RELOCATION BEHAVIOUR THROUGHOUT THE BUSINESS CYCLE

A QUANTITATIVE APPROACH FINDING THAT NO EVIDENT TRENDS COULD BE DISTINGUISHED OF THE BUSINESS CYCLE AS AN INFLUENCE ON RELOCATION BEHAVIOUR IN GREATER-AMSTERDAM.

What are the effects of housing prices and income on people's intention to move inside or outside Greater-Amsterdam throughout the business cycle?

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10-1-2020

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COLOPHON

Title	Relocation behaviour throughout the business cycle
Version	1.0
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Study	Real Estate Studies
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Amount of words	19,726

PREFACE

Before you is the thesis '*Relocation behaviour throughout the business cycle: a quantitative approach finding that no evident trends could be distinguished of the business cycle as an influence on relocation behaviour in Greater-Amsterdam.* This thesis is a final work to fulfill my masters' degree for Real Estate Studies in the Faculty of Science at the University of Groningen.

Almost two years ago I graduated with a Bachelor of Human Geography & Urban Planning at the University of Amsterdam. The real estate aspects within this bachelor program always have had my interest, causing me to choose this Real Estate Master in order to specialize myself in this discipline. I would like to take this chance to thank my supervisor, Dr. S. van Lanen for his professional support and Prof. Dr. Ir. A.J. van der Vlist for the extra professional guidance, and for their flexibility in planning the feedback meetings.

I hope you enjoy your reading,

Joost Mulders
Groningen, January 10, 2020

EXECUTIVE SUMMARY

Within Greater-Amsterdam, both housing and rental prices showed an increase the last number of years. More lower-income people already experience displacement processes within the city of Amsterdam due to this increase (Hochstenbach & Musterd, 2018). This study focused on different effects, of this ever-changing housing market and the various effects of different income groups on relocation behaviour within Greater-Amsterdam, and found that the business cycle has no evident effects on relocation behaviour. Four different phases of the business cycle were distinguished to examine whether the possible effects of housing prices and income on people's moving intention change throughout this business cycle. More specifically, out of the people who have an intention to move, would they like to move outside or inside Greater-Amsterdam? As such, the main research question was formulated as follows:

What are the effects of housing prices and income on people's intention to move inside or outside Greater-Amsterdam throughout the business cycle?

To answer this question a theoretical framework was developed, showing that there are different incentives and barriers as influence for people to relocate. Micro-level characteristics, such as a low-income, appeared to be a trigger to relocate (Musterd & Van Gent, 2015). Whereas, macro-level incentives, such as high housing prices within the housing market, proved to be an incentive to leave expensive areas as well (Dieleman, 2001; Helderman et al., 2004). This housing market is interrelated with the business cycle, however, not much literature can be found on the relation between different stages of the business cycle and moving behaviour, especially not regarding the effects of different income and housing prices.

Therefore, four different Housing Surveys (HS) held in four different stages of the business cycle were analyzed using a quantitative approach to examine these possible effects. The distinguished business cycle phases are: peak (2009), recession (2012), trough (2015) and expansion (2018). An analysis of both the Dutch and Amsterdam housing market determined these stages. Furthermore, a first binary logistic regression analysis of the HS merged proved that lower-income groups are more inclined to leave Greater-Amsterdam compared to the upper-middle and higher income groups. This indicates that processes of displacement regarding moving intentions are also noted on a higher regional level. Moreover, housing prices of the current dwelling appeared to have a negative effect on people's relocation intentions of leaving Amsterdam.

Nonetheless, to research if the overall Greater-Amsterdam's housing prices have an effect on moving behaviour a test was conducted. By the use of a likelihood ratio test statistical differences between the segmented models of the individual years of the HS and the merged

HS model were found. For this reason, segmented binary regressions analyses were conducted. Yet, no significant trends emerged from the segmented binary regression analysis. Therefore, it cannot be concluded that the differences in people's moving intentions between the segmented and merged regression models are explained by just the effects of income amounts or housing prices. Other macro-level and micro-level factors appeared to explain the relocation behaviour, such as tenure, ethnicity or possibly the rental market, especially during the expansion and peak stage of the business cycle.

Further studies could asses the influence of rental prices on relocation behaviour, since this study mostly focusses on housing prices, income and the business cycle, rather than tenure. As the tight Amsterdam housing market is a unique case, more studies could focus on possible comparable cities, municipalities or regions in the Netherlands or abroad. The municipality of Amsterdam is already taking several measures to deal with the increasing housing prices, yet, more research is needed to examine if these measures show any effects.

Keywords: real estate, housing market, relocation behaviour, business cycle, displacement

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1. INTRODUCTION

1.1. Motivation

Last year it was expected that, after years of rising rents in Amsterdam, rental rates had reached a cap. However, the average private-sector rent in the Netherlands' capital proved the opposite and rose to 22.83 euros per square meter. This is 3.5 percent more compared to the same period last year (Damen, 2018). "*These climbing rents are the result of rising housing prices and are 'spreading like an oil stain'* " according to De Groot, CEO of Pararius; the largest independent housing platform in the Netherlands (Damen, 2018). Besides, due to the high prices in Amsterdam, both the rental and housing prices in surrounding municipalities have risen likewise. In the rest of his article he states that as more and more people of lower-income groups leave Amsterdam and its region, more wealthy people are moving into Greater-Amsterdam. The capital of the Netherlands proves to be a popular destination for both firms and people causing the housing prices to rise (Municipality of Amsterdam, 2018a). An additional factor is the Brexit, causing firms or organizations, now based in the United Kingdom, to relocate to Metro Amsterdam, such as the European Medicines Agency (EMA). This popularity does not only trigger a population growth, but also an economic growth and this economic growth is related with the business cycle, and so is the housing market (Davis & Heathcote, 2005).

Looking at the owner-occupier market, it can be seen that the housing market is cooling off with average sold housing prices being reduced. This does not necessarily mean that housing prices are dropping, but instead says that more less-expensive houses are sold compared to one year ago (Westerveld, 2019). Families, for instance, choose to relocate as well. More often relatively cheaper residences are bought by these families in the suburbs like Geuzenveld, Slotermeer or Amsterdam South-East, according to Van Esseveld from real estate agency Van der Linden. More and more families are leaving Amsterdam due to the fact that single-family homes have become prohibitive for them (Westerveld, 2019).

Even though the municipality implements different measures, the amount of people with a lower-income leaving Amsterdam is considerably high (Municipality of Amsterdam, 2018b). The popularity of the city has grown that much that the city is already suffering from its own success due to the unaffordability of not only housing, but also of different amenities and products. Rising housing prices also discourage the possibility to save money in order to buy a house in later phases of life. Consequently, this research focuses on the housing market of the Amsterdam region, in particular on different income groups to examine how changing housing prices and relocation behaviour have changed since the financial crisis of 2008.

1.2. Literature Review

Earlier literature already shows that rising housing and rental prices trigger a process of suburbanization of poverty and displacement in Amsterdam (Hochstenbach & Musterd, 2018). However, it is still unclear what the main causes are for these residential relocations and how these processes differ in different stages of the business cycle. A number of theories exist in the literature regarding relocation behaviour; Groot et al. (2011), for instance, argue about the different possible motives of people to relocate. Mostly, people will only relocate when there is a fundamental reason to move, such as major life events; *"An important reason why people intend to move is related to (expected) life events within one of the various life course trajectories, life events such as cohabiting and having children, frequently alter preferences and needs with respect to housing, thereby triggering decisions to move"* (Groot et al., 2011, p.309). Therefore, during people's lives, different trajectories will be experienced which can influence relocation motives. That is one of the reasons why individual characteristics, like age, are also of influence on moving behaviour as these characteristics might form incentives or barriers whether to move or not (Groot et al., 2011; Mulder & Hooimeijer, 1999; Willekens, 1991). Subsequently, other literature stresses that housing preferences can be linked to certain individual characteristics. Students, for example, rather live in city centres whereas families prefer to live in more spacious suburbs (Bootsma, 1998; Crompton, 2008). Ethnic characteristics can play a role in relocation behaviour as well (Kan, 1998). These studies clearly indicate that there is a relationship between individual characteristics and relocation behaviour.

Much of the current literature on relocation behaviour pays particular attention, next to individual characteristics, to housing market conditions. The effects of housing market principles on relocation behaviour are widely explained (Henley,1998; Mulder & Hooimeijer, 1999; Dieleman, 2001; Helderman et al., 2004). A significant difference between housing demand and housing supply might form incentives or barriers to move and need to be addressed. In times of oversupply, housing prices are likely to be reduced, where in times of housing shortage an increase is expected, as seen in Amsterdam. The same goes for high or low interest rates which have a link with the housing market through mortgages. That is one of the reasons why economic conditions on both the local, regional and global level are interrelated with the housing market, with peaks and troughs, but also with the financial crisis of 2008 (Hochstenbach & Musterd, 2018; Schwartz & Seabrooke, 2009; Wilde & Decker, 2016).

Dieleman (2001) elaborates on these market conditions together with Musterd & Van Gent (2015) and states that rising housing prices and rents are a significant incentive for people forming intentions to move to lower-priced areas further away from large cities. This is

also what Hochstenbach & Musterd (2018) examined in their study, finding that suburbanization of poverty and displacement processes are an effect of rising housing prices and rents in Amsterdam. Butler et al. (2008) also describe the process of the arrival of mid-income and high-income groups driving up housing prices, replacing lower-income groups. However, Damen (2018) described that prices in Amsterdam are not only increasing in the inner cities and the suburbs, but also in the surrounding municipalities. Consequently, this study will focus not only on the changing housing market of Amsterdam, but also on the peripheral municipalities.

1.3. Scientific relevance

Two important themes emerge from the studies discussed so far: individual characteristics and housing market principles regarding relocation behaviour, with rising housing prices being an incentive for relocations in Amsterdam. Comparable processes of displacement are already observed in other European cities, such as London or Stockholm (Baeten et al., 2017; Zhang et al., 2019). However, this study focuses on potential relocations outside of Greater-Amsterdam instead of within. Hereby, bringing displacement and moving intentions to the regional scale. There is not much literature concerned with the relocation behaviour of people wanting to leave Greater-Amsterdam, especially not concerning the ever-changing housing market and its rising housing prices.

Furthermore, this study adds value to existing literature by extending the data in this research to more recent years. Consequently, this research will elaborate and extend upon these relocation processes by looking at different stages of the business cycle regarding different income groups. The research can be conducted using the data from four different housing surveys (HS) conducted by the Dutch government entitled '*WoonOnderzoek'* (*Housing Research*). It is unique in the sense that data from four different moments in time of a large part of the business cycle are used and analyzed in this study. These four data moments reflect four different stages of the cycle: trough, recovery, expansion and peak. The housing market has experienced significant changes since the financial crisis of 2008 and so have the housing prices, especially within the Amsterdam region. With this in mind, has relocation behaviour experienced a similar change, and if so, how does this relate to certain income groups? In this study, the relationship between the housing market dynamics, with a focus on housing prices, income groups, and relocation behaviour will, therefore, be examined.

1.4. Research problem statement

The research aim of this study is to understand the effects of the housing market on relocation behaviour of Greater-Amsterdam's residents during peaks and troughs of the economy, hereby taking different income groups into account to see whether phases of the business cycle have different influences on different income groups. It is expected that, due to the increasing housing prices and rents, lower-income groups intend to leave Greater-Amsterdam (Dieleman, 2001; Musterd & Van Gent, 2015). Hochstenbach & Musterd (2018) already explained the gentrification and displacement processes within Amsterdam; however, they only look within the city region and examine spatial effects, without examining the actual effects of housing prices and different income groups of people leaving Greater-Amsterdam throughout the business cycle.

Except for macro-level factors, like changing market conditions, micro-level factors, such as individual characteristics, proved to be of influence on relocation behaviour as well (figure 1). Different individual characteristics could form triggers or thresholds for people's intention to move. Individual characteristics (i.e. income, age or household composition) proved to be amongst the main factors. People have different preferences during their life cycle phases relating to needs for dwellings in different urban geographies. As some regions, like the Amsterdam region, become more expensive its accessibility for certain income groups changes as well, especially since the financial crisis of 2008. But, out of the people who have an intention to move, what are the effects of housing prices and different income on the intentions to move within or outside the region and how do they differ between different stages of the business cycle? As such, the central research question can be stated as:

What are the effects of housing prices and income on people's intention to move inside or outside Greater-Amsterdam throughout the business cycle?

By answering this research question, human geographical issues become evident as well, such as housing affordability, accessibility or displacement. Consequently, this research could be of interest to both public or private organizations. Before we can understand moving behaviour, it is of importance to understand the context. For this reason, the development of both Amsterdam and the Netherlands' housing markets need to be understood to determine the periods of the different stages of the business cycle. The development of the median-income needs to be understood as well, as income is one of the main factors of influence for the affordability of houses.

Data from the Housing Surveys (HS) and literature will be studied to answer the following question:

Sub-question 1: What is the development of both the housing market and median-income in Greater-Amsterdam and the Netherlands throughout the business cycle?

When the context has become clear and the different business cycle stages are distinguished, then examining the effects of housing prices and income on people's intention to move is the next step in understanding relocation behaviour. To study people's moving intentions, whether people with a moving intention want to move inside or outside Greater-Amsterdam, merged data from the four HS will be analyzed. This will be done to understand the actual effects of different income groups and housing prices, apart from the different business cycle stages, on relocation behaviour. Bringing us to the second sub-question:

Sub-question 2: What are the effects of housing prices and income on people's intention to move inside or outside Greater-Amsterdam?

