
Very satisfied	24.0 (390)	28.6 (36)	23.6 (354)
Satisfied	32.9 (535)	42.1 (53)	32.2 (482)
Neutral	19.7 (320)	14.3 (18)	20.1 (302)
Dissatisfied	15.9 (259)	10.3 (13)	16.4 (246)
Very dissatisfied	7.4 (121)	4.8 (6)	7.7 (115)
Size (m2)			
< 29	1.4 (23)		

30-59	6.6 (108)	2.4 (3)	1.3 (20)
60-89	35.3 (573)	2.4 (3)	7.0 (105)
90-119	18.0 (292)	21.4 (27)	36.4 (546)
120-149	12.6 (205)	17.5 (22)	18.0 (270)
150-179	6.7 (109)	8.7 (11)	12.9 (194)
180-209	4.5 (73)	6.3 (8)	6.7 (101)
210-239	4.1 (67)	11.1 (14)	3.9 (59)
240-269	2.2 (36)	8.7 (11)	3.7 (56)
>270	8.6 (139)	2.4 (3)	2.2 (33)
		19.0 (24)	7.7 (115)

The power of a study increases by sample size (Tabachnick & Fidell, 2014), ideally having a large sample with a good distribution across cells. Since the sample consists of 126 respondents who do rent out a room, there may be very few people belonging to the different categories of both the dependent and independent variables. For example, the dependent variable housing satisfaction has five categories over which the 126 respondents are divided. The dissatisfied and very dissatisfied categories only consist of three or four respondents. Tabachnick & Fidell (2014) states the following about this: “It is best if all expected frequencies are greater than one, and that no more than 20% are less than five. Should either of these conditions fail, the choices are:

1) accept lessened power for the analysis,
2) collapse categories for variables with more than two levels,
3) delete discrete variables to reduce the number of cells,
4) use a goodness-of-fit criterion that is not based on observed versus expected frequencies of cells formed by categorical variables.” (Tabachnick & Fidell, 2014, p. 488)

Merging the categories will not solve everything in this analysis, in fact, one can choose to transform the five categories into three categories, unfortunately the last category will still contain significantly fewer respondents. Removing the variable is not a solution either, housing satisfaction is the dependent variable and it is essential to the study. The last point cannot be circumvented by the use of SPSS either, therefore the choice is made to accept the lessened power of the analysis.

Appendix C provides the Spearman (1910) correlation matrix. This matrix makes it possible to test the correlation between the predictors in the model. If there is a high correlation this indicates that approximately the same prediction is made between the predictors. This is referred to as multicollinearity in the model which is undesirable. The Spearman correlation

matrix is utilized since it is suitable for testing correlation between ordinal variables and linearity between variables is not crucial, in contrast to the Pearson correlation matrix (James et al., 2009). The matrix demonstrates that many of the correlations are between -0.2 and +0.2, which means low correlation. Coefficients of 0.5 or 0.7 are considered as boundaries for high correlation. From the model it can be observed that there are four coefficients with values higher than 0.5, none of them are above the value of 0.7.

3.4 Methodology

While the first sub-question is answered by literature review, quantitative analysis is needed to answer the remaining sub-questions. Statistical analyses are performed by using SPSS statistical software (version 27). By addressing the sub-questions, the main question can be answered, '*To what extent is room rental related to housing satisfaction, and, for which (types of) households is it most appropriate?'.* Methodologies applied to the two sub-questions will be discussed.

Does room rental affect the housing satisfaction of the lessor?

A Univariate test is first used to examine whether a significant difference exists between the dependent and the mediator variable at all. For this purpose, both the Chi-Square and the Mann-Whitney U test are used. The Chi-Square test is appropriate for examining significant differences between two nominal or ordinal variables. The Mann-Whitney U test is appropriate for data that are not normally distributed. Subsequently, multivariate testing, a regression is performed where the independent variables are also included. It is not possible to use a Linear Regression Model since the dependent variable, housing satisfaction, is a categorical variable. "The use of a linear function is problematic because it leads to predicted probabilities outside the range of 0 to 1." (DeMaris, 1995, p. 957). When using a binary dependent variable in linear regression, the assumption of the error term to be uncorrelated with the predictors is violated (DeMaris, 1995). Although the binary logistic model can be used, this involves responses with only two categories. For instance, answers such as 'agree' and 'disagree' or 'satisfied' and dissatisfied'. There is the possibility of transforming the variable, housing satisfaction, which consists of five categories, into a binary variable. Besides the fact that it is not clear where the middle category should belong, also important information about the orders is lost. The Multinomial Logit Model makes it possible to use the binary logistic model also for variables with more than two categories, preferring variables with unordered categories (Lu, 1999). Although The Multinomial Logit Model has the potential to be used, Ordered Logistic Regression is preferred because it takes into account the ordinal nature of the outcome variable (Hosmer & Lemeshow, 2013; Osborne, 2015). When using a Multinomial Logistic Regression each category of the dependent variable is compared to each other category,

similar to performing several Binomial Logistic Regressions. This is useful when the dependent variable is nominal and there is no logical order in the different categories. However, when the dependent variable is ordinal, it is less intuitive to compare the categories one by one, because the difference between the first and second category, for instance, is smaller than the difference between the first and third category, and so on. Taking into account that the difference between the categories becomes larger when the categories are further apart can be used to find only one regression coefficient for each explanatory variable that explains the effect of a 'unit' increase on the probability of the occurrence of a higher level in the dependent variable (Hosmer & Lemeshow, 2013). The logits of an Ordered Logistic Regression are formed in a manner that takes ordering of the ordinal values into account (DeMaris, 1995).

In this study, housing satisfaction has five categories, out of which arises J, J=5. P = P(y = i/x), represents the probability that a respondent has a certain level of housing satisfaction. Where i represents the respondent. A Proportional Odds Model can be used to analyze ordinal responses. Equation three shows how the log odds of the explanatory variables in the model are estimated:

$$log\,\frac{p_i}{(1-p)} = \propto_i + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k \quad (1)$$

where P_i is the probability of an outcome <=i and $\propto_i$ is the intercept for outcome <=i. x are the covariates and β are the coefficients. A Model of Proportional Odds can also be constructed for this study, which are shown in the following four regression equations:

$$\log\frac{(P(R_i \leq Very\ dissatisfied)}{(P(R_i > Very\ dissatisfied)} = \beta_{0,1} + \beta_1 * Room\ rental_i + \beta_n * Independent\ variables_n + \varepsilon_{i,1} \quad (2)$$

$$\log\frac{(P(R_i \leq Dissatisfied)}{(P(R_i > Dissatisfied)} = \beta_{0,2} + \beta_1 * Room\ rental_i + \beta_n * Independent\ variables_n + \varepsilon_{i,2} \quad (3)$$

$$\log\frac{(P(R_i \leq Neutral)}{(P(R_i > Neutral)} = \beta_{0,3} + \beta_1 * Room\ rental_i + \beta_n * Independent\ variables_n + \varepsilon_{i,3} \quad (4)$$

$$\log\frac{(P(R_i \leq Satisfied)}{(P(R_i > Satisfied)} = \beta_{0,4} + \beta_1 * Room\ rental_i + \beta_n * Independent\ variables_n + \varepsilon_{i,4} \quad (5)$$

where, in the first equation, P(Ri ≤ Very dissatisfied) is the probability that the response to the question 'How satisfied are you with your current house?' from respondent i, is equal (or lower) to very dissatisfied. $\beta_{0,1}$ is the intercept, Room $rental_i$ and the independent $variables_n$ are the predictors, β_1 and β_n are regression coefficients of the predictors. $\varepsilon_{i,1}$ is the error term, where i represents the respondent. The remaining equations are similarly represented. The Ordered Logistic Regression has log odds as output. The log odds should be interpreted as conditions in which respondents feel more satisfied with their housing. In the regression outcomes, positive values indicate higher levels of housing satisfaction and negative values indicate lower levels of housing satisfaction. The assumptions for Ordered Logistic Regression are:

1. The dependent variable is ordered;
2. One or more of the independent variables are either continuous, categorical or ordinal;

3. Absence of multicollinearity;
4. Proportional odds.

They must be tested in order (Lee, 2019). As stated earlier, the dependent variable in this thesis is measured at an ordinal level, there are five response categories in which there is a clear order (from very satisfied to very dissatisfied). Therefore, it can be argued that the first assumption is met. The second assumption is also met since the mediator variable and the independent variables are either ordinal and/or treated as continuous variables. The third assumption comprises the lack of multicollinearity. As mentioned by Alin (2010), multicollinearity is a linear relationship between two or more variables. It is considered as a data problem, which causes less reliable estimates of the model parameters. To test the third assumption, it is necessary to perform a regression displaying Variance Inflation Factor (VIF) scores; these scores provide an indication of multicollinearity. Since an Ordered Logistic Regression does not include a multicollinearity test, it is necessary to perform a linear regression. It is required that the VIF scores are below 10, where 1 is optimal (Field, 2018). As observed in **Appendix D**, the test shows that almost all VIF scores are around 1, which is the optimal point. However, the variables income < modal and income up to 1.5 times modal have higher scores, namely 7.538 and 4.207. So, there could be an overlap in this regard. However, all VIF scores are below 10 so in the model being tested it can be assumed that there is no multicollinearity. To test the fourth assumption (proportional odds), the Test of Parallel Lines is applied, displayed in **Appendix E**. The Test of Parallel Lines has the null hypothesis: the location parameters (slope coefficients) are the same across response categories. Based on sig .298 > .05, it can be concluded that the null hypothesis cannot be rejected, and the effects of explanatory variables are proportional across the different thresholds. Thus, after checking this fourth assumption, it can be concluded that all assumptions are met, and the Ordered Logistic Regression may be performed.

To what extend differ households renting out a room from households not renting out a room?

To investigate whether there is a difference between the characteristics of households that rent out a room and households that do not rent out a room, a regression analysis is required. This should reveal whether the groups differ from each other and on what aspects. The dependent variable is room rental, as mentioned, room rental consists of two categories, renting or not renting out a room. A variable with two categories is called a binary variable. The appropriate regression for binary variables is a Binary Logistic Regression. In case of one explanatory variable X, and a binary outcome variable Y, the logistic regression model predicts the logit of Y from X which represents a natural logarithm of odds of Y. The formula can be written as (Peng et al., 2002):

$$\text{In}\left(\frac{\hat{p}}{1-\hat{\text{p}}}\right) = \alpha + \beta x + \varepsilon \quad (6)$$

Formula (6) can be extended if multiple X variables are included in the regression. The general logistic regression model is reported as:

$$\text{In}\left(\frac{\hat{p}}{1-\hat{\text{p}}}\right) = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \cdots + \varepsilon \quad (7)$$

Where in formula (7) the left side is called the log-odds or logit, α is the constant, β's are parameters of the slope, and x's are explanatory variables (Author, 2021). The logistic regression model of the current research is specified as:

$$\text{In}\left(\frac{\hat{p}}{1-\hat{\text{p}}}\right) Room\ rental = \alpha + \beta_1 Income + \beta_2 Age + \beta_n\ independent\ variables + \varepsilon \quad (8)$$

This model (8) is used to relate the quantitative mediator variable room rental, to the independent variables, with the emphasis on income and age, the error term is also included in the model. The independent variables are individual characteristics and housing characteristics. The individual characteristics include (in addition to income and age) household composition and education level. The housing characteristics include, tenure type, size of the house and satisfaction with the layout and maintenance of the house. These variables are selected based on the literature research, from which these characteristics of the home-sharers emerged.

The assumptions for Binary Logistic Regression are:

1. Independence of errors;
2. Linearity in the logit for continuous variables;
3. Absence of multicollinearity;
4. Lack of strongly influential outliers (Stoltzfus, 2011).

The first assumption is a design assumption. It implies that there is no overlap between respondents, for example, questionnaires are completed individually by different respondents. Another example is that each respondent can only participate in the survey once, unlike longitudinal research. In the WoON2018 dataset, each respondent participated only once and not in consultation with other respondents, which means there is independence of errors. The second assumption mentions linearity in the logit for continuous variables, however, the study only includes categorized variables, implying that this assumption is untestable and is met. The third assumption regarding the lack of multicollinearity does need to be tested. However, since this assumption also applies for Ordered Logistic Regression, the used method is already covered. **Appendix F** shows the VIF scores of the model, all scores are below 10 which allows us to state that there is no multicollinearity. The fourth and final assumption, lack of strongly influential outliers is an assumption that is directly met by using only ordinal and binary variables, where having outliers is almost impossible. In conclusion, after checking the assumptions, the assumptions are met, and the Binary Logistic Regression can be performed.

4. RESULTS & DISCUSSION

To answer the second and third sub-question, statistical tests are conducted; this section presents and discusses the results.

4.1 Effect of room rental on housing satisfaction

This section will present the results of the analyses to answer the second sub-question (*Does room rental affect the housing satisfaction of the lessor?).* As mentioned in the methodology chapter, both a univariate and a multivariate test are performed. **Appendix G** presents the results of the Chi-Square test and the Mann Whitney U test. The Chi-Square test indicates with a sig <.001 that there is a significant difference. Consequently, the null hypothesis stating that there is no relationship between the variables can be rejected, so it can be assumed that there is a relationship between the variables room rental and housing satisfaction. Furthermore, the test indicates that relatively more people who rent out a room are more likely to be highly satisfied. Thus, reflecting a positive effect of renting out a room on housing satisfaction of the lessor. The Mann-Whitney U test likewise presents sig <.001. This allows rejection of the null hypothesis: housing satisfaction is equal between Dutch people renting out a room and not renting out a room. The mean rank of people renting out a room is 652.60, while the mean rank of people not renting out a room is 826.48. In other words, people who do rent out a room have a lower mean rank, this implies that people who rent out a room experience more housing satisfaction. In conclusion, both univariate tests demonstrates that there is a significant difference between the housing satisfaction of lessors of a room and non-lessors, and that lessors experience higher housing satisfaction. After the visible significant difference in the univariate tests, it is necessary to perform a multivariate test by adding independent variables in the model. As mentioned in the methodology, Ordered Logistic Regression is performed. To perform the Ordered Logistic Regression, it is necessary to satisfy the assumptions. As examined and appointed in the methodology, all assumptions are met. The results of the Ordered Logistic Regression are reported in **Table 11**. Since the model is tested on the assumption of proportional odds, it is possible to represent the results using one regression coefficient, similar to the way DeMaris (2004) uses in his book "Regression with Social Data: Modeling Continuous and Limited Response Variables" on page 304, Table 8.7.