The main focus of this research lies on the effects of the changing housing market on relocation triggers throughout the business cycle in relation with different income groups. Literature already explains the different incentives and restrictions influencing relocation behaviour, but it first need to be tested whether there are significant differences between stages of the business cycle as an influence on relocation behaviour since ongoing processes of increasing housing prices and displacement are pushing the affordable housing limits further and further away from the city. Nevertheless, different trends could be possible. Again, data from the four different HS will be used to examine this. Hence, the last sub-question can be stated as:

Sub-question 3: What is the effect of the business cycle on relocation behaviour in Greater-Amsterdam?

To visualize the effects of the housing market and individual characteristics on the concept of relocation behaviour a conceptual model is set up, which will be explained in the following part.

1.5. Conceptual model

Out of the studied literature it appeared that the different individual characteristics are factors influencing the intentions of people to relocate (figure 1). Because there are a number of different characteristics these variables will be used as control variables in this research to understand the different factors of people having an intention to leave Greater-Amsterdam. However, relocation behaviour not only proved to be dependent of individual characteristics of people, but also of housing market conditions (i.e. housing prices). Those type of factors can form macro-scale motives or restrictions in forming intentions to move as well. The changes of these market conditions on the long term might also result in rising housing prices due to a lag in the relatively long process of housing construction. Therefore, the housing market conditions are part of the conceptual framework, based on the relocation behaviour model of Mulder & Hooimeijer (1999) and can be seen in figure 1.

Consequently, the individual conditions together with the housing market conditions form a framework in which the relocation behaviour of Greater-Amsterdam could be researched. Because the focus lies on the business cycle and its changing housing market the variable housing prices is implemented in the conceptual model to see whether the effects of housing prices on relocation behaviour have changed over time (figure 1).
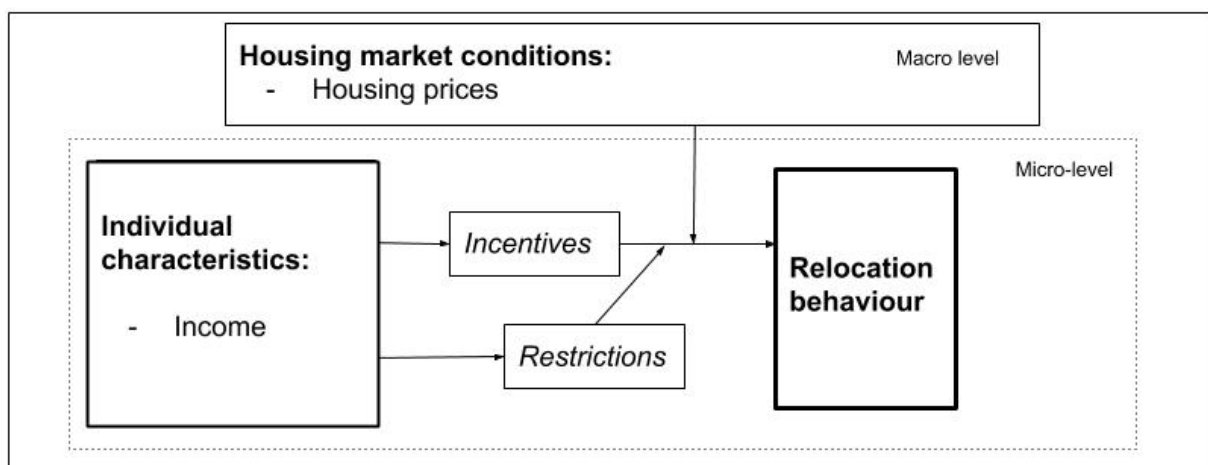
Figure 1: Conceptual model explaining relocation behaviour

The remainder of this research is organized as follows. Part two will explain theory about relocation behaviour and will elaborate on the conceptual model as described above. In part three the empirical approach, the data and the exploratory analysis are treated. Part four clarifies the context and descriptive statistics. At last, part five, six and seven present the results, conclusion and recommendation.

2. THEORY

To develop a theoretical framework about relocation behaviour and to understand reasons and motives why residents relocate, different literature is studied. In this chapter, a number of theories will be explained to give an understanding of what is already known about this relocation phenomenon. It will first be explained why the study of relocation behaviour is of importance.

2.1. Relocation behaviour

Understanding relocation behaviour and its processes is one of the factors determining the composition and size of populations. Whenever residential relocations in cities or regions are predicted, demographic structures can be understood and predicted as well (Hooimeijer & Heida, 1995). This is not only of interest for policymakers, like governmental bodies, but also for real estate agencies, project developers or construction companies in understanding the demand and supply side of the housing market. The importance of those relocation processes can be divided into three different dimensions; understanding of the composition of households, understanding labor supply and the understanding of the demand for amenities (i.e. retail).

By examining moving behaviour it is of importance to take income into account. As income might also influence relocation processes through rising rents, causing some houses to become too expensive for lessors. Hochstenbach & Musterd (2018, p.26) state that: *"cities' class maps are redrawn, urban poverty also shifts; it may, for example, move away from the inner city milieu and suburbanize or decentralize"*. Basically, this means that lower-income groups cannot pay the excessive rents in the inner cities anymore, causing them to move to relatively less expensive locations. Which are normally located in the periphery of cities, or even outside of the city limits. It is of importance to look at relocation processes and behaviour since problems like displacement, accessibility and affordability of housing are manifest in these processes. Especially, in the Randstad district in Holland which is an urban district acting as an *escalator district*. An escalator district can be seen as an upgoing social class within a region that develops automatically due to ongoing migration. More mobile young urban professionals tend to move to this kind of regions causing an upward trend in housing prices due to their higher purchasing power, which could cause class differences (Hochstenbach & Musterd, 2018; Crommentuijn, 1997). Therefore, it is necessary to study relocation behaviour in order to understand different demographic dimensions.

## 2.2. Relocation behaviour at the macro-level: housing market conditions

A considerable amount of literature has been published regarding the housing market as an influence on relocation behaviour (Coulter, 2013; Mulder & Hooimeijer,1999; Clark & Onaka, 1983; Henley, 1998). The housing market and its development will be described in this part as an influence on moving intentions.

Housing market conditions proved to be of influence on the choice set of houses. There might be more or fewer houses available during different stages of the business cycle, hereby influencing the moving behaviour of people. Simply, a household cannot relocate whenever there are no houses available. A considerable large difference between demand and supply at the local or regional housing market might cause a restriction due to a tight housing market. A tight housing market normally drives up housing prices and rents. Besides, high prices are a larger threshold for lower-income groups to relocate within this expensive area compared to higher income groups. These higher housing prices are found in major cities in general, wherefore, a price increase, during for instance a peak period, could form a barrier to relocate within these cities and could trigger a relocation outside this city region (Coulter, 2013; Mulder & Hooimeijer, 1999).

Overall, there are a number of market related reasons for households to move or not to move to another location. However, the economic market, more specifically the housing market, changes continuously. Housing prices can differ remarkably during, for instance, peak and trough phases of the economic cycle, thereby influencing the triggers and barriers to move. The next part will elaborate on these housing market changes regarding moving behaviour.

Different phases of the business cycle refer to the economic fluctuation of common economic activity, trade and production. In general, the phases of the business cycle are measured using the upward and downward going long term trend of the real gross domestic product (GDP). Four different phases can be distinguished in the business cycle: trough, expansion, peak and recession (Kenton, 2019; Heilemann & Weihs, 2007). Trough periods are a negative saturation point, the deepest phases of an economy characterized by a low GDP and low employment rates (figure 2). The next phase, the expansion phase experiences economic growth, declining unemployment rates and an upgoing pressure on prices. Whenever an economy reaches its peak, then the highest point of the business cycle is reached with a maximum level of growth. In the following recession phase growth slows down and even diminishes, the same goes for employment rates and prices bringing the cycle back to eventually another trough period (Kenton, 2019; Heilemann & Weihs, 2007). It is said that the housing market is interrelated with the investment and capital market and that the housing market is the main leading factor of the business cycle. This is due to the fact that the largest

share of the GDP normally emerges from the housing market (Davis & Heathcote, 2005). For this reason, in this study, housing prices will be used in order to measure the different phases of the business cycle.
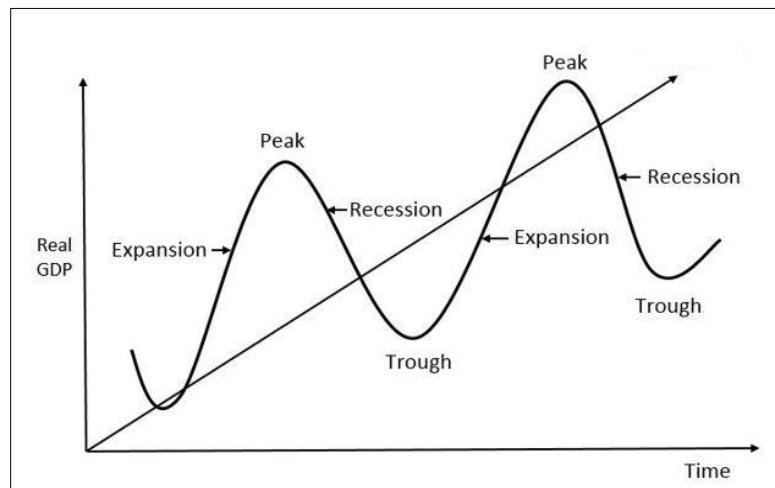
Note: the subsequent business cycle contains higher Real GDP amounts compared to the prior business cycle.

Figure 2: Explanation of the business cycle and its phases (Source: Kenton, 2019)

The housing market can, and most probably will change with the economy as it is one of the leading factors for the business cycle. Moreover, changing economic phases can influence factors like interest rates which are, for instance, directly related to mortgages and housing. According to Clark & Onaka (1983), households are more likely to move whenever interest and mortgage rates are reducing as the cost for housing reduces with it. Still, this is context dependent since there might be tax incentives of force, which differs per country. It is also of importance to notice that certain events of force majeure could be of force, think of expropriation or demolition (Henley, 1998).

It was already explained above that rising housing prices could form a barrier for people to relocate. Lu (1999) even states that housing prices have a negative impact on forming an intention to relocate. These effects are enforced during expansion and peak phases of the business cycle. Because of the fact that in prosperity phases of the business cycle people have more trust in the economy, hereby increasing demand. This might cause a tight housing market in certain regions when construction falls behind of this increasing demand. Thus, relating these pricing constraints to the business cycle it can be assumed that the business cycle prosperity phases (i.e. expansion and peak), with upgoing housing prices, form a barrier for people to move. Especially for lower-income groups since they have less capital to actually move to the more expensive houses (Coulter, 2013; Mulder & Hooimeijer, 1999). This is also what Hochstenbach & Musterd (2018) found in their study, lower-income

groups were less likely to move during the pre-crisis peak period. Probably because the availability and accessibility of, for instance, rental housing decreases. The choice set for lower-income groups simply diminishes when housing prices increase.

The housing market does not only experiences peaks and troughs at the local or regional level, but also at the global level (Schwartz & Seabrook, 2009). As the business cycle of the economy is interrelated with the housing market. The financial crisis of 2008 is a great example of this. Housing market downturn and contraction have a negative influence on, not only economies, but also on relocation trajectories of different population and income groups. Inequalities between these groups are enlarged because of this crisis, the owner-occupier market has become less accessible for certain income groups as a result of institutional changes and restrictions (i.e. loan and mortgage restrictions). Nevertheless, the growing inequalities in the housing market already took place before the financial crisis (Wilde & Decker, 2016).

Hochstenbach & Musterd (2018) argue that there is a difference in housing composition within cities and between different types of states. When a state has a more liberal oriented housing market compared to a more social oriented market; *"It is to be expected that the relationship between socioeconomic and spatial divisions is more robust in more liberal societal and housing contexts, while stronger welfare state arrangements suppress spatial inequalities to a greater extent through a range of policies, including tenure mixing at low spatial scales"* (Hochstenbach & Musterd, 2018, p.30). Which is why it is of importance to study the housing context of Amsterdam as well. In the Netherlands, the housing market was liberalized during the peak before the global financial crisis. This liberalization drove up housing prices and supported the emerge of a housing bubble. Which resulted in a larger threshold for households to relocate. Hereby, increasing the socio-economic inequalities in Dutch cities (Musterd & Van Gent, 2015).

Therefore, housing prices and certain admission requirements (i.e. social housing) are also economic factors that can trigger or form a barrier to relocate. However, housing prices and vacancies can differ remarkably between different regions. Higher housing prices in a certain region trigger households to relocate to lower-priced areas further away from large cities (Dieleman, 2001; Helderman et al., 2004; Coulter, 2013). This also applies to regions with high housing prices, just like in Greater-Amsterdam (Coulter, 2013). Hence, different regions need to be distinguished to examine moving behaviour, and that is why in this study the region of Amsterdam is demarcated. Different regions have various characteristics, as some are more urbanized than others. Normally, higher prices are experienced in urbanized regions compared to predominantly rural regions (Helderman et al., 2004).