Table 11 Ordered Logistic Regression of housing satisfaction

	Log odds	St. Err.	Odds ratios
Constants			
Intercept$_1$ (Very dissatisfied)	-3.686	(0.504)	0.025***
Intercept$_2$ (Dissatisfied)	-1.822	(0.481)	0.162***
Intercept$_3$ (Neutral)	0.238	(0.481)	1.269
Intercept$_4$ (Satisfied)	3.205	(0.486)	24.656***
Intercept$_0$ (Very satisfied)	base	base	base
Room rental (yes = 1)	0.331	(0.200)	1.393*
Individual characteristics			
Household composition (multi p.hh = 1)	-0.237	(0.139)	0.789*
Age	0.023	(0.034)	1.024
Income			
< modal	-0.203	(0.288)	0.817
> modal < 1.5 times modal	-0.273	(0.277)	0.761
> 1.5 times modal < 2 times modal	-0.450	(0.299)	0.956
> 2 times modal < 3 times modal	-0.123	(0.293)	0.884
> 3 times modal	base	base	base
Education level			
Low educated	0.336	(0.150)	1.399**
Middle educated	0.202	(0.116)	1.224*
High educated	base	Base	base
Housing characteristics			
Tenure type (owner = 1)	0.680	(0.155)	1.973***
Satisfaction with layout			
Very satisfied	3.252	(0.371)	25.830***
Satisfied	1.955	(0.356)	7.062***
Neutral	0.819	(0.369)	2.268**
Dissatisfied	0.555	(0.387)	1.743
Very dissatisfied	base	base	base
Satisfaction with maintenance			
Very dissatisfied	-3.365	(0.228)	0.035***
Dissatisfied	-2.019	(0.184)	0.133***
Neutral	-1.385	(0.167)	0.250***
Satisfied	-0.679	(0.146)	0.507***
Very satisfied	base	base	base
Size	0.128	(0.024)	1.136***

St. Err. = Standard Error. ***p<0.01, **p<0.05, *p<0.1. N = 1625.

Although most variables are entered as categories in the model, it is decided not to do so for the variables age and size. A reason for this was that these variables (more than income and education) have equal steps in the categories (for age always 10 years per age group, and for size always 30 m2). Whereas for income, the difference between category one and category two is half a modal, between category two and category three half a modal and between category three and category four a whole modal and between category four and category five an unknown number of modals. The stepwise distribution between the categories for age and size gives the variable more of a continuous character than the other variables. Although there is the possibility of including age and size as multiple categories, considering the power of the test, this is not optimal. The more variables added to a model, the more power it loses. Including age as a continuous variable in the test would 'cost' one degree of freedom. The seven categories would 'cost' six degrees of freedom. Another solution could be the merging of certain categories, but here power loss also applies. The loss of power is a major consideration in the choice to treat the variables size and age as continuous variables. The assumption of linearity can be checked with the Box-Tidwell approach (Hosmer & Lemeshow, 2000). This involves performing a logistic regression, including an interaction between age and size and their log transformation. Based on the test results and applying the Bonferroni correction, it can be said that the assumption of linearity is not violated (Tabachnick & Fidell, 2014; Laerd Statistics, 2017).

The Ordered Logistic Regression outputs Log Odds of the predictors. The method of interpretation is therefore different from, for example, interpreting the results of a linear regression analysis. The SPSS statistical program can provide the results as well in Odds Ratios (OR), however, this can also be calculated by taking the exponent of the Log Odds (for example: $exp^{-3.686} = 0.025$). An OR above 1 indicates that the predictor increases the odds of being in a higher category for housing satisfaction, since the dependent variable is an ordinal variable with many categories. An OR below 1 indicates that the predictor decreases the odds of being in a higher category of housing satisfaction. Also, the results can be interpreted in terms of probabilities rather than Odds (DeMaris, 1995). The significance is tested at the $p<0.01$(***), $P<0.05$(**) and $p<0.1$(*) levels.

The reported results of the Ordered Logistic Regression analysis indicate that room rental is significant at a significance level of 10%. The OR of room rental is 1.393, indicating that the probability of being at a higher level of housing satisfaction increases for people who rent out a room (0 = no, 1 = yes) compared to people who do not rent out a room. In addition, the OR indicates that people who rent out a room have a 39% higher probability of being at a higher level of housing satisfaction. The assumption of proportional odds was assessed by means of

the Test of Parallel lines, which compares the -2 Log Likelihood (-2LL) of a model in which the null hypothesis (slope coefficients are the same across outcome categories) with the -2LL of the actual model that is tested. Using a chi-square test it can be determined whether the two -2LL's differ significantly. In case the chi-square test is significant, the assumption of proportional odds is violated (which is not the case). In that case, a Multinomial Logistic Regression is the preferred alternative.

As mentioned, the independent variables are divided into individual characteristics and housing characteristics. Based on the regression analysis, it appears that in the group of individual characteristics, only household composition and education level significantly differ in the level of housing satisfaction. The OR of 0.789 for the variable household composition indicates with a significance level of 1% that the probability of being at a higher level of housing satisfaction is 27% (1/0.789 =26.7%) smaller for a multi-person household compared to a single-person household. In other words, multi-person households generally have lower levels of housing satisfaction than single-person households. As mentioned, education level also reflects a significant difference between low and middle educated people compared to high educated people. Low educated people have a 39.9% higher probability of having a higher category of housing satisfaction compared to high educated people. Assuming a significance level of 5%. Middle educated people have a 22.4% higher probability of having a higher category of housing satisfaction relative to highly educated people. So, the less educated you are, the higher the probability of being in a higher category of housing satisfaction.
The regression indicates that all four variables in the housing characteristics group are (partially) significant. One significant difference is found in the level of housing satisfaction when one owns or rents a house. The probability of being at a higher level of housing satisfaction increases 97.3% with ownership (0 = renter, 1 = owner) compared to renters, based on a 1% significance level. Considering the variable satisfaction with the layout of the house it is observed that when being very satisfied with the layout of the house, there is a higher probability of being in a higher category of housing satisfaction compared to those who are very dissatisfied with the layout of their house. This is also the case when people are satisfied or neutral about the layout of their house. Although the dissatisfied category is not significantly different from the very dissatisfied category, in general the results reveal a pattern. Very satisfied has an OR of 25.830 and dissatisfied has an OR of 1.743. That is, the more satisfied one is with the layout of one’s house, the higher one’s housing satisfaction. For the variable satisfaction with maintenance, it is observed that all categories differ significantly from the base category, which is very satisfied, with a significance level of 1%. In this regard, a trend is observed again, the more satisfied people are with the maintenance of the house, the higher the OR. The results indicate that the more dissatisfied people are with maintenance, the lower

their overall level of housing satisfaction. The OR of the variable size is 1.136, which implies the probability of being in a higher category of housing satisfaction increases 13.6% with each unit that size increases, with a significance level of 1%. The larger the house, the more satisfied one is.