It is not only necessary to stress different housing market regions, but also the two main housing markets, these are the owner-occupier market and the rental market. As earlier

explained, home-ownership is a restriction for people to relocate. As soon as a house is bought, the chance of relocating changes significantly as owner-occupiers are normally unwilling to relocate, while renters relocate more regularly. For instance, when housing prices reduce and current mortgages become relatively higher compared to the actual value of the dwelling, the barrier to relocate increases. Furthermore, there are high transaction costs involved with buying or selling a house. Not much research is found on this phenomenon because the switch from rental to owner-occupier is a long term choice which is mainly influenced by the financial obligations of related mortgages.

According to Clark et al. (1994), it is acknowledged that, looking at the relocation process itself, an individual first makes the choice of relocating, subsequent, they decide the tenure choice. Nonetheless, this study focuses on the effects of income and housing prices and potential relocations throughout the business cycle, wherefore, tenure will be implemented as variable, but will not have the main focus. Overall, it is presumed that a high housing price of a particular residence indicates a relatively high rental price of this residence as well, especially regarding the private rental sector (Kenton, 2019).

Overall, different incentives and restrictions relating to market circumstances determine the probability of having an intention to relocate or not. Nonetheless, different studies showed the effects of housing market conditions and the related business cycle on relocation behaviour. It is proved that the housing market is interrelated with different stages of the business cycle, but it is also proved that the housing market can form triggers or barriers for people's intention to move. However, these macro-level incentives and restrictions only form a part of the factors influencing relocation behaviour. The next part will explain theories regarding the micro-level factors.

2.3. Relocation behaviour at the micro-level: individual characteristics

Relocation behaviour is not only dependent of housing market conditions as described in the previous part, but taking relocation behaviour to a smaller scale, it is argued that there are a number of individual characteristics of influence as well (Willekens, 1991; Groot et al., 2011; Mulder & Hooimeijer, 1999; Bootsma, 1998). These individual characteristics will be described in the following part.

Individuals may experience different incentives and restrictions, due to the fact that houses are heterogeneous and so is their availability (Mulder & Hooimeijer, 1999). Some houses, for instance, are only available with a certain admission requirement (i.e. social housing). On the other hand, other houses in the private sector are only within the range of more wealthy people. For this reason, relocation behaviour is not only related to spatial aspects, but also to social aspects.

Most individuals regard the relocation process as a stressful event, this is because the moving process not only takes time, but it also requires capital and effort (Groot et al., 2011). Therefore, a majority of the people only tend to relocate as soon as there is a fundamental reason to move. Most of those reasons are related to life events (i.e. family composition or a divorce). Mostly, an imbalance between the preferred housing condition and the current condition is experienced (Moore, 1986; Morrison & Clark, 2016). This concerns the satisfaction of the dwelling itself, but also about an imbalance between preferred and current neighborhood conditions. Hence, locational characteristics, such as the satisfaction of the dwelling and neighborhood, are factors for people to move (Cao et al., 2018). There are a number of characteristics of influence for this satisfaction, and will be described below.

Crowdedness could form a moving intention, a household is more triggered to move to another location when the amount of living space per person per household is too small (Clark & Onaka, 1983; Groot et al., 2011). When households' floorspace per person declines, crowdedness might emerge. This means that the livability is undermined by the deficiency of floorspace, hereby triggering a relocation. Wherefore, the floorspace area of the house together with the size of the household could form an incentive to relocate to a more spacious dwelling (Van der Vlist et al., 2002). However, whenever a household cannot find a house based on their preferences, a tradeoff must be made between different housing characteristics, but also between locations in order to find a suitable house. These tradeoffs seem to occur more often in highly-priced areas, just like Amsterdam (Coolen & Hoekstra, 2001).

The realization of these preferences is affected by income, which is a main factor in the affordability of a residence. It makes sense that when a household has a higher income more different types of houses are within the supply range of this household (Mulder & Hooimeijer, 1999). Thence, higher-income groups are more inclined to actually move when they have a moving intention compared to less wealthy people, due to the fact that it is easier for them to translate their moving intentions into actions (Mulder & Hooimeijer, 1999; Coulter, 2013). There are a number of studies that also found this positive relation between income and relocation behaviour (Clark & Dieleman, 1996; Helderman et al., 2004; Malpass & Murie, 1999; Coulter, 2013; Mulder & Hooimeijer, 1999). Lower-income groups appear to have a housing choice set which is limited due to their income, where higher-income groups can afford various houses, thereby increasing their choice set. As some areas, like the Amsterdam region, become more expensive fewer houses will fall within the choice set. Hereby restricting, for instance, lower-income groups to move according to their preferences. Causing them to look for less expensive houses outside the city.

Circumstances, such as the combination of income constraints together with a tight housing market, forms an even larger barrier for people to move within the same area (Cao et

al., 2018). Furthermore, lower-income groups also encounter more housing constraints since they are more limited to secure a mortgage compared to higher-income groups (Helderman et al., 2004). Though, it should be mentioned that certain effects of different incomes are nuanced. This probably is the case because more wealthy people only choose high-end dwellings within the market, meaning they have different housing preferences (Groot et al., 2011; Kan, 1998).

Income and relocation behaviour are also connected to certain changes in household composition. A couple normally has a higher income compared to a single-parent family. A large and growing body of literature has investigated these household compositions and the different phases within the life cycle as an important role in relocation behaviour (Willekens, 1991; Bootsma, 1998; Crompton, 2008). Therefore, besides household composition is age an important factor for people to have an intention to move or not. Due to the fact that a person's' career, whether it is about their job or their housing career, is related to their life cycle trajectories. As the utilized amenities within the area of the house and the desired amount of space differs per life cycle trajectory. It is of importance to stress these different life cycle phases and household compositions as an influence on relocation behaviour. To give an example, the life trajectory of young adults differs from the life cycle trajectory from mature adults, because most young adults want to live within the inner cities and mature adults in the suburbs, due to the demand for location or space (Bootsma, 1998). The paragraphs below describe the different stages of this life trajectory.

After an individual leaves the parental house, the actual location and the amount of amenities matter more compared to the condition of the residence. As young adults care more about their study, labor, friends and amenities. The same goes for students, who have the highest priority of living in the proximity of their university or school, mostly because of the absence of car ownership. Moreover, their social lives normally also take place outside of their dwellings (Bootsma, 1998). In the subsequent trajectory of the young adulthood, people seem to care more about the relative position of the house compared to their workplace and daily activities. Since most people from this group are trying to make a career, causing them to live close to their jobs (Crompton, 2008).

As soon as people form a family, with children being raised, more value is attached to aspect of the houses like a spacious backyard, public amenities and green spaces (Mulder & Hooimeijer, 1999). The absence of one of these aspects is an incentive for a relocation. However, these households tend to move outside city centres, relatively close to their current home. At the same time, dual earners are more inclined to live in cities of larger size compared to single earners (Camstra, 1994). Groot et al. (2011) argue that people who are single, divorced or widowed more often have an intention to move compared to families, married

people or couples. This might be caused by the fact that no other person needs to be taken into account with in the decision making process for a new dwelling.

In the next life trajectory phase when children are coming of age, people seem to be most interested, again, in the actual characteristics of the house rather than the geographical location (Bootsma, 1998; Crompton, 2008). In the last life phase when people become of age, they are less likely to move as well, especially compared to younger people (Crowder, 2001; Christelis et al., 2008). Elderly people only tend to move as soon as there is a fundamental reason for this, such as health-related reasons (Chiuri & Jappelli, 2010). Overall, different life cycle trajectories and different household compositions cause a relocation trigger of a household or not.

Other studies proved that the alteration of the different life cycle trajectories and the relationship with dwelling preference is also based on changes in employment and education (Mulder & Hooimeijer, 1999; Clark & Dieleman, 1996; Coulter, 2013; Kulu, 2008). A job shift or a shift of the location of the job might require a person to commute or to relocate. This differs between high and low educated people since higher educated people tend to attach more value to their jobs compared to low educated people, therefore, having the willingness to commute more or to live closer towards their workplace. Besides, there seems to be a positive relation between education and income, increasing the probability that when a person is highly educated, a higher income is earned. Hereby, increasing the housing choice set. Highly educated people more often have the preference to live in the cities, which are overall more expensive, compared to low educated people which might cause the so-called '*escalator effect*' as discussed earlier (Mulder & Hooimeijer, 1999; Clark & Dieleman 1996).

Unemployed people also seem to more often have an intention to move to other locations compared to employed people, due to the fact that those unemployed people seek to find a job around a new residential location. It is also examined that employed people are more connected to their residential place compared to unemployed people, causing them to have fewer triggers for a relocation (Coulter, 2013; Kulu, 2008).

Earlier literature also describes the relationship between ethnic backgrounds, housing preferences and moving intentions. It is examined that non-western immigrants are less likely to move compared to western-immigrants and natives (Crowder, 2001). Furthermore, in Europe, immigrants tend to locate in urbanized districts due to the possibilities for education and employment in cities. These processes are not only evident for immigrant groups, but also for people with a non-western background (Clark & Coulter, 2015).

Altogether, influences on relocation behaviour can be divided into two parts: the macro-level with the changing housing market, and the micro-level with individual characteristics. These micro-level factors create incentives and triggers to form an intention to move. As soon people have formed an intention to move the macro-level factors could influence the set of

available houses. Together, the micro and macro context form a choice set for an individual or a household which is of influence on people's moving behaviour. It also became clear that the housing market and the business cycle are interrelated with each other. The housing market even appeared to be the main driver for the business cycle. The complicated housing market in Amsterdam has experienced different business cycle phases as will be explained in part 4.1. Still, not much research is conducted on the combination of changing housing prices within the business cycle, together with different income groups on forming moving intentions. This research tries to explain these different effects on relocation behaviour with the use of four different Housing Surveys (HS). The HS data and the methods used in this research will be described after the hypotheses are formulated.

2.4. Hypotheses

Literature discussed above showed different effects of housing market conditions and individual characteristics on relocation behaviour. Based on these showed effects different hypotheses can be formulated concerning the strengths and directions of the possible influences. In which the focus lies on the changing influence of housing prices and income on moving processes during the business cycle.

i. The lower the income the more likely a person has an intention to move outside Greater-Amsterdam.

As Amsterdam is becoming more expensive it is predicted that the lower-income groups are more inclined to have an intention to leave Greater-Amsterdam.

ii. The higher the housing price of the current residence the more likely a person has an intention to move outside Greater-Amsterdam.

For people who have an intention to move, it is presumed that the higher the current housing price, the more likely they intend to relocate outside Amsterdam. As it is expected that a high housing price results in a higher mortgage payment or a higher rental price. Causing them, for instance, to search for a lower priced or more spacious dwelling outside the Amsterdam region.

iii. There are different effects of income and housing prices throughout the business cycle on people's intention to leave Greater-Amsterdam.

Housing prices fluctuate and so does the business cycle. Different distinguished business cycle stages are expected to cause various effects of income and housing prices on relocation behaviour.

iv. Lower-income groups more often have intentions to relocate outside Amsterdam in times of recession and trough compared to higher income groups.

As inequalities are more evident in recession and trough stages of the business cycle it is expected that lower-income groups have more relocation incentives compared to the higher income groups in these uncertain times of the business cycle.

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3. DATA & METHOD

This chapter describes the research methodology and the data used. The data analysis plan and the statistical test performed in this research will be elaborated, together with the operationalization of the variables used in the different models.

3.1. Quantitative research

Because this research aims to explain relocation behaviour, more specifically a relationship between housing prices, income and moving intentions, a quantitative research design seems to be in place. By using quantitative research strategies relations of variables like these could be researched and measured. In this way, this research will have an objectivist conception of the social reality of relocation behaviour (Taylor, 2005). To see whether the changing housing prices within the business cycle influence moving intentions and how they differ between income groups, quantitative methods can be used, for instance to categorize the income groups. By applying a quantitative analysis the housing market and people's behaviour within this market can be studied. Therefore, a quantitative approach suits the nature of this research.

3.2. Data

Quantitative approaches are also used in similar studies. As earlier explained, the changing population compositions within the Amsterdam region were already examined (Hochstenbach & Musterd, 2018). They use long-term secondary data of housing markets of Amsterdam and Rotterdam, combined with highly detailed longitudinal register data to examine moving patterns. Besides, Groot et al. (2011) studied the intentions to move and actual moving behaviour in the Netherlands using one of these HS of 2002 combined with longitudinal Spatial and Social Mobility data from the Social Statistical Database in the Netherlands. This data was analyzed using a descriptive analysis and a logistic regression model.

This study aims to stress the changes of market circumstances, these changes can be measured using data from the four Housing Surveys (HS), held in four different years (CBS, 2009; CBS, 2012; CBS, 2015; CBS, 2018). The methodology has a longitudinal character because there will still be looked at developments over the period time of one business cycle. But, is not considered as longitudinal since the same persons are not followed throughout these years. The combination of the four different HS throughout time enables to study possible changes of the influences of income and housing prices on moving intentions. Still, the different periods of the HS give us a general conception of the housing prices and income groups in relation to the overall changes of the business cycle.

The first HS of 2009 was conducted between the first of September 2008 and April 30th, 2009. This HS is seen as the beginning of the recession of a business cycle since the 'official' start of the financial crisis of 2008 is considered as the 15th of September, the date the investment bank Lehman Brothers went bankrupt (Ivashina & Scharfstein, 2010). The latest HS of 2018 is considered as a new peak of the economic business cycle.

The HS are based on a random sample of Dutch individuals of an age from 18 years or over. The data is based on cross-section information about the housing situation of households living in the Netherlands. It contains information about different characteristics of the previous and current occupied residence. But, also about the households itself (i.e. age, income, education or possible moving intentions). Which are of significant importance for the empirical analysis of the incentives of certain households having an intention to move.

Because the data is based on a national survey it is filtered first. The data allows us to bring the scale down to the regional scale of the so-called 'COROP-gebieden'. These are 40 distinctive regions within the Netherlands. The Greater-Amsterdam COROP is one of those regions. This regional data will be used as the destination area of this research. The Amsterdam region is used instead of just the Amsterdam municipality limits because relocation and displacement processes are expected to cross these borders. That is one of the main reasons why in this research the housing prices and different income groups of people having an intention to leave the Amsterdam region are examined.

3.3. Reliability & validity

To identify and reduce the measurement error, meaning that the different observed relationships are not distorted, two characteristics of measurements should be distinguished: reliability and validity. Validity means to what extent the measure actually represents what it is supposed to measure. In brief, are we actually measuring a reality of moving behaviour? In social quantitative research, validity can be subdivided into two important concepts: internal validity and construct validity (Bryman, 2012). Construct validity refers to the measures of the investigated concept (Brooks & Tsolacos, 2010). It is of importance that the measure of the understanding actually reflects the concept to know if income classes and housing prices really are of influence on relocation behaviour. To answer the construct validity different control variables are added in the research models, which will be explained in the next part. Because the data does not allow us to follow the respondents over time their changing relocation intentions are used to measure relocation behaviour instead, in order to meet the construct validity. Internal validity focuses on causal relations rather than on the measures of the concept (Bryman, 2012). A correlation can sometimes be observed between different variables, but this does not necessarily mean that there is also a causation. To what extent is

the independent variable responsible for the variation in the dependent variable? Shortly, are changing housing prices and different incomes the actual, or at least part of the cause for the variations of having a relocation intention. To answer to internal validity, again, different other independent variables will be implemented in the models based on the control variables to control for possible relations. As soon the variables are added, changes in the model fit will be researched to see any changes in the variation in the dependent variables that is explained by these control variables.

Reliability is also of importance of conducting quantitative social research. To ensure a reliable research measures of the used concept need to be consistent. To what extent are the observed variables measuring the *true values*. In short, are the observed variables *error-free*. When the estimators are precise enough the research could be denoted as reliable (Brooks & Tsolacos, 2010). Reliability also concerns the repeatability of the study, whenever measures are consistent in social research, the research is considered to be reliable. This basically means that whenever the research would be conducted again, the results should show the same outcomes. The data from all four HS is randomly sampled and the questions from the HS used in this research, explained below, have not changed over time. Hereby, increasing the reliability. This increases the consistency of the measures due to random selection and repeatability (Bryman, 2012). Therefore, the research could be replicated, also due to the fact that the data from the HS is freely accessible for people requesting submission. In addition, the transparent operationalization within the next part should improve the reliability and replicability of this research. However, it should be noted that construct validity has a relation with reliability, whenever the measure of an understanding is inconsistent, it is impossible to provide a valid measure of the understanding. This basically means that the estimate of the construct validity suggests that the measure is reliable (Bryman, 2012).

3.4. Binary logistic regression model and likelihood ratio test

To examine the relationship between income, housing price and moving behaviour a binary logistic regression analysis will be used, in order to shed light on the relocation processes in Amsterdam and to explain and predict people's choices. With the use of logistic regression models the data from all HS merged can be analyzed, this concerns models 1, 2, 3 and 4. In every model different specific variables are added following literature.

There are different techniques to model limited choice outcomes like this, but the logistic regression model seems to be the most suitable method to focus on. According to Train (2009) and DeMaris (1995), a logistic regression is a specific form of regression and has been set-up to explain and forecast a binary categorized variable in preference to a metric dependent measure. For the dependent variable: having an intention to move within or outside Greater-Amsterdam, the choice for the respondents is limited due to the binary choice. A

logistic regressions' variate is comparable to a general regression, but there is a change to maximum likelihood as estimation technique. Within this technique, the parameters of the logistic model will be estimated (Moore et al., 2014). For this research this implies the impact of the independent variables on the ln(odds) an individual falls within a certain category. The two categories are: having an intention to move within or having an intention to move outside Greater-Amsterdam. The model will be explained using the following equation:

$$Y = \ln\left(\frac{P}{1-P}\right) = \ln\left(\frac{Poutside}{Pinside}\right) = \alpha + \beta1HP + \beta2Inc + \beta3IndC + \beta4ResC + \beta5LocC + \varepsilon \tag{1}$$

where, P is the probability of Y = 1. Y is, out of the people who have an intention to move, the intention to move outside or inside Greater-Amsterdam. α is the constant, $\beta1$ the parameter of the housing price, HP the housing price, $\beta2$ the parameter of the income classes and *Inc* defines the categorical income classes. The characteristics added to the model as control variables are described in part 3.5. Where, $\beta3$ represents the parameter of the individual and household characteristics, $IndC$ the individual and households characteristics, $\beta4$ the parameter of the residence characteristics, $ResC$ the residence characteristics, $\beta5$ the parameter of the location characteristics, $LocC$ the location characteristics and at last ε the error term.

The models will be interpreted with the use of coefficients and odd ratios. The relationship between the independent variables and the dependent variable can be interpreted as follows: the probability of Y = 1 decreases with an odds ratio < 1. Vice versa, the probability of Y = 1 increases with an odds ratio > 1. Whenever the odds ratio = 1, no relationship is detected between the dependent and independent variable (Szumilas, 2010). The data needs to meet the statistic conditions applicable to logistic regressions before the models are estimated (Vellis, 2003). First, the dependent variable is dichotomous. Second, the alternatives must be mutually exclusive and the choice must be exhaustive. At last, the number of alternatives must be finite and the observations must be independent of each other. It should be noted that the above mentioned conditions are met, the observations are independent due to the fact that the respondents are not followed over time (Train, 2009; DeMaris, 1995). The budget constraint of the respondent basically provides a choice set representing a combination of houses and housing related amenities the respondent can purchase based on their income (Train, 2009; DeMaris, 1995). However, this choice set is related to the preferred destination of the respondent and the housing market conditions as became clear in chapter two. It might, for instance, be possible that a respondent's current residence is too expensive due to their income.

After the first logistic regressions are analyzed a likelihood ratio test will be conducted, which will be described in the following part. The likelihood ratio test will be used to examine whether statistical differences between the business cycle stages are observed. The four different HS are considered as different phases of the business cycle. Model 4 of all HS merged will be compared to the different four HS[1] to see if there is any statistical difference. The models used in this test are explained in the subsequent chapter. The likelihood ratio will be calculated using the following formula (Train, 2009):

$$Likelihood\ ratio = -2\left[(loglikelihood\ model\ 4) - (loglikelihood\ model\ 5 + loglikelihood\ model\ 6 + loglikelihood\ model\ 7 + loglikelihood\ model\ 8)\right] \tag{2}$$

In order to calculate this ratio the so-called *'-2loglikelihood'* of the model's logistic regression outputs are transformed into a loglikelihood using the following formula:

$$loglikelihood = \frac{-2loglikelihood}{-2} \tag{3}$$

A significant difference is observed as soon as the likelihood ratio value exceeds the Chi-squared critical value using the correct degrees of freedom. It can then be stated that the four different HS differ significantly from the merged model and it is then assumed that there is a difference in relocation behaviour regarding the different business cycle stages. Giving a reason to perform segmented individual logistic regressions per HS year. Overall, the research logistic regression analysis is chosen together with the likelihood ratio test to research relocation behaviour.

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[1] Model 5 = HS 2009, model 6 = HS 2012, model 7 = HS 2015 and model 8 = HS 2018.

3.5. Operationalization of the research question

The data from the four HS is based on a series of choices of responding individuals. Most of the variables used are categorized. The variables used which are continuous are housing price and floorspace. To get back to our main subject of relocation behaviour, with the focus on moving intentions of people wanting to leave or to stay within Greater-Amsterdam, the variable needs to be explained in order to measure the outcomes both quantitatively and empirically. Within the HS for the question: '*would you like to move within the next 2 years?*' an intention to move is considered as one, as soon as the respondent answered: '*probably yes, maybe*', '*I want to, but I cannot find anything*' or '*most certainly yes*'. Causing the outcome variable to be discrete with a limited amount of choices. The dataset of the research contains 5655 observations, this is the total amount of people currently living in Greater-Amsterdam and having an intention to move merged from all HS. After the removal of the *missing values* and the outliers, the amount of observations comes down at 3427.

To know whether the respondent wants to live at the current location or somewhere else in the country the question: '*where do you want to live?*' will be used. As soon as the respondent answered the question with: '*certainly at the current place*' or '*preferably at the current location of the residence, but possibly somewhere else*', it is considered that the respondent has an intention to move within Greater-Amsterdam. A response of: '*preferably somewhere else in the Netherlands, but possibly at the same place as now*', '*most certainly somewhere else in the Netherlands*' or '*abroad*' are considered as an intention to leave Greater-Amsterdam. Thus, this variable can be used to measure whether the respondent has an intention to move outside or inside the Amsterdam region. When a respondent can choose between two or more discrete alternatives it is stated as a discrete choice model (Train, 2009). The dependent variable used can be seen as a discrete variable like this, due to the fact that the people having an intention to move have the option to move outside of Greater-Amsterdam or to move within.

In all HS the *WOZ-waarde,* which stands for the value of the dwelling, is used to indicate the housing price. This WOZ-value is determined by every municipality, in this case the municipality of Amsterdam, and forms a fundament for taxes and charges. The value of the dwelling is based on two main aspects: the location of the dwelling and housing features (i.e. floorspace). According to Lubberink et al. (2017), the WOZ-value can be used as a reliable market value indicator. Earlier it was already clarified that the housing market and its ever-changing housing prices can be used as an indicator for the different phases of the business cycle (Davis & Heathcote, 2005). Therefore, in this research, the WOZ-values will be used to measure the different phases of the business cycle characterized by Kenton (2019) and Heilemann & Weihs (2007) as an influence on relocation behaviour in Greater-Amsterdam.

Due to the fact that relocation behaviour, and especially displacement, is related to rising housing prices and a certain income, triggering people's intentions to leave a certain place (Mulder & Hooimeijer, 1999; Dieleman, 2001; Butler et al., 2008). However, it is important to mention that the rental price for rental houses is omitted in the models, if rental prices are included in all models then only the rental houses and not the owner-occupier are modeled due to the missing rental price values of those owner-occupier households. A large part of the observations will then be omitted. Moreover, this research focuses on relocation behaviour throughout the business cycle, not particular on tenure. Consequently, instead WOZ-value and tenure are used which are available in the HS for all respondents. In this way the value of both rental and owner-occupied houses is generalized, but still, a potential influence of owner-occupier or rental on moving behaviour can be detected using respondent's tenure as variable. It is expected that the WOZ-value is positively related to rents, since it is assumed that a high WOZ-value of a dwelling indicates a relative high rental price for that particular dwelling (Kenton, 2019). Furthermore, the WOZ-value is also used in the calculation of the rental price of social rental housing in the Netherlands (Hielkema, 2019). Nevertheless, it should be mentioned that in several cases rents are less sensitive to housing price increase on the long-term (Gallin, 2008).

It appeared there are a number of houses with relatively extreme high housing prices; in all HS the statistical distribution showed to be positively skewed. Wherefore, the WOZ-values are transformed into log-transformed data in order to follow a near normal distribution and to form a more constant variance, see Appendix A (Brooks & Tsolacos, 2010). This transformation as a solution for housing prices is commonly used amongst literature (Yang et al., 2019). For the WOZ-value the information of the data is used one year prior to the publicity of the research, since it took almost a year to process all the information of the HS (i.e. WOZ-value of 2018 is based on the WOZ-value of 2017). Regarding income, the different incomes from all HS are subdivided into five income classes based on the median taxable income in the Netherlands and can be seen in table 1. The median-taxable income is calculated taking 79% of the average income per year of the Dutch population, the actual amounts of the official median-incomes can be found in table 3.

To control for the effects of income and housing price different independent variables are added to the models. These control variables are not to be omitted in the model since they could have an influence on relocation behaviour as well following literature. In this way, the relationship with the dependent variable can be denoted, but will not be of main concern for the outcome of the model. A certain change of one of these related control variables could undermine the correlation of the housing price and incomes on moving behaviour, hereby skewing the outcome of the model (Spector & Brannick, 2011). The control variables implemented in the models are based on the current dwelling and literature as described in

chapter two. The variables can be subdivided into three categories: individual characteristics, residence characteristics and location characteristics and are clarified in the next part.

Table 1: Categorization and definition income groups

Definition	Measure
Low income	< Median-income
Lower Middle-income	Till 1.5 x Median-income
Upper middle-income	Till 2 x Median-income
Higher income	Till 3 x Median-income
Highest income	> 3 x Median-income

At first, for individual characteristics, age of the respondent as a variable is added to the model following this literature. Age can be measured in years and is subdivided into seven classes as can be seen in table 2. Second, the household composition is also amongst a relocation factor (Willekens, 1991; Bootsma, 1998; Crompton, 2008). The household composition is divided into five categories: single-person, couple, couple with child(ren), single parent family and non-family household. Third, the level of education is another factor of forming certain intentions to move (Clark & Dieleman, 1996). Level of education represents the highest, yet to be finished, level of education. According to Weert & Boezerooy (2007), three different categories of levels of education can be distinguished in the Netherlands. Low educated, medium educated and highly educated. Low educated is defined as more practical based *LBO* and *VMBO* level education. The selective secondary education of *HAVO* and *VWO* fall amongst medium education, the same goes for the *MBO* finished educations. At last, highly educated is defined as having finished an applied science *HBO* study or a university *WO*. Fourth, ethnic backgrounds is added to the model as a control variable as people with a certain background have different preferences and moving intentions (Crowder, 2001; Clark & Coulter, 2015). The three sub-categories: native, non-western immigrant and western immigrant can be distinguished. Fifth, the dummy variable employment and is measured as having a paid job or not (Coulter, 2013; Kulu, 2008).