4.2 Characteristic difference between participating in room rental and not participating in room rental

This section reports the results obtained for answering the third sub-question (*To what extend differ households renting out a room from households not renting out a room?*). The test indicates a result for the Nagelkerke R Square of 0.181. This implies that 18.1% of the variance of renting out a room or not is explained by the model. Since it is not possible to include all factors that do have influence in the analysis, 18.1% is a decent score. The results of the Binary Logistic Regression are presented in **Table 12**.

Table 12 Binary Logistic Regression of room rental

	Log odds	**St. Err.**	**Odds ratios**
Individual characteristics			
Income			
< modal	0.705	(0.452)	2.024
> modal < 1.5 times modal	0.519	(0.413)	1.681
> 1.5 times modal < 2 times modal	0.167	(0.445)	1.182
> 2 times modal < 3 times modal	0.215	(0.419)	1.240
> 3 times modal	base	base	base
Age	0.137	(0.067)	1.147**
Household composition (multi p.hh = 1)	-0.007	(0.261)	0.993
Education level			
Low educated	-1.006	(0.294)	0.366***
Middle educated	-0.316	(0.223)	0.729
High educated	base	base	base
Housing characteristics			
Tenure type (owner = 1)	1.652	(0.296)	5.215***
Satisfaction with layout			
Very satisfied	-1.173	(0.674)	0.309*
Satisfied	-1.143	(0.657)	0.319*
Neutral	-1.063	(0.702)	0.346
Dissatisfied	-0.734	(0.740)	0.480
Very dissatisfied	base	base	base
Satisfaction with maintenance			

Very dissatisfied	0.048	(0.497)	1.049
Dissatisfied	0.161	(0.387)	1.175
Neutral	0.044	(0.331)	1.045
Satisfied	0.309	(0.254)	1.363
Very satisfied	base	base	base
Size	0.123	(0.824)	1.131***

St. Err. = Standard Error. ***p<0.01, **p<0.05, *p<0.1. N = 1625.

For interpreting the results of the Binary Logistic Regression, it is likewise possible to look at the ORs. Although it is observed that among the respondents in different income categories there is no significant difference between renting and not renting out a room, it is observed that a few other predictors contribute significantly to the model's predictive capability. First, age, the OR of 1.147 at a significance level of 95%, implying the probability of renting out a room increases 14.7% with each unit age increases. The higher age, the more respondents rent out a room. Secondly, it can be mentioned that respondents who are lower educated have a significantly lower probability to rent out a room compared to those who are higher educated. The OR is 0.366, implying that lower educated respondents have a (1/0.366) 2.73 times lower probability of renting out a room than those who are higher educated, at a significance level of 99%. Third, with respect to tenure type, the following can be observed: homeowners are more willing to rent out a room compared to renters. The OR of 5.215 indicates that homeowners have a five times higher probability to rent out a room compared to renters, at a significance level of 99%. Fifth, satisfaction with the layout of the house is indicated to be significant in two categories, very satisfied and satisfied, with a significance level of 90%. The OR of 0.309 and 0.319, means that the probability of respondents renting out a room becomes about (1/0.309 and 1/0.319) 3 times smaller when respondents are (very) satisfied with the layout of their house compared to people who are not satisfied with the layout of their house. Finally, the size of the house, with a significance level of 99%, influences the probability to rent out a room. The OR of 1.131 shows that for each increase in the size category, the probability of renting out a room increases by 13.1%. The larger the house, the more respondents rent out a room. Using the results of the Binary Logistic Regression, a profile of people who have the highest probability to rent out a room can be created, which is shown in **Table 13**.

Table 13 Profiling respondents have the highest probability to rent out a room

Individual characteristics	**Housing characteristics**
High(er) age	Homeowners
High educated	Less satisfied with the layout of the house
	Big(ger) house size

4.3 Discussion of the results

The results of the second and third sub-questions are expounded in this section against the literature and hypotheses. Next, limitations and validity of the study are discussed.

Starting with the second sub-question '*Does room rental affect the housing satisfaction of the lessor?*'. The Ordered Logistic Regression indicates that room rental does indeed affect housing satisfaction. The test indicates that the probability of being in a higher category of housing satisfaction increases by renting out a room compared to not rening out a room. In other words, room rental has a positive effect on housing satisfaction. The existing literature is inconclusive in the possible effect room rental could have on housing satisfaction. Several studies demonstrated that home sharing has disadvantages that could negatively affect housing satisfaction. For example, research by Pauly (2015), which mentioned that the loss of privacy, reduced personal space and conflicts arising from collective living would have a negative effect on housing satisfaction. By Hemmens et al. (1996), the negative effect of home sharing on mental health was mentioned. Several other researchers also evidenced the adverse effects of home sharing, leading to hypothesis 1 as follows:

> *Hypothesis 1: There is a negative association between room rental and the housing satisfaction of the lessor.*

Based on the Ordered Logistic Regression analysis, the above hypothesis must be rejected. Namely, results of the current study indicate that there is a positive association between room rental and housing satisfaction, meaning that people who rent out a room in general report a higher level of housing satisfaction. However, as both housing satisfaction and room rental are determined at the same time point, it is not possible to assume that a causal relationship between room rental and housing satisfaction exist. A longitudinal study is needed to determine causality between the two concepts. There may even exist a reciprocal relationship between the two concepts as it is plausible that room rental affects a person's housing satisfaction, but the level of housing satisfaction can also influence the choice to rent a room.
The finding is consistent with various studies. For example, Clark et al. (2018) mentions that home sharing is experienced as fun, companionship, mutual support, it alleviates loneliness, and it can boost social life. Furthermore, according to Heath et al. (2018), it brings a higher perception of comfort and security. Although there are far fewer studies naming the positive effects of room rental, the results of the current study suggest that these positive aspects appear to outweigh the negative aspects of room rental. A logical point of view to consider why people might experience more housing satisfaction through room rental, in addition to the positive effects resulting from the social contact, could include the very conscious decision to rent out a room. For example, people who see the social importance and thereby have a good feeling about room rental, which may have a positive effect on their housing satisfaction.

Although the results of this study indicate a positive effect of renting out a room on the lessor's housing satisfaction, it is a matter of luck/bad luck with the situation of renting out a room. The experience of renting out a room does not depend only on individual and housing characteristics. “Human groups are not merely a number of independent individuals but complex systems of interdependent characters constantly adjusting to the actions and reactions of others” (Lewin, 1997, p. 301). Birmingham (2001) hereby mentions important factors in shared housing such as, mutual respect, consideration, and cooperation.