For residence characteristics, three variables are used in the different models: floorspace, crowdedness and tenure. Floorspace and crowdedness could trigger a moving intention because of the amount of living space per person becomes too small (Clark & Onaka, 1983; Groot et al., 2011). The amount of floorspace is measured in square meters and appeared to be right-skewed. Therefore, the outliers of the highest 5% of floorspace amounts

were removed from the database in order to follow a more normal distribution (Appendix A). The amount of crowdedness can be measured using a ratio of rooms-per-person and is divided into three groups. Overcrowded: less than one room per person, medium crowded; one to two rooms per person and under-crowded; two or more rooms per person. The other residence characteristic is tenure which can be divided into owner-occupier or rental which is done in order to take the influence of rental or owning into account (Bootsma, 1998; Clark et al., 1994).

At last, the variables for location characteristics are the satisfaction of the residence and the satisfaction of the neighborhood. Which are used to measure the satisfaction of the current housing condition and its environment (Cao et al., 2018; Moore, 1986; Morrison & Clark, 2016). Both variables are based on a Likert scale; very satisfied, satisfied, neutral, unsatisfied and very unsatisfied. All above mentioned variables and their indicators can be seen in table 2.

Table 2: Operationalization of the variables used

Variables	Indicator
Main independent variables:	
Housing price	WOZ-value in Euro
Income	Low, lower middle, upper middle, higher, highest
Individual & household characteristics:	
	Age in years
Age (7 classes)	(1 = 18-24 years, 2 = 25-34 years, 3 = 35-44 years, 4 = 45-54 years, 5 = 55-64 years, 6 = 65-74 years & 7 = 75 > years)
Household composition	Single-person household - couple - couple with child(ren) - single parent family - non-family household
Level of education	Low educated - medium educated - highly educated
Ethnicity	Native - non-western immigrant - western immigrant
Employment	Employed - not employed
Residence characteristics	
Crowdedness	Overcrowded - medium crowded - undercrowded
Floorspace	Total floorspace in square meters
Tenure	Rental, owner-occupier
Location characteristics	
Satisfaction residence	Very satisfied - satisfied - neutral - unsatisfied - very unsatisfied
Satisfaction neighborhood	Very satisfied - satisfied - neutral - unsatisfied - very unsatisfied

This research will be organized as follows: in order to answer the first sub-question:

Sub-question 1: What is the development of both the housing market and median-income in Greater-Amsterdam and the Netherlands throughout the business cycle? The context of the housing market and median-income will be clarified with a brief overview of the changes within the business cycle to determine the periods of the four stages in Greater-Amsterdam. Furthermore, descriptive statistics will be analyzed. Subsequently, different logistic regression models will be analyzed in order to answer the second sub-question: *What are the effects of housing prices and income on people's intention to move inside or outside Greater-Amsterdam?* The third sub-question: *What is the effect of the business cycle on relocation behaviour in Greater-Amsterdam?* Will be tested applying the likelihood ratio test to examine whether the four HS datasets differ statistically to examine whether there are differences within the business cycle stages regarding relocation behaviour. Bringing us back to the main research question: *What are the effects of housing prices and income on people's intention to move inside or outside Greater-Amsterdam throughout the business cycle?* And will be answered by analyzing the results of segmented logistic regression models to see whether there are different effects of housing prices and income on moving intentions throughout the business cycle.

4. CONTEXT & DESCRIPTIVE STATISTICS

In this chapter, the context of the housing market, the development of median-income amounts and descriptive statistics will be described. This context will sketch the housing market situation and will help to interpret the results. As the influence of income and housing prices on relocation behaviour have the main focus in this research.

4.1. Context Amsterdam housing market & median-income

Because the housing market proved to be the leading aspect of the business cycle the WOZ-values will be used as a proxy for the different stages of the business cycle (Davis & Heathcote, 2005). Figure 3 provides us the development of the housing market in both the Netherlands and Greater-Amsterdam based on WOZ-values (CBS, 2019a). First, it is striking to see the considerable difference between the Dutch and Greater-Amsterdam housing market. The housing prices in Amsterdam seem to be considerably higher compared to the rest of the Netherlands and the diverge only seems to increase over time. With housing prices in 2018 being remarkably higher compared to the peak in 2010. The period from the four HS stretches from 2008 to 2017. Hence, the context of the Amsterdam housing market was researched from 2005 till 2019 to see a more complete development of the business cycle. It should be noted that the average WOZ-value per HS is also slightly higher compared to the overall average WOZ-values (figure 3).

If we parallel figures 2 and 3 the four different business cycle phases become evident. The recession phase was expected to start around 2008 after the bankruptcy of Lehman Brothers. Yet, an ongoing increase of the WOZ-value till around 2009-2010 in both the Netherlands and Amsterdam proves the opposite. It was already clarified that the data from the HS is based on the WOZ-values of one year prior to the release date due to the response time of the individuals. Therefore, the first HS of 2009 is considered as the peak phase of the business cycle as described by Kenton (2019) and Heilemann & Weihs (2007). After 2010 the recession period seems to begin, which is why the HS of 2012 is linked to the recession phase in this research. It looks like the Dutch housing market reacts with a time lack to the world financial crisis. After years of housing price decline, the apparent trough of the business cycle is reached between 2014-2015. Three years later the last phase of expansion seems to bring the housing prices to a completely new level (figure 3). Consequently, the latest HS is considered as the expansion phase within the business cycle.
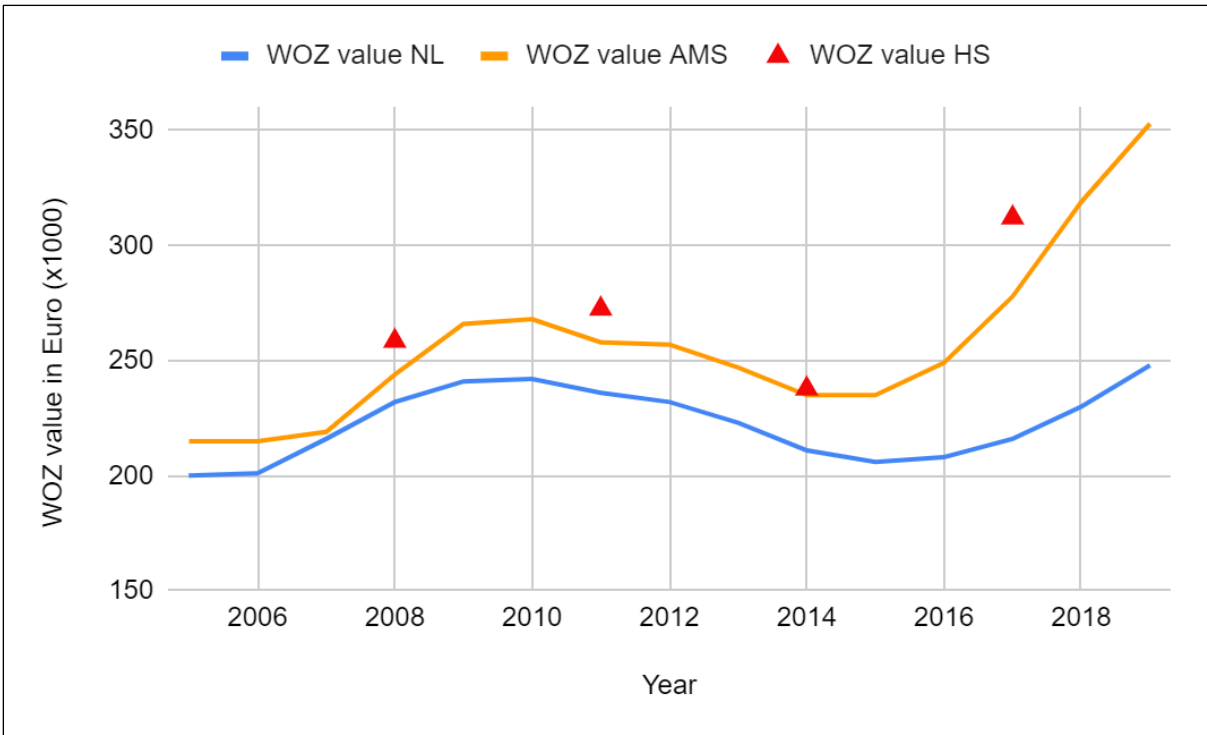
Figure 3: Development WOZ-values in the Netherlands (NL) and Amsterdam (AMS) (Source: CBS 2019a)
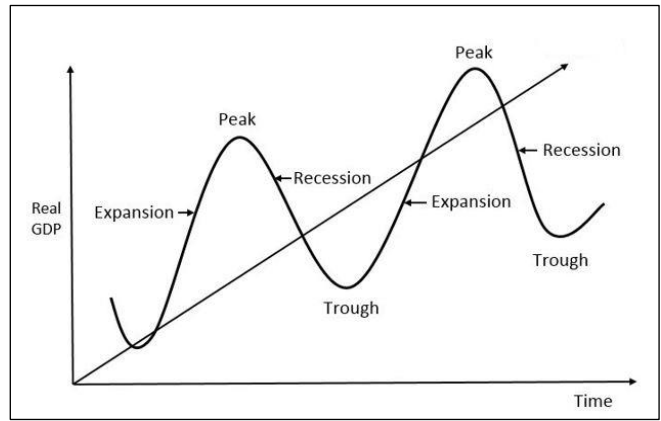
Figure 2: Explanation of the business cycle and its phases (Source: Kenton, 2019)

If we compare figure 3 with figures 4 and 5 it should be marked that the housing prices still increase despite a trend of a growing housing stock. The WOZ-value decline between 2010 and 2015 (figure 3) could be explained by a growing housing stock. However, even after 2015 when the housing stock increases significantly, the housing prices do so as well. It seems that despite the construction of new dwellings the prices rise anyway, so these constructions seem to have no depressing effect on the housing prices.
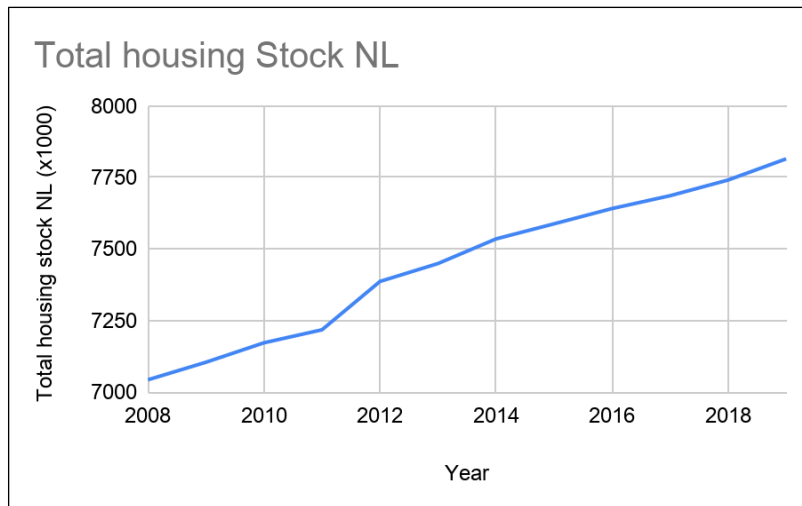
Figure 4: Total housing Stock in the Netherlands (NL) (Source: CBS, 2019b)
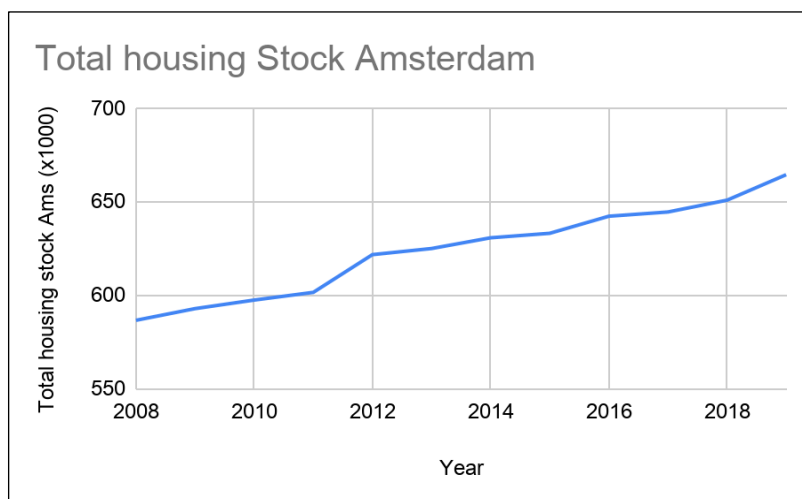
Figure 5: Total housing Stock Greater-Amsterdam (CBS, 2019b)

Regarding the income groups, it should be mentioned that the data from the HS only allows us to calculate the descriptive statistics of the different income classes related to the national median-income were are shown in table 1. Table 3 below shows the median-incomes per year. Looking at the overall median-income it should be noted that the median taxable income of both the Dutch and Greater-Amsterdam population have experienced an increase since 2009. The median taxable income appears to be slightly higher in Greater-Amsterdam compared to the rest of the Netherlands. It must be stressed that the minimum and maximum incomes are not shown in this database. This data comes from the same statistical institution: CBS, just as the HS, wherefore it is considered as a reliable reference for the amount of taxable median-income. The other summary statistics will be presented in the next part.