The analysis also indicates a significant impact on housing satisfaction for independent variables. Namely for the variables household composition; education level, tenure type, satisfaction with layout and maintenance of the house and the difference in size of the house. The literature shows that housing satisfaction depends on the household composition and the dwelling they have, for example, couples would have a more positive housing satisfaction in a flat and people with children would be happier in a house with a garden (Morville, 1969). The regression analysis indicates that multi-person households experience a lower degree of housing satisfaction compared to single-person households. This is consistent with research by Musterd & Van Kempen (2007) who state that single person households are generally more positive about their houses. Dekker et al. (2004) concluded with respect to education level the following: lower educated people tend to be more satisfied with their houses. In this area, the results of the regression are consistent with the literature found. Similarly, the findings on the effect of tenure type are also in line with the literature; for example, Elsinga & Hoekstra (2005) found that owning a property has a positive effect on housing satisfaction. The results related to the layout, maintenance and size of the house are also consistent with the literature. The more satisfied one is with the layout, the more satisfied one is with the maintenance and the larger the size of their house, the higher the housing satisfaction. For example, literature refers to the appearance of buildings, with lack of appearance having a negative effect on housing satisfaction (Hastings & Dean, 2003; Rowlands et al., 2009), after renovation people are more satisfied (Dekker et al., 2011) and Bird (1976) concluded in his research that quality of houses contributes very strongly to housing satisfaction. Regarding size, Rossi (1980) stated that people with larger houses tend to be more satisfied with their house.

The test conducted to verify if the sample is representative for the entire respondent sample of the WoON2018 dataset indicated that the sample is not representative. Since there are indeed differences between the groups and this is due to routing in the questionnaire, there may have been selection bias that may have affected the results of the analyses. The lack of a representative sample may also mean an inability to generalize conclusions to the entire Dutch population.

The results of the analysis for answering the third sub-question '*To what extend differ households renting out a room from households not renting out a room?*' obtained from the Binary Logistic Regression indicate with several significant p-values that there is indeed a difference in characteristics between households that do and do not rent out a room. This finding is consistent with research by Heath & Clever (2003) who found several characteristic differences between people who did and did not choose to share a house. However, the result is contrary to research by Bush & Shinn (2017) which concluded, using data from the American Housing Survey, that people choose to share houses unrelated to their background. Considering the characteristics, a significant difference is observed for about half of the variables. From the literature review, the following hypothesis emerged:

> *Hypothesis 2: Income and age of respondents who are renting out a room are lower than those who are not renting out a room.*

Based on the Binary Logistic Regression analysis, hypothesis 2 must be rejected. Although income does not show a significant difference at all, age does. It is remarkable that the variable income seems to have no effect, since income emerges in almost all studies as the biggest driver behind home sharing (Kemp & Rugg, 1998; Natalier, 2003). The variable age indicates that older respondents have a higher probability to rent out a room compared to younger respondents. This contradicts research by Clark (2017) which states that people later in life tend to be less open to home sharing. Also contradicted is research by Bush & Shinn (2017) who argue that age has no influence on whether people want to share a house.

The independent variables, education level, tenure type and size do indicate a significant difference. Higher educated people would have a higher probability to rent out a room, which again may stem from the possibility that such people might be more aware of the social importance. It could also be related to higher educated people having a higher salary and therefore a bigger house, which means more space opportunities to rent out a room. Furthermore, it is observed that home owners more often rent out a room, this may be since subletting may be prohibited for tenants, thus eliminating the possibility for renters. However, housing corporations are increasingly likely to allow subletting. One striking outcome is the outcome related to the layout of the house. Respondents have a lower probability to rent out a room when they are very satisfied or satisfied with the layout of their house compared to not satisfied with the layout. No literature was found that rejects or is consistent with this outcome. Regarding size, it has been found that people living in larger houses have a higher probability to choose to rent out a room, although this has not emerged in literature this is a plausible point. People with larger houses may have more space (left over) to rent out, therefore there may also be a smaller claim for privacy reduction.

Although the study provides clear results, there are aspects that limit the reliability and accuracy of the findings. The most prominent aspect is the incomplete nature of the variable room rental. It is up for debate whether the questions of the WoON2018 dataset were correctly interpreted as mentioned in section 3.2, resulting in a lower number of room rentals compared to what the case is. Which leads to a less powerful model. Furthermore, 97.1% of respondents did not have to answer the question of whether they rent a room. This number is substantial and affects the representativeness of the study. Although a considerable number of respondents did not have to answer the question, there is still a large sample left to continue the analysis with. However, this requires knowing whether these respondents are representative of the entire respondent population. Since the study shows that the characteristics of these respondents differ significantly from the total respondent population, the sample can be argued to be unrepresentative. This has implications for drawing conclusions. As a result, the conclusions do not directly apply to the entire Dutch population. Another notable point in the study is that almost all previous research reflects the effect of income on whether to share a house or rent out a room, although the current study does not show a significant effect. This may also be due to the incomplete and not representative sample. Furthermore, there are several factors that influence housing satisfaction, unfortunately the WoON2018 dataset does not contain all factors, which means that more issues must be considered in addition to the included variables. **Table 2** lists the potential independent variables that emerged from literature research. This indicates that for example, the individual characteristic 'people's expectations at certain points in their lives' and the housing characteristic 'location' also contribute as factors that influence housing satisfaction, which unfortunately do not appear in the WoON2018 dataset.

5. CONCLUSION & RECOMMENDATIONS

This chapter answers the main question, reflects on the limitations of the study, and provides recommendations both regarding policy and further research.

5.1 Conclusion

As mentioned, the Dutch housing market is overheated. It is not possible to build enough housing in the short term, therefore it is essential to look at the possibilities the existing housing stock can offer in this period of scarcity. The shortage of student rooms and single person houses could possibly be solved by having students and starters move in with other households. In this regard, however, it is important to know what effect this has on households to know whether the government should encourage room rental. For policy makers to know what the effects of room rental are, the following main question was formulated: *To what extent is room rental related to housing satisfaction, and, for which (types of) households is it most appropriate?*

After performing an Ordered and Binary Logistic Regression it is possible to answer the main question. The results of the Ordered Logistic Regression indicate that room rental has a positive effect on the housing satisfaction of the lessor. Based on this it is possible to answer the first part of the main question, due to the positive effect room rental has on the housing satisfaction of the lessor, room rental is suitable for Dutch households. This is contradictory to various literature which states that sharing a home negatively affects housing satisfaction (Pauly, 2015; Hemmens et al., 1996). Here the following reasons come up, loss of privacy, reduced personal space and conflicts at home. Nevertheless, other studies have also mentioned the positive aspect of sharing a house. For example, Clark et al. (2018) who named fun, companionship, mutual support and reducing loneliness. Although there are fewer studies highlighting the positive aspects of home sharing, this research contributes to them. Binary Logistic Regression results indicate that a difference can be observed in characteristics between households that do and do not rent out a room. This is both consistent (Heath & Clever, 2003) and contrary (Bush & Shinn, 2017) with previous studies. Although the literature focuses primarily on income and age, multiple variables are included in the test. As a result, the test results in a profile of households that have the highest probability to rent out a room. Based on these results, the second part of the main question can also be answered. Room rental is appropriate for: households (or head of household) with a high(er) age, who are highly educated, owning a house, and having a large house. The variable income does not indicate a significant difference so it cannot be further discussed. Previous studies expect an opposite

outcome with respect to the variable age, Clark (2017) in fact concluded that people would be less open to home sharing at a later age.

5.2 Limitations

While the study complements the small number of studies related to renting a room, this study also has limitations. First, the most important and impactful limitation is the low number of responses to the question related to room rental. Therefore, since the data used are not representative of the entire respondent population, the conclusions drawn cannot be adopted one-to-one for all Dutch households. Second, it is up for debate whether the questions of WoON2018 have been properly interpreted; a set of definitions accompanying the questionnaire can solve this. Third, literature review has identified that in addition to the variables included in this study, there are several other aspects that can intervene in the effect of renting out a room on the lessor's housing satisfaction. Fourth, due to the use of WoON2018, the effect of COVID-19 is not included in this study. For example, COVID-19 could generate a greater desire to share a house to reduce significant loneliness due to the lockdown or there could be a reduced desire to share a house to decrease the risk of infection.

5.3 Recommendations

Policy-making advice

Assuming the low response rate has minimal impact, and the results of the study are correct, recommendations can be given for public policy in the Netherlands regarding room rental. As explained in 1.1, the government's Actieagenda Wonen focuses primarily on building more houses (Actieagenda Wonen, 2021). In addition to improving neighborhoods, building additional housing, affordable housing and sustainable housing, more intensive use of the current housing stock should also become one of the main topics of the Actieagenda Wonen. Current research suggests that room rental has a positive effect on housing satisfaction and is therefore suitable for Dutch households. With this knowledge, the government can make additions to the Actieagenda Wonen regarding various aspects.

First, for example by making room rental more accessible, by increasing the ‘kamerverhuurvrijstelling’. Second, the government may start advertising for room rental. Many people will not be aware of the existence of the ‘hospitaverhuur’ regulation and the ‘kamerverhuurvrijstelling’. Based on this research, it is hereby recommended to consider the individual and housing characteristics identified, which will bring room rental to the attention and create more awareness among the target group. Third, the results indicate that homeowners are more likely to rent out a room. Although room rental seems more appropriate for homeowners, if renters are offered more opportunities to rent out a room, this group would

probably engage in it more often. The government could initiate discussions with (social housing) landlords to consider the possibility of subletting, allowing people who rent (social) housing to sublet a room. Fourth, the government can reconsider the hospita regulation by, for example, including rules on the rights and obligations of lessee and lessor after the trial period (nine months). With this, to prevent the room from being rented out for only nine months each time (because thereafter it becomes an indefinite lease). Although the rent protection is more favorable for a tenant with an indefinite contract, for the landlord, a relaxation regarding the termination of the lease could also be considered when the landlord wants to sell the house or stops renting the property himself. This could all lead to more people choosing to rent out a room and reduce the number of people looking for a room.

Research improvements

The significant low number of responses that is an issue, is one area where this study could be greatly improved. There are two possible ways. First, a ‘non-response’ survey could be done which means that all respondents who did not answer a certain question are approached again to answer the question. In this case, in contrast, it is not called a non-response survey, but an additional question for all households. However, it is questionable to what extent this is possible given the anonymity and size of the dataset. Second, conduct a new survey in which all questions need to be answered. When the low response is resolved or excluded in these ways, the respondents will be a representative representation of the Dutch population. When conducting a new survey and compiling a new dataset, the research could be improved by including more factors that influence housing satisfaction and definitions among questions.

Recommendations for future research

The study can be repeated with a more recent dataset to include the influence of COVID-19 in the analysis. Unfortunately, a brief glance at the despite published WoON2021 dataset revealed that an equally low response rate to the question on room rentals appeared. Making this dataset ineligible, so new data will be required. If it is assumed that renting out a room has a positive effect on housing satisfaction and it is advisable to adjust government policy accordingly, more and more people will rent out a room. Follow-up research could be whether this should be considered in the design of new housing. Consider what kind of houses are most suitable for room rental, this could for example include the most appropriate size of the house and modifications that make room rental easier, such as multiple bathrooms. Other future research could focus on the effect of subsidies on people's willingness to rent out a room. It would also be interesting to consider the housing satisfaction of the renter (students, starters, singles); after all, this research only highlights the landlord's perspective. Are they willing to live with a household at all?

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APPENDICES

Appendix A. Chi-square test to check representativeness of respondents

Table 14 Chi-square room rental respondents vs remaining sample

	Respondents		**Remaining sample**			
Variable	N	%	N	%	X^2	**p**
Individual characteristics						
Household comp.					629.963	<0.001
Single-person hh	982	60.4	17234	31.0		
Multi-person hh	643	39.6	38352	69.0		
Age					3428.287	0.000
17-24 years	473	29.1	1591	2.9		
25-34 years	398	24.5	7430	13.4		
35-44 years	154	9.5	8124	14.6		
45-54 years	177	10.9	10703	19.3		
55-64 years	170	10.5	11139	20.0		
65-74 years	162	10.0	9820	17.7		
75+ years	91	5.6	6779	12.2		
Housing characteristics						
Tenure type					854.800	<0.001
Owner	502	30.9	36681	66.0		
Renter	1123	69.1	18905	34.0		
Size					518.622	<0.001
< 29	23	1.4	322	0.6		
30-59	108	6.6	3168	5.7		
60-89	573	35.3	11707	21.1		
90-119	292	18.0	17274	31.1		
120-149	205	12.6	11342	20.4		
150-179	109	6.7	5431	9.8		
180-209	73	4.5	2681	4.8		
210-239	67	4.1	1330	2.4		
240-269	36	2.2	743	1.3		
>270	139	8.6	1588	2.9		

Table 15 Chi-square room rental yes respondents vs room rental no respondents

	Yes		**No**			
Variable	N	%	N	%	X^2	**p**
Housing satisfaction					27.583	<0.001
Very satisfied	60	47.6	394	26.3		
Satisfied	42	33.3	698	46.6		
Neutral	17	13.5	290	19.3		
Dissatisfied	4	3.2	92	6.1		
Very dissatisfied	3	2.4	25	1.7		
Individual characteristics						
Household comp.					20.972	<0.001
Single-person hh	52	41.3	930	62.0		
Multi-person hh	74	58.7	569	38.0		
Age					75.850	<0.001
17-24 years	13	10.3	460	30.7		
25-34 years	18	14.3	380	25.4		
35-44 years	13	10.3	141	9.4		
45-54 years	34	27.0	143	9.5		
55-64 years	19	15.1	151	10.1		
65-74 years	26	20.6	136	9.1		
75+ years	3	2.4	88	5.9		
Housing characteristics						
Tenure type					85.556	<0.001
Owner	85	67.5	417	27.8		
Renter	41	32.5	1082	72.2		
Size					51.684	<0.001
< 29	3	2.4	20	1.3		
30-59	3	2.4	105	7.0		
60-89	27	21.4	546	36.4		
90-119	22	17.5	270	18.0		
120-149	11	8.7	194	12.9		
150-179	8	6.3	101	6.7		
180-209	14	11.1	59	3.9		
210-239	11	8.7	56	3.7		

240-269	3	2.4	33	2.2	
>270	24	19.0	115	7.7	

Appendix B. Data Preparation

Table 16 Data Preparation

#	Observations cleaned	What has been done?	Observations left
1	8425	Filter out missing housing satisfaction	59098
2	57423	Filter out room rental due to routing in questionnaire	1675
3	0	Changing household composition to 2 categories instead of 3 (Single-person hh vs. Multi-person hh)	1675
4	50	Filter out response ‘don’t know or unknown’ in education level responses	1625
5	0	Transform size to a categorical variable with 10 categories	1625
6	0	Transforming income into 5 dummies	1625
7	0	Transforming education level into 3 dummies	1625
8	0	Recode all binary variables to 0 and 1 instead of 1 and 2	1625
9	0	Recode housing satisfaction variable to a logical order (1 = very dissatisfied, 5 = very satisfied)	1625

The initial number of observations of 67,523 dropped to 1625 after preparing and cleaning the data.