Table 3: Median yearly taxable income in Greater-Amsterdam (AMS) & the Netherlands (NL) (CBS, 2019c)

	Year 2009	2012	2015	2018
Median taxable income NL (x 1000 Euro)	27.9	28.9	30	30.2
Median taxable income AMS (x 1000 Euro)	30.2	31.3	32.5	34

4.2. Descriptive statistics

In this part, the summary statistics will be presented and described. The different logistic methods and tests are conducted and analyzed using SPSS. SPSS is a software with which data can be analyzed, also statistical tests can be performed using SPSS. It is of use to explain the characteristics and their quantities used in the logistics regression analysis to sketch a first impression of the summarized values of the data (Brooks & Tsolacos, 2010). It should be mentioned that these statistics are based on a merge of all HS.

If we look at table 4 it is remarkable to see that out of the amount of people having an intention to move, most want to move within Greater-Amsterdam. This could be explained by the high amount of people who are satisfied with both the dwelling and the neighborhood (table 4). The log transformations of the WOZ-value show to be of use as described above due to the relatively high maximum and relatively low minimum values of this variable, with an average of 229,010 Euro (table 4). Most remarkable findings are that most of the people belong to the lowest income group, while at the same time most of the sample population are highly educated. The majority also appears to be Native and the share of non-western immigrants seems to be nearly double the share of western-immigrants.

Besides the descriptive statistics of all HS merged, the different independent HS statistics are analyzed to see any trends or developments. It is of importance to note that the change in household composition shares, with an increase of single-person households of 36.1 % in 2009 to a 42.5 % share in 2018, the other household composition categories stayed relatively the same. At last, the most significant finding is the growth of highly educated people (from 41% to a 53.4% share) and the decrease of the low educated people (from 28.4 % to 17.3% share) which is in line with earlier mentioned theory describing that highly educated people prefer to live in large cities compared to low educated people (Mulder & Hooimeijer, 1999; Clark & Dieleman, 1996). A first symptom of the earlier described *escalator effect* might be evident from these statistics (Hochstenbach & Musterd, 2018; Crommentuijn, 1997). Still, the binary logistic regression analysis from the next part hopefully sheds light on these statistics.

Table 4: Descriptive statistics of the variables used in the analysis

Characteristic		Characteristic	
Dependent variable		*Individual & Household*	
Intention to move within Greater-Amsterdam (%)	76	Age in years (average)	37.97
Intention to move outside Amsterdam (%)	24	Household composition	
		Single-person household (%)	40.6
Housing market		Couple (%)	25
WOZ-value (x 1000 Euro)	229.01	Couple + Child(ren) (%)	18.9
WOZ-value min. (x 1000 Euro)	11	One parent family (%)	9.3
WOZ-value max. (x 1000 Euro)	1,366	Non-family household (%)	6.2
		Level of education	
Labor-market		Low (%)	22.5
Median taxable income (average of 5 classes)	2.25	Medium (%)	30.3
Income class		Highly (%)	47.2
Low (%)	42.5	Ethnicity	
Lower Middle (%)	20.4	Native (%)	65.1
Upper Middle (%)	14.2	Non-Western immigrant (%)	22.7
Higher (%)	15.4	Western immigrant (%)	12.3
Highest (%)	7.5	Employment:	
		Employed (%)	68.8
Location		Not-employed (%)	31.2
Satisfaction residence			
Very satisfied (%)	15.9	*Residence*	
Satisfied (%)	49.7	Total Floor Area (average m²)	73.3
Neutral (%)	19.3	Total Floor Area min (m²)	12
Unsatisfied (%)	10.8	Total Floor Area max. (m²)	155
Very unsatisfied (%)	4.4	Crowdedness	
Satisfaction neighborhood		Overcrowded (%)	7.9
Very satisfied (%)	20.4	Medium crowded (%)	66.1
Satisfied (%)	46.5	Under-crowded (%)	25.9
Neutral (%)	18.4	Tenure	
Unsatisfied (%)	10.7	Rental (%)	69.6
Very unsatisfied (%)	4	Owner-Occupier (%)	30.4

5. RESULTS

This chapter will describe and explain different models regarding relocation behaviour in Amsterdam. The results of the logistic regressions of these models will be statistically analyzed and described. Besides the logistics regressions, a likelihood ratio test is performed.

5.1. Binary logistic regression analysis

Different binary logistic analyses are conducted with different variables to examine whether the parameters are stable. The first model is limitative with just the main variables used. In the other three models, different theory proved control variables are added to see any changes in correlations between the variables used and people's intention to move outside or inside Greater-Amsterdam. In this way, we can examine if the correlations stand or maybe are explained by other variables. The different models will be described and analyzed in the following part.

Multicollinearity should be tested before the start of the regression analysis. Multicollinearity can be described as a correlation between the independent variables. If the tests prove no presence of multicollinearity then we can assume the explanatory variables are not correlated with one another (Brooks & Tsolacos, 2010). Appendix B represents a bivariate correlation matrix of the variables used and proves there are no, referring to Pearson's product moment, highly correlated variables used in the models (Taylor, 1990). Another way to test for multicollinearity regards the variance inflation factor (VIF), when the VIF of a variable exceeds 2.5 it is considered as possible multicollinearity (Fox, 1991). As table 5 represents, not one of the VIF values exceeds 2.5. Again, no multicollinearity is experienced between the used values. Consequently, no variable will be removed from the models.

Table 5: Multicollinearity test by variance inflation factor (VIF)

Variable	Income	ln(WOZ-value)	Age	Education	Ethnicity	Employment
VIF	1.641	1.053	1.492	1.311	1.057	1.444

Variable	Household composition	Crowdedness	Floorspace	Tenure	Satisfaction residence	Satisfaction neighborhood
VIF	1.555	1.511	1.674	1.402	1.372	1.173

Subsequently, the Chi-square test is conducted to determine whether the models with independent variables are good fitting models, all models seem to be good fitting models since all model Chi-squares are significant at 1%, respectively. Furthermore, the Nagelkerke Pseudo R-squared will also be displayed in order to decide the fit of the model. The Pseudo R-squared represents the variation in the dependent variable which is explained by the model and can take any value between 0 and 1, the higher the Pseudo R-squared the better the model fit (Schemper, 1992). In table 6 it can be seen that the R-Squared rises from 2.1 % in the first

model, to 5.6% in the second, 7.7% in the third and 11.3% in the last model as soon as individual, housing and location characteristics are added, implying a better fit of the model. The other results from those four models will be treated in the next part.

Housing prices proved to be amongst the main factors for people creating an intention to move, this becomes even more evident in relative expensive urban regions like the Randstad or Amsterdam (Crommentuijn, 1997; Hochstenbach & Musterd, 2018). This is also what Musterd & Van Gent (2015) stated: Amsterdam is a city encountering structural socio-economic changes. The other proved main variable responsible for these changes is income, as some income groups can afford certain housing in certain regions, and some cannot (Coulter, 2013; Mulder & Hooimeijer, 1999; Dieleman, 2001). That is why in the first model income is implemented as micro-context variable combined with housing prices as macro-context variable as an influence on intentions to move inside or outside Amsterdam. This model does not include any control variables.

Table 6 represents the results of the models, what stands out in the first model is that all income parameters are significant and the WOZ-value does not seem to have a significant influence on relocation behaviour. If we look at the coefficients and the odds ratio it is evident that the odds ratio decreases as we switch to a higher income category. A person with a lower middle-income is 29.2%[2] less likely to have an intention to relocate outside of Amsterdam compared to the lowest income group. The same goes for the upper middle-income group with a 48.6% decrease, higher income group with a 56.2% decrease and highest income group 58.2% with a decrease in the odds of having an intention to relocate compared to the lowest income group. So, looking at model 1, it appears that the higher the income group the less likely a person has an intention to move outside of Greater-Amsterdam.

It already became clear in part two that relationships between individual characteristics and people's relocation behaviour are to be expected, such as age, education, employment, ethnicity and household composition (Willekens, 1991; Bootsma, 1998; Crompton, 2008; Mulder & Hooimeijer, 1999; Coulter, 2013; Crowder 2001). Hence, these variables are added in the second model to see if these control variables explain part of the moving intentions. Looking at model two it is quite revealing in several ways (table 6). First, unlike model 1, WOZ-value has a significant influence on moving intentions. A 1% increase in ln(WOZ-value) causes a 0.054 % decrease of the log(odds) of having an intention to leave Greater-Amsterdam.

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[2] All odds ratio percentages are calculated as follows: [(1 – '*odds ratio of*' *0.708*)*100 = 29.2%] (Szumilas, 2010).

Table 6: Various logistic regression model results of the likelihood of having an intention of leaving Greater-Amsterdam

	(1)		(2)	
	B	Odds ratio	B	Odds ratio
Income (Low)	-	-	-	-
Income (Lower Middle)	-0.346** (0.159)	0.708	-0.308*(0.16)	0.74
Income (Upper Middle)	-0.665*** (0.167)	0.514	-0.517*** (0.17)	0.60
Income (Higher)	-0.826*** (0.158)	0.438	-0.592*** (0.17)	0.55
Income (Highest)	-0.872*** (0.144)	0.418	-0.56*** (0.18)	0.57
ln(WOZ Value)	-0.032 (0.029)	0.968	-0.054* (0.03)	0.95
Age 18 - 24			-	-
Age 25 - 34			-0.449*** (0.17)	0.64
Age 35 - 44			-0.229 (0.18)	0.80
Age 45 - 54			-0.06 (0.19)	0.94
Age 55 - 64			-0.147 (0.19)	0.86
Age 65 - 74			-0.549** (0.22)	0.58
Age > 75			-1.044*** (0.32)	0.35
HC: Single-person household			-	-
HC: Couple			0.289** (0.12)	1.34
HC: Couple with child(+)			0.009 (0.13)	1.01
HC: Single parent family			-0.247 (0.17)	0.78
HC: Non-family household			-0.371* (0.20)	0.69
Employment (1= Employed)			-0.013 (0.12)	0.99
Ethnicity (Native)			-	-
Ethnicity (Non-Western)			-0.579*** (0.12)	0.56
Ethnicity (Western)			-0.267** (0.13)	0.77
Education (Low)			-	-
Education (Medium)			0.216* (0.13)	1.24
Education (High)			0.326*** (0.13)	1.39
Constant	-0.34* (0.185)	0.712	-.028 (0.30)	0.76
Observations	3,427		3,427	
Model Chi-square	49.544		130.202	
Pseudo R-squared	0.021		0.056	
-2Loglikelihood	3,731.6		3,650.4	
Degrees of freedom	5		20	

Note: Standard errors in parentheses with *** , **, * indicating significant at 1%, 5% and 10%, respectively. All model Chi-squares are significant at 1%, respectively. Model 3 & 4 can be found one the next page.

	(3)		(4)	
	B	Odds ratio	B	Odds ratio
Income (Low)	-	-	-	-
Income (Lower Middle)	-0.198 (0.164)	0.82	-0.225 (0.167)	0.798
Income (Upper Middle)	-0.336* (0.176)	0.715	-0.374** (0.179)	0.688
Income (Higher)	-0.315* (0.177)	0.73	-0.328* (0.18)	0.72
Income (Highest)	-0.195 (0.185)	0.823	-0.195 (0.188)	0.823
ln(WOZ Value)	-0.073** (0.03)	0.93	-0.059* (0.03)	0.943
Age 18 - 24	-	-	-	-
Age 25 - 34	-0.457*** (0.172)	0.633	-0.462*** (0.175)	0.63
Age 35 - 44	-0.358* (0.185)	0.699	-0.428** (0.189)	0.652
Age 45 - 54	-0.24 (0.189)	0.787	-0.317 (0.194)	0.729
Age 55 - 64	-0.4** (0.196)	0.67	-0.503** (0.201)	0.605
Age 65 - 74	-0.847*** (0.233)	0.429	-0.858*** (0.237)	0.424
Age > 75	-1.37*** (0.332)	0.254	-1.405*** (0.335)	0.245
HC: Single-person household	-	-	-	-
HC: Couple	0.187 (0.134)	1.205	0.237* (0.137)	1.268
HC: Couple with child(+)	-0.161 (0.175)	0.851	-0.137 (0.177)	0.872
HC: Single parent family	-0.366* (0.189)	0.693	-0.367* (0.193)	0.693
HC: Non-family household	-0.512** (0.219)	0.599	-0.497** (0.221)	0.608
Employment (1= Employed)	-0.036 (0.122)	0.965	0.014 (0.124)	1.014
Ethnicity (Native)	-	-	-	-
Ethnicity (Non-Western)	-0.435*** (0.12)	0.647	-0.46*** (0.123)	0.631
Ethnicity (Western)	-0.203 (0.13)	0.816	-0.21 (0.131)	0.81
Education (Low)	-	-	-	-
Education (Medium)	0.173 (0.129)	1.189	0.163 (0.13)	1.177
Education (High)	0.277** (0.126)	1.319	0.314** (0.128)	1.368
Floorspace	0.008*** (0.002)	1.008	0.007*** (0.002)	1.007
Crowdedness (Over)	-	-	-	-
Crowdedness (Medium)	0.325 (0.201)	1.384	0.267 (0.203)	1.306
Crowdedness (Under)	0.259 (0.243)	1.295	0.204 (0.247)	1.226
Tenure (Owner-Occupier)	-	-	-	-
Tenure (Rental)	-0.369*** (0.101)	0.692	-0.37*** (0.104)	0.691
SR: Very Satisfied			-	-
SR: Satisfied			-0.384*** (0.12)	0.681
SR: Neutral			-0.532*** (0.154)	0.587
SR: Unsatisfied			-0.403** (0.185)	0.669
SR: Very Unsatisfied			-0.413 (0.269)	0.662
SN: Very Satisfied			-	-
SN: Satisfied			0.672*** (0.129)	1.959
SN: Neutral			1.21*** (0.149)	3.353
SN: Unsatisfied			1.173*** (0.173)	3.23
SN: Very Unsatisfied			1.272*** (0.245)	3.569
Constant	-0.487 (0.436)	0.614	-0.829* (0.455)	0.436
Observations	3,427		3,427	
Model chi-square	181.582		269.591	
Pseudo R-squared	0.077		0.113	
-2Loglikelihood	3599		3511	
Degrees of freedom	24		32	

Note: Standard errors in parentheses with *** , **, * indicating significant at 1%, 5% and 10%, respectively. All model Chi-squares are significant at 1%, respectively. HC = Household composition, SR = Satisfaction Residence, SN = Satisfaction Neighborhood.

To infer, the higher the current housing price the more likely a person has an intention to move within the Greater-Amsterdam region. Getting back to income, almost the same effect of income groups on relocation intentions as in model 1 is revealed, all income groups higher than the lowest income group have more intentions to move within Amsterdam. A person with a lower middle-income is 26%, an upper-middle group 40%, a higher group 45% and the highest income 43% is less likely of having an intention to relocate outside of Amsterdam compared to the lowest income group. Other significant variables seem to explain the dependent variable as well and appear to be: age, household composition, ethnicity and education which will be discussed below.

In model 3 the residence characteristics crowdedness, floorspace and tenure are added (Clark & Onaka, 1983; Groot et al., 2011; Bootsma, 1998; Clark et al., 1994). Table 6 illustrates that the income parameters are less stable once these variables are added, especially compared to the WOZ-value which appears to be even more significant compared to models 1 and 2. When the ln(WOZ-value) increases with 1%, then the log(odds) of having an intention to relocate outside Amsterdam decreases with 0.073%. Again, the lower the housing price the higher the likelihood of having an intention of moving outside Greater-Amsterdam. Still, the odds for a person of having an intention to move outside of Amsterdam decreases for upper middle-income groups with 28.5% and for the higher income group a decrease of 27% compared to the group of low income.

In the last, most complete model, model 4, the location characteristics satisfaction of the residence and neighborhood are the last control variables to be added (Cao et al., 2018; Moore, 1986; Morrison & Clark, 2016). The income parameters turn out to be relatively the same compared to model 3. When a person has an upper middle-income the odds of having an intention to move outside Amsterdam decreases with 31.2%, a slight less percentage of 28% decrease is observed for a person who has a higher income compared to the lowest income. It appears, comparing the four models with each other, that lower-income groups more often tend to have an intention to leave the city compared to these higher income groups. This is mostly in line with the first hypothesis: the lower the income the more likely a person has an intention to move outside Greater-Amsterdam. The lowest-income group is indeed more inclined to relocate outside of Amsterdam compared to income groups higher than this lowest income group, however, the highest income and the lower middle-income group do not show a significant effect in model 4. It seems that these results partly confirm the theory of the arrival of upper-middle and higher income groups replacing the lower-income groups based on these relocation intentions (Butler et al., 2008; Hochstenbach & Musterd, 2018; Musterd & Van Gent, 2015). Which could possibly be caused by the increase of housing prices. But, whether this is an ongoing process within the business cycle or not it is still unclear and will be examined in the next part.

Returning to the housing price (model 4), when the ln(WOZ-value) rises with 1%, the log(odds) of having an intention to move outside the Amsterdam region declines with 0.059%. Although this coefficient is, together with the coefficient in models 2 and 3, not too high it still stresses a significant negative relation between WOZ-value and intentions of moving outside of Amsterdam. As it is expected that a high WOZ-value results in a relatively high rental price of the dwelling it is also expected that higher rents reflect a higher moving intention of moving outside Greater-Amsterdam. The result contradicts the theory that higher housing prices are a trigger for people to relocate to lower-priced areas located further away from large cities like Amsterdam (Dieleman, 2001; Helderman et al., 2004; Coulter, 2013). Therefore, we reject the second hypothesis: the higher the housing price of the current residence the more likely a person has an intention to move outside Greater-Amsterdam. Still, this relationship could be explained by the positive correlation between incomes and WOZ-values as can be seen in Appendix B, people with a higher income probably live in more expensive houses due to their choice set and affordability. As higher housing prices proved to be a threshold for low-income groups in areas like Amsterdam to relocate relative to higher-income groups (Mulder & Hooimeijer, 1999; Coulter, 2013). Another explanation could be that when people experience a high current housing price, they could invest more in a new dwelling by using the money of the sale of this current dwelling. When people experience a low housing price it could be hard to invest in a new dwelling in Amsterdam since the housing prices are already relatively expensive, causing them to look for a dwelling further away from the city.

Looking at all four models together it seems that there is not only a significant effect of income and WOZ-value on people's intention to move. But also of age, ethnicity, education, floorspace, tenure and satisfaction of the residence/neighborhood on these intentions. Model 4 illustrates that the odds of having an intention to relocate outside Amsterdam for age categories of 25-34 have a 37% decrease, for 35-44 a 34.8% decrease, for 55-64 a 39.5% decrease, for 65-74 a 57.6% decrease and for 75 and older a 75.5% decrease compared to the youngest age group. Those coefficients explain a part of the moving intentions. It seems that the older a person, the less likely this person would have an intention to move outside Amsterdam which is in line with Chiuri & Jappelli (2010). This could be elaborated by the emotional attachment to a certain place or city, but also by the possible wealth generated from earlier residences or income growth when people get older due to career development (Willekens, 1991 & Bootsma, 1998). Besides age, it is also striking to see that higher educated people more often have an intention to leave Amsterdam compared to low educated people which goes for all models, with a 36.8%[3] increase in the odds of moving outside Amsterdam compared to low educated people. This contradicts the aforementioned theory of Mulder &

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[3] All odds ratio percentages are calculated as follows: [(1 - *'odds ratio of'* 1.368)*100 = - 36.8%] (Szumilas, 2010).

Hooimeijer (1999) and Clark & Dieleman (1996). The other remarkable finding is that people with a non-western ethnicity are 36.9% less likely to intend to relocate outside rather than inside Amsterdam compared to natives just as Crowder (2001) describes. For housing composition, it is notable that single-parent families and non-family households are less likely to leave Amsterdam compared to a single person household due to the negative coefficients, where on the other hand a couple is more likely to leave.

The results also show the significant residence characteristics which explain part of the model. For every square meter increase in floorspace the odds of having a moving intention to leave increases by 1.007 times or 0.7% (table 6). More floorspace could mean a more expensive house, hereby increasing a moving intention of leaving Amsterdam in the search for a less expensive dwelling. Besides floorspace are people who are renting a place 30.9% less likely to leave compared to people owning a place with a stable parameter in models 2 and 3. At last, logically when the household is less satisfied with the neighborhood, the more likely the household is to leave Amsterdam. The analysis shows an odds ratio of 3.569 implying that the odds a person intends to leave Amsterdam is 256.9% higher for a person who is very unsatisfied compared to a very satisfied person. To infer, not only income and WOZ-value explain the influence on relocation behaviour in Greater-Amsterdam, but also other factors.

Yet, the focus of this research does not just lie on the influence of income and housing price on relocation behaviour, but also on the changes throughout the business cycle. To examine whether there are significant statistical differences between every of the four HS, as would be expected following literature, a likelihood ratio test will be conducted, explained in the following paragraph.

5.2. Likelihood ratio test

It was already expected that lower-income groups form more intentions to leave relative expensive housing market regions compared to higher incomes, just as the first analysis showed (Coulter, 2013; Mulder & Hooimeijer, 1999). This not only goes for lower-income groups, but it is also presumed that households more often want to locate to lower-priced areas as soon as housing prices increase (Dieleman, 2001; Helderman et al., 2004; Coulter, 2013). This is not only expected for their current dwelling, but also for rising housing prices of the overall regional housing market. As the housing market changes constantly and different of those business cycle stages can be distinguished, it is presumed that there are statistical differences between the different HS years as well (Davis & Heathcote, 2005; CBS 2019a). Therefore, the null hypothesis can be formulated as: there are no statistical differences between the merged model (4) and the segmented models (5, 6, 7 & 8). The likelihood ratio test will be conducted as follows to decide whether we can reject this hypothesis or not (Train, 2009). The segmented models and the '*-2loglikelihood*' values can be found in table 8 (Appendix D).

$$Likelihood\ ratio = -2\left[\left(\frac{3511.011}{-2}\right) - \left(\frac{1080.545}{-2} + \frac{1016.291}{-2} + \frac{580.052}{-2} + \frac{723.426}{-2}\right)\right]$$

$$Likelihood\ ratio = -2(-54.898) = 109.796$$

The likelihood ratio test statistic exceeds the Chi-squared critical value with a degrees of freedom of 32 (53.486 < 109.769) at a 1% significance level as can be seen in Appendix C. For this reason, we can reject the null hypothesis, assuming there is a statistical difference between the HS years and the merged model. This gives us a reason to perform individual logistic regressions for every HS year in order to distinguish the business cycle stages regarding relocation behaviour. Which will be described in the next part, together with the most important relocation reasons and the amount of relocations during those stages. Note that the merged model 4 with all control variables is used in the likelihood ratio test, this is done to follow literature, and because the addition of the location characteristic variables caused a remarkable increase of the model fit from 0.077 to 0.113.

5.3. Relocation incentives throughout the business cycle

The changing relocation incentives and the most important descriptive statistics of the segmented models are explained in this part prior to the segmented logistic regressions to sketch an idea to what extent and why people have an intention to move within or outside Greater-Amsterdam. This will help interpreting the results.

Table 7 below illustrates the amount of relocation intentions and incentives. It should be noted that the share of people having an intention to relocate has increased over time, logically at expense of the people not having an intention. Comparing this to the business cycle phases there does not appear to be a manifest relationship since the trend of people having an intention to move grows regardless of a peak or trough phase, vice versa for people not having an intention to move.

Looking at the percentage share of people having an intention to relocate and actually want to leave Greater-Amsterdam it can be seen that this share slightly rises from a peak to recession phase, but then dropping and stagnating at the trough and expansion phase. Less people seem to have intentions to move outside Amsterdam during trough and expansion phase. It could, for instance, be possible that from the people having an intention to leave they expect that the housing prices are going to rise in Amsterdam, therefore seeking a house within Amsterdam. Those people could be risk-averse in uncertain times since mortgage and rental payments are normally the highest expenses people have, relatively to their income. It can also be seen that the share of the low-income group has slightly decreased, whereas the share of the higher and highest income group have experienced a small growth.

Table 7 also presents the most important incentives for relocation intentions. It should be noted that the option '*financial reason*' was only included in the HS of 2015 and 2018. Which seem to gain a markable share of 8.1% and 11.4% for potential movers within Amsterdam and 2.9%, 9.8% for potential movers outside Amsterdam, this seems to be higher whenever housing prices rise in trough and expansion stage just as Hochstenbach & Musterd (2018) and Crommentuijn (1997) described. However, this might cause crooked results since some people might have chosen this option in the first two HS. This would explain the decrease of the '*otherwise option*' after 2012. Still, the other general findings will be discussed briefly.

Table 7: Descriptive statistics and moving incentives throughout the business cycle

HS Year:	2009	2012	2015	2018
Business cycle stage:	Peak	Recession	Trough	Expansion
Having an intention to relocate (%)	31.9	37.2	45.7	46.3
Not having an intention to relocate (%)	68.1	62.8	54.3	53.7
Having an intention to relocate within Greater-Amsterdam (%)	74	72.5	77.4	77.4
Having an intention to relocate outside Greater-Amsterdam (%)	26	27.5	22.6	22.6
Median taxable income (5 classes)	2.19	2.27	2.23	2.34
Income class (share)				
Low (%)	44.3	41.7	42.7	41.1
Lower Middle (%)	20.5	20.5	20.2	19.8
Upper Middle (%)	14.6	14.5	14.3	12.7
Higher (%)	13.5	15.2	17.4	16.8
Highest (%)	7.1	8.1	5.4	9.6
WOZ-value (x 1000 Euro)	216.71	234.23	197.3	266.92
WOZ-value min. (x 1000 Euro)	20	11	34	46
WOZ-value max. (x 1000 Euro)	1366	1359	1164	1144
Most important reason to relocate % share				
1. Health or need for care	10.1 (3.9[4])	11.5 (4)	14.2 (3.6)	16.5 (6.7)
2. Study	1.4 (0)	0.9 (3.2)	1.6 (4.3)	1.5 (7.9)
3. Work	2 (16.9)	3.3 (10.8)	3 (9.4)	2.4 (9.1)
4. Financial reason	N.A.	N.A.	8.1 (2.9)	11.4 (9.8)
5. Your current home	45.3 (27.3)	39.5 (17.3)	42.5 (21.0)	48.6 (18.3)
6. The living environment or residential area of your current home	24.3 (29.9)	13.2 (23.7)	14 (30.4)	13.4 (37.8)
7. Because you want to live closer to family, friends or acquaintances	2 (7.8)	2.4 (12.9)	2.2 (15.2)	2.5 (8.5)
8. Otherwise	14.9 (14.3)	29.1 (28.1)	14.4 (13)	3.7 (1.8)
Observations	1,059	950	649	769

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[4] Note: Most important reason to relocate outside Amsterdam is showed in parentheses.