Appendix C. The Spearman Correlation Matrix

Table 17 The Spearman Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Room rental	1.000								
(2) Household comp.	0.114	1.000							
(3) Age	0.150	0.365	1.000						
(4) Income	0.126	0.636	0.397	1.000					
(5) Education	0.053	-0.065	-0.236	0.122	1.000				
(6) Tenure type	0.229	0.535	0.512	0.590	-0.083	1.000			
(7) Layout	-0.027	-0.101	-0.209	-0.123	0.128	-0.247	1.000		
(8) Maintenance	0.069	0.216	0.304	0.262	-0.096	0.339	-0.359	1.000	
(9) Size	0.132	0.382	0.280	0.396	-0.050	0.386	-0.147	0.210	.000

Appendix D. Testing Assumption 3 (VIF) – Ordered Logistic Regression

Table 18 Variance Inflation Factor (VIF)

Variables	**VIF**
Room rental	1.077
Household composition	1.868
Age	1.714
Income	
< modal	7.538
> modal < 1.5 times modal	4.207
> 1.5 times model < 2 times modal	2.538
> 2 times modal < 3 times modal	2.621
Education	
Low	1.566
Middle	1.294
Tenure type	2.035
Layout	1.165
Maintenance	1.255
Size	1.230
Mean	2.316

Appendix E. Testing Assumption 4 (Test of Parallel Lines) – Ordered Logistic Regression

Table 19 Test of Parallel Lines

Model	**-2 Log Likelihood**	**Chi-Square**	**df.**	**Sig.**
Null Hypothesis	2727.776			
General	2665.637	67.997	57	.298

Appendix F. Testing Assumption 3 (VIF) – Binary Logistic Regression

Table 20 Variance Inflation Factor (VIF)

Variables	**VIF**
Household composition	1.868

Age	1.707
Income	
< modal	7.527
> modal < 1.5 times modal	4.203
> 1.5 times model < 2 times modal	2.538
> 2 times modal < 3 times modal	2.621
Education	
Low	1.551
Middle	1.292
Tenure type	1.981
Layout	1.164
Maintenance	1.255
Size	1.221
Mean	2.411

Appendix G. Chi-square and Mann-Whitney U test

Table 21 Chi-square and Mann-Whitney U test

	Yes		**No**			
Variable	N	%	N	%	X^2	**p**
Housing satisfaction					27.583	<0.001
Very satisfied	60	13.2	394	86.8		
Satisfied	42	5.7	698	94.3		
Neutral	17	5.5	290	94.5		
Dissatisfied	4	4.2	92	95.8		
Very dissatisfied	3	10.7	25	89.8		
	M		M		U	p
Mann-Whitney U test	652.60		826.48		74226.500	<0.001

Appendix H. Syntax

Data cleaning and preparing

```
DATASET ACTIVATE DataSet1.
FREQUENCIES VARIABLES=twoning
  /ORDER=ANALYSIS.

FILTER OFF.
USE ALL.
SELECT IF  (NOT(twoning=0)).
EXECUTE.

FREQUENCIES VARIABLES=twoning
  /ORDER=ANALYSIS.

FREQUENCIES VARIABLES=hhverhur
  /ORDER=ANALYSIS.

FILTER OFF.
USE ALL.
SELECT IF  (NOT(hhverhur=0)).
EXECUTE.

FREQUENCIES VARIABLES=hhverhur
  /ORDER=ANALYSIS.

FREQUENCIES VARIABLES=hht
  /ORDER=ANALYSIS.

RECODE hht (1=1) (2=2) (3=2) INTO Recoded_Householdcomp.
VARIABLE LABELS  Recoded_Householdcomp 'Householdcomp_as_single_or_multiple'.
EXECUTE.

FREQUENCIES VARIABLES=Recoded_Householdcomp
  /ORDER=ANALYSIS.

FREQUENCIES VARIABLES=inkmod5_r
  /ORDER=ANALYSIS.

FREQUENCIES VARIABLES=leeftijd
  /ORDER=ANALYSIS.

FREQUENCIES VARIABLES=vltoplop3
  /ORDER=ANALYSIS.
```

```
RECODE vltoplop3 (1=1) (2=2) (3=3) (9=SYSMIS) INTO Recoded_opleidingsniveau.
VARIABLE LABELS  Recoded_opleidingsniveau 'Opl_niv_3categories'.
EXECUTE.

FREQUENCIES VARIABLES=Recoded_opleidingsniveau
  /ORDER=ANALYSIS.

FILTER OFF.
USE ALL.
SELECT IF  (NOT(Recoded_opleidingsniveau=0)).
EXECUTE.

FREQUENCIES VARIABLES=Recoded_opleidingsniveau
  /ORDER=ANALYSIS.

FREQUENCIES VARIABLES=eighuura
  /ORDER=ANALYSIS.

FREQUENCIES VARIABLES=tindelin
  /ORDER=ANALYSIS.

FREQUENCIES VARIABLES=tonderho
  /ORDER=ANALYSIS.

FREQUENCIES VARIABLES=gebruiksopp
  /FORMAT=NOTABLE
  /HISTOGRAM NORMAL
  /ORDER=ANALYSIS.

RECODE gebruiksopp (90 thru 119=4) (120 thru 149=5) (Lowest thru 29=1) (30 thru 59=2) (60 thru
    89=3) (150 thru 179=6) (210 thru 239=8) (180 thru 209=7) (240 thru 269=9) (270 thru Highest=10)
    INTO Recoded_size.
VARIABLE LABELS  Recoded_size 'gebruiksopp_categorien'.
EXECUTE.

FREQUENCIES VARIABLES=Recoded_size
  /ORDER=ANALYSIS.

RECODE hhverhur (2=0).
EXECUTE.

RECODE Recoded_Householdcomp (1=0) (2=1).
EXECUTE.
```

```
RECODE eighuura (2=0).
EXECUTE.
```

Testing the representativeness of the respondents

```
FREQUENCIES VARIABLES=twoning hhverhur Recoded_Householdcomp leeftijd inkmod5_r
    Recoded_opleidingsniveau eighuura tindelin tonderho Recoded_size
  /ORDER=ANALYSIS.
FREQUENCIES VARIABLES=hhverhur
  /ORDER=ANALYSIS.

RECODE hhverhur (1=1) (2=1) (8=2) (SYSMIS=2) INTO hhverhur_antw_vs_missing.
VARIABLE LABELS  hhverhur_antw_vs_missing 'verhuur kamers ja/nee vs missing'.
EXECUTE.

FREQUENCIES VARIABLES=hhverhur_antw_vs_missing
  /ORDER=ANALYSIS.

FILTER OFF.
USE ALL.
SELECT IF  (NOT(twoning=0)).
EXECUTE.

FREQUENCIES VARIABLES=vltoplop3
  /ORDER=ANALYSIS.

FILTER OFF.
USE ALL.
SELECT IF  (NOT(vltoplop3=9)).
EXECUTE.

CROSSTABS
  /TABLES=Recoded_Householdcomp leeftijd eighuura Recoded_size BY hhverhur_antw_vs_missing
  /FORMAT=AVALUE TABLES
  /STATISTICS=CHISQ
  /CELLS=COUNT COLUMN
  /COUNT ROUND CELL.

CROSSTABS
  /TABLES=twoning Recoded_Householdcomp leeftijd eighuura Recoded_size BY hhverhur
  /FORMAT=AVALUE TABLES
  /STATISTICS=CHISQ
  /CELLS=COUNT COLUMN
  /COUNT ROUND CELL.
```

Testing assumption of linearity (age & size)

```
COMPUTE nlog_leeftijd=ln(leeftijd).
EXECUTE.

COMPUTE nlog_size=ln(Recoded_size).
EXECUTE.


* Generalized Linear Models.
GENLIN Recoded_Housingsatisfaction (ORDER=ASCENDING) BY tindelin tonderho (ORDER=ASCENDING)
WITH hhverhur
    Recoded_Householdcomp leeftijd nlog_leeftijd Inkomen_1 Inkomen_2 Inkomen_3 Inkomen_4 Opleiding_1
Opleiding_2
    eighuura Recoded_size nlog_size
  /MODEL tindelin tonderho hhverhur Recoded_Householdcomp leeftijd leeftijd*nlog_leeftijd Inkomen_1
Inkomen_2
    Inkomen_3 Inkomen_4 Opleiding_1 Opleiding_2 eighuura Recoded_size Recoded_size*nlog_size
 DISTRIBUTION=MULTINOMIAL LINK=CUMLOGIT
  /CRITERIA METHOD=FISHER SCALE=1 COVB=MODEL MAXITERATIONS=100 MAXSTEPHALVING=5
    PCONVERGE=1E-006(ABSOLUTE) SINGULAR=1E-012 ANALYSISTYPE=3(WALD) CILEVEL=95
CITYPE=WALD
    LIKELIHOOD=FULL
  /MISSING CLASSMISSING=EXCLUDE
  /PRINT CPS DESCRIPTIVES MODELINFO FIT SUMMARY SOLUTION (EXPONENTIATED).
```

Descriptive statistics

```
DESCRIPTIVES VARIABLES=twoning hhverhur Recoded_Householdcomp leeftijd inkmod5_r
    Recoded_opleidingsniveau eighuura tindelin tonderho Recoded_size
  /STATISTICS=MEAN STDDEV MIN MAX.


NONPAR CORR
  /VARIABLES=hhverhur Recoded_Householdcomp leeftijd inkmod5_r Recoded_opleidingsniveau
    eighuura tindelin tonderho Recoded_size
  /PRINT=SPEARMAN TWOTAIL NOSIG FULL
  /MISSING=PAIRWISE.


CROSSTABS
  /TABLES=twoning tindelin tonderho vltoplop3 eighuura Recoded_size inkmod5_r leeftijd
Recoded_Householdcomp BY hhverhur
  /FORMAT=AVALUE TABLES
  /CELLS=COUNT
  /COUNT ROUND CELL.
```

Sub-question 2 - Testing (Chi-square, Mann-Whitney U)

```
CROSSTABS
  /TABLES=hhverhur BY twoning
  /FORMAT=AVALUE TABLES
  /STATISTICS=CHISQ
  /CELLS=COUNT COLUMN
  /COUNT ROUND CELL.
```

**Nonparametric Tests: Independent Samples.*

```
NPTESTS
  /INDEPENDENT TEST (twoning) GROUP (hhverhur)
  /MISSING SCOPE=ANALYSIS USERMISSING=EXCLUDE
  /CRITERIA ALPHA=0.05  CILEVEL=95.
```

Sub-question 2 - Testing assumptions

```
SPSSINC CREATE DUMMIES VARIABLE=inkmod5_r
ROOTNAME1=Inkomen
/OPTIONS ORDER=A USEVALUELABELS=YES USEML=NO OMITFIRST=NO.

SPSSINC CREATE DUMMIES VARIABLE=Recoded_opleidingsniveau
ROOTNAME1=Opleiding
/OPTIONS ORDER=A USEVALUELABELS=YES USEML=NO OMITFIRST=NO.

DATASET ACTIVATE DataSet1.
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA COLLIN TOL
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT twoning
  /METHOD=ENTER hhverhur Recoded_Householdcomp leeftijd Inkomen_1 Inkomen_2 Inkomen_3 Inkomen_4
    Opleiding_1 Opleiding_2 eighuura tindelin tonderho Recoded_size.

PLUM twoning BY tonderho tindelin WITH hhverhur Recoded_Householdcomp leeftijd Inkomen_1
    Inkomen_2 Inkomen_3 Inkomen_4 Opleiding_1 Opleiding_2 eighuura Recoded_size
  /CRITERIA=CIN(95) DELTA(0) LCONVERGE(0) MXITER(100) MXSTEP(5) PCONVERGE(1.0E-6)
SINGULAR(1.0E-8)
  /LINK=LOGIT
  /PRINT=FIT PARAMETER SUMMARY TPARALLEL.
```

Testing Sub-question 2 – Ordered Logistic Regression

```
* Generalized Linear Models.
GENLIN Recoded_Housingsatisfaction (ORDER=ASCENDING) BY tindelin tonderho (ORDER=ASCENDING)
WITH hhverhur
    Recoded_Householdcomp leeftijd Inkomen_1 Inkomen_2 Inkomen_3 Inkomen_4 Opleiding_1 Opleiding_2
    eighuura Recoded_size
  /MODEL tindelin tonderho hhverhur Recoded_Householdcomp leeftijd Inkomen_1 Inkomen_2
    Inkomen_3 Inkomen_4 Opleiding_1 Opleiding_2 eighuura Recoded_size
 DISTRIBUTION=MULTINOMIAL LINK=CUMLOGIT
  /CRITERIA METHOD=FISHER SCALE=1 COVB=MODEL MAXITERATIONS=100 MAXSTEPHALVING=5
    PCONVERGE=1E-006(ABSOLUTE) SINGULAR=1E-012 ANALYSISTYPE=3(WALD) CILEVEL=95
CITYPE=WALD
    LIKELIHOOD=FULL
```

```
  /MISSING CLASSMISSING=EXCLUDE
  /PRINT CPS DESCRIPTIVES MODELINFO FIT SUMMARY SOLUTION (EXPONENTIATED).
```

Sub-question 3 - Testing assumptions

```
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA COLLIN TOL
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT hhverhur
  /METHOD=ENTER Recoded_Householdcomp leeftijd Opleiding_1 Opleiding_2 Inkomen_1 Inkomen_2
Inkomen_3 Inkomen_4 eighuura tindelin tonderho Recoded_size.
```

Testing Sub-question 3 – Binary Logistic Regression

```
LOGISTIC REGRESSION VARIABLES hhverhur
  /METHOD=ENTER inkmod5_r leeftijd Recoded_Householdcomp  Recoded_opleidingsniveau eighuura tindelin
    tonderho Recoded_size
  /CONTRAST (inkmod5_r)=Indicator
  /CONTRAST (Recoded_opleidingsniveau)=Indicator
  /CONTRAST (tindelin)=Indicator
  /CONTRAST (tonderho)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```