The most important reason people want to relocate within Amsterdam is due to their current home (Moore, 1986; Morrison & Clark, 2016). It might be possible that quite some people are, for instance, seeking a better or larger house meeting their preferences. People less often have this as main reason during recession and trough periods (table 7) compared to peak and expansion period, this is in line with the theory of Coolen & Hoekstra (2001) stating that housing need tradeoffs become more evident whenever housing prices are relatively high. These shares are remarkably more compared to the same relocation incentive for relocations within Amsterdam.

The main incentive for people having an intention to leave Amsterdam is due to their living environment and grows throughout the years (table 7). Moreover, during expansion periods more people seem to be inclined to leave Greater-Amsterdam because of their residential area. Health and study related reasons seem to be increased over time for all people having relocation intentions, especially for the study related reasons for people leaving increasing from 0% to 7.9%. Relocations related to work only seem to show a considerable downward trend from peak to trough phase for people leaving the Amsterdam region (16.9% to 9.1%). Which is one of the main moving incentives as Mulder & Hooimeijer (1999) described, especially for the young adulthood phase (Crompton, 2008). The next part with the individual logistic regression analyzes hopes to clarify the above mentioned changing relocation incentives and changing income class compositions.

5.4. Binary logistic regressions throughout the business cycle

The results from the segmented models will be described in this part to study if the influences of income and housing prices on relocation behaviour differ throughout the business cycle. The segmented models are based on the same variables as used in model 4.

The analysis shows that income only has a significant effect on relocation behaviour during the recession phase of 2012. Table 8 (Appendix D) provides the binary logistic regressions conducted for the four years of the HS representing different stages of the business cycle. It is striking to see that, compared to model 4, income only seems to have a significant effect on relocation behaviour during the recession phase of 2012. The effects of different income groups are relatively the same for the upper-middle, higher and highest income groups compared to the lowest income group. A person with an upper middle-income has a 52% decrease in the odds of having an intention to move outside Amsterdam compared to the lowest income group. For the higher income group this is a decrease of 52.2% and for the highest income group a decrease of 51.5% in the odds of having a relocation intention of leaving Greater-Amsterdam. So, during the recession stage upper-middle, higher and highest income groups are almost 52% less likely to have an intention to move outside of Amsterdam

compared to lowest-income group. It turns out that higher-income groups have more intentions to stay in Amsterdam compared to the lowest group, just like the results from model 4. Nonetheless, the parameters during the recession phase prove to be higher, assuming that the higher income groups are even more likely to stay in Amsterdam compared to the lowest income group in times of recession. This could be explained by the result found by Hochstenbach & Musterd (2018) finding that lower-income groups are less likely to relocate during a peak stage due to high housing prices, assuming that the contradicting recession phase with housing prices going downwards forms a relocation incentive. It could be possible that more vacant houses are available on the housing market or that those lower incomes can now find a less expensive dwelling or rental house outside Amsterdam.

During this recession phase, age seems to be explaining relocation behaviour as well, with all age groups to be of an significant influence. All category coefficients appear to be relatively high compared to the other coefficients. The coefficients are negative and cause a decreasing log(odds) of relocation intentions outside Amsterdam for people from the highest four age groups compared to the lowest age group. As already discussed in model 4 (Chiuri & Jappelli, 2010; Willekens, 1991 & Bootsma, 1998). Subsequently, it is striking to see the influence of crowdedness. An under-crowded household is 152.6% more likely to leave the city compared to a household living in an over-crowded home. Which is contradicting the aforementioned theory (Groot et al., 2011).

The only main independent variable of influence during the trough phase appears to be the WOZ-value. A 1% increase in the ln(WOZ-value) is causing a 1.495 % decrease in the log(odds) of having an intention to leave Amsterdam (Appendix D: table 8). Comparing this to the 0.059% decrease from model 4 a higher negative influence is notified. Therefore, it is presumed that during a trough stage, with overall lower average housing prices (figure 3), that people with a higher current housing prices causes these people to be even more likely to move within rather than outside Amsterdam. This is not in line with Lu (1999) showing that a higher current housing price negatively impacts relocation intentions in times of prosperity, not in the opposite times of troughs as is proved in this case. It could be explained by expected lower overall rental prices in times of troughs due to lower average WOZ-values, causing a barrier for households to relocate to other places outside Amsterdam. As a renter is 39.6% less likely to form a moving intention outside of Amsterdam compared to housing owners.

In times of trough are household composition, education, ethnicity, floorspace also variables responsible for an influence on relocation behaviour according to model 7. Medium and highly educated people seem to be triggered to relocate outside Amsterdam compared to low educated people, as discussed in model 4, this relation is also observed in model 5. The same goes for a non-western ethnicity and proves to cause a 45% decrease in the odds of having intentions of leaving Amsterdam compared to natives as described by Crowder (2001),

this negative relation is also experienced in model 5 and 8. Looking at floorspace, for every square meter floorspace increase the odds of having a relocation intention of leaving Greater-Amsterdam increases with 1.011 times, a positive effect just as in model 4. This positive effect is also seen in the peak stage of model 5 and the expansion stage of model 8.

It seems that tenants, in both the expansion and peak stage, are less likely to move outside Amsterdam compared to owner-occupiers. With a 43.1% decrease in the odds during the peak phase and a lower 10.9% decrease during the expansion phase (table 8). Looking at all business cycle stages together no real trends can be distinguished since not all variables have a significant influence on moving behaviour. Only neighborhood satisfaction has a considerable amount of significant coefficients, but this was already expected in the first place since the main reason for people having an intention to leave Amsterdam is due to their living environment as became clear in table 7. Thus, no real trends can be distinguished during different phases of the business cycle regarding income and WOZ-value as an influence on moving behaviour.

Overall, the first results showed that lower-income groups are more likely to have moving intentions of leaving Amsterdam compared to the upper-middle and higher income groups. Displacement processes seem to be noted at a higher regional level, giving a reason not to reject the first hypothesis. Where housing prices appeared to have a negative influence on the moving intentions of leaving Amsterdam, giving a reason to reject the second hypothesis. Unfortunately, regarding the last two hypotheses, it cannot be concluded that the differences regarding relocation behaviour between the merged and the segmented models are explained by the effects of income and housing prices. But is, especially in peak and expansion stage, explained by other variables. Returning to hypothesis three: *there are different effects of income and housing prices throughout the business cycle on people's intention to leave Greater-Amsterdam*. And returning to hypothesis four: *lower-income groups more often have intentions to relocate outside Amsterdam in times of recession and trough compared to higher income groups*. Both hypotheses are rejected since there is not enough prove that income and housing prices have different effects throughout the business cycle because there are not enough significant results to prove otherwise.

6. CONCLUSION

In this research, relocation behaviour is investigated to question latent displacement processes in Greater-Amsterdam, with a focus on different effects of the ever-changing housing market on relocation incentives throughout the business cycle. The results showed that no evident trends could be distinguished of the business cycle as an influence on moving behaviour in Amsterdam's region. Different income groups have been taken into account to examine whether various stages of the business cycle have different effects on people's intention to move. Relocation behaviour proved to be influenced by both macro-level factors like housing market conditions and micro-level factors such as a number of individual characteristics. A combination of housing conditions and individual characteristics showed to form incentives or barriers for people to move. But still, the macro-level factors appeared to be considerably less of influence on moving intentions compared to individual characteristics. This might be the case because the macro-context applies to all the people in the region, but are experienced differently due to people's individual characteristics.

The increasing housing prices already caused processes of suburbanization of poverty and displacement in Amsterdam (Hochstenbach & Musterd, 2018). Which is supported by the first analysis in this research, showing an increase in the share of the highest two income groups replacing the lowest income group. The same goes for the remarkable increasing share of highly educated people at cost of the low educated people, both findings supported a number of theories (Mulder & Hooimeijer, 1999; Clark & Dieleman, 1996; Crommentuijn, 1997). The arrival of these higher income groups could partly explain the moving intentions of the lower-income groups. Not only there are a number of lower-income people moving to the suburbs or the peripheral towns around Amsterdam, but the analysis of this study stressed that the lowest income group is more likely to form intentions of leaving the Greater-Amsterdam region compared to higher income groups. Hereby, indicating that these processes of displacement are also observed on the regional level and not only on the local level.

This research focuses on the effects of income and housing prices and not on the overall demographic changes, however, these relocation intentions could still form an indication of which types of income groups want to relocate inside or outside Greater-Amsterdam. Moreover, it is not yet known where those people want to move to, do they want to live just outside Greater-Amsterdam or somewhere else in the Netherlands?

Subsequently, this study is limited by the lack of information on rents, as it might be possible that higher housing prices do not always lead to higher rents since governmental measures are of force, such as the so-called 'huurbescherming', this measure implies that landlords, mostly, cannot unilaterally terminate the leasing contract. The analyses also

indicated a negative relation between the housing prices of the current residence and the intention of leaving Greater-Amsterdam rather than moving within the region. The moving intentions formed by housing prices could be explained by the relation between income and housing price as well, as higher incomes normally can afford the more expensive houses in Greater-Amsterdam compared to lower incomes. Still, we get back to the main question to examine whether the common Greater-Amsterdam housing prices and the current housing price have an effect on relocation behaviour. As the aim of the research is to examine relocation behaviour throughout the business cycle.

What are the effects of housing prices and income on people's intention to move inside or outside Greater-Amsterdam throughout the business cycle?

Even though it was found that there are statistical differences between the segmented models representing different stages of the business cycle and the merged model, the estimation results from these segmented models showed no certain trends throughout the HS years regarding effects of different income groups or housing prices on people's intention to move inside or outside Greater-Amsterdam. Only during the recession stage some effects of income groups became clear. The same goes for the WOZ-value which only proved to have an effect on relocation behaviour during the trough stage of the business cycle. Therefore, we cannot state that income nor housing price has a different influence during the four stages of the business cycle on people's intention to move inside or outside Greater-Amsterdam. As the different effects of the business cycle on this relocation behaviour is probably explained by other factors. Nonetheless, there is one thing that is known for certain, housing prices in both Amsterdam and the Netherlands have risen to a substantial higher level compared to the years prior to the financial crisis. Further research on the topic of relocation behaviour throughout the business cycle is needed to examine if and how these increasing prices will affect different income groups in the future.

7. RECOMMENDATION & DISCUSSION

Even though it was showed that tenants were less likely to leave Amsterdam compared to owner-occupiers, still this study focusses on effects throughout the business cycle, and not particularly on tenure. Therefore, more broadly research is needed to determine the rental effects on relocation behaviour, as it might be possible that people with a higher income live in a rental dwelling with a relatively low rental price, or vice versa a lower-income in an expensive house, this phenomenon is known in the Netherlands as '*scheefwonen'*. Further research could maybe also show that certain effects of rental prices can be distinguished throughout the business cycle regarding relocation behaviour.

Another shortcoming of this research is that the regional scale data from Greater-Amsterdam does not allow us to determine geographical differences within this destination area. Hence, possible differences between moving intentions or certain income groups in, for instance, the inner-city, suburbs or satellite towns are not researched. Additionally, the tight Amsterdam housing market is quite a unique case, and raises the question of whether other municipalities or regions in the Netherlands experience effects which can be compared to Greater-Amsterdam, the same goes for possible regions abroad. This due to the fact that local and governmental policies differ between regions and countries. Subsequently, since the analysis proved that higher housing prices have a negative effect on forming a moving intention of leaving Amsterdam, further research is needed to explore and explain this relationship.

It should be noted that it is presumed that the housing prices in Greater-Amsterdam are about to increase in the near future as well. The municipality of Amsterdam already acknowledges the problem of rising housing prices and is already integrating new restrictions: new owner-occupier homes in the mid-segment will gain a maximum price to keep these houses affordable for lower and lower-middle income groups. The so-called '*zelfwoonplicht*' is another restrictive measure; whoever buys a house need to actually live in this house themselves, this prevents investors from buying mid-segments houses for rental purposes (Couzy, 2019). At last, the municipality wants to relieve pressure on the housing market by starting with the construction of 52,500 houses until 2025. Forty percent of these houses will be built for social housing and forty percent for the mid-rent segment, the other twenty percent will be available for the private market (Municipality of Amsterdam, 2018b). However, it seems that even though measures are taken, and more houses already have been built, that this does not have a depressing effect on the housing prices yet (figures 3 and 4). Future research could investigate if these measures actually have any effects on the housing prices in Greater-Amsterdam. It could be possible that more measures need to be implemented in order to deal with this problem of increasing housing prices and ongoing processes of displacement.

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Therefore, it is of great importance to understand these processes in order to maintain the livability of the Dutch cities since a new housing price peak in both Amsterdam and the rest of the Netherlands is not yet to be notified.

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APPENDICES

APPENDIX A: Transformation WOZ-value & floorspace

Histogram

Mean = 79,88
Std. Dev. = 42,637
N = 3.607

Histogram

Mean = 73,3
Std. Dev. = 29,244
N = 3.427

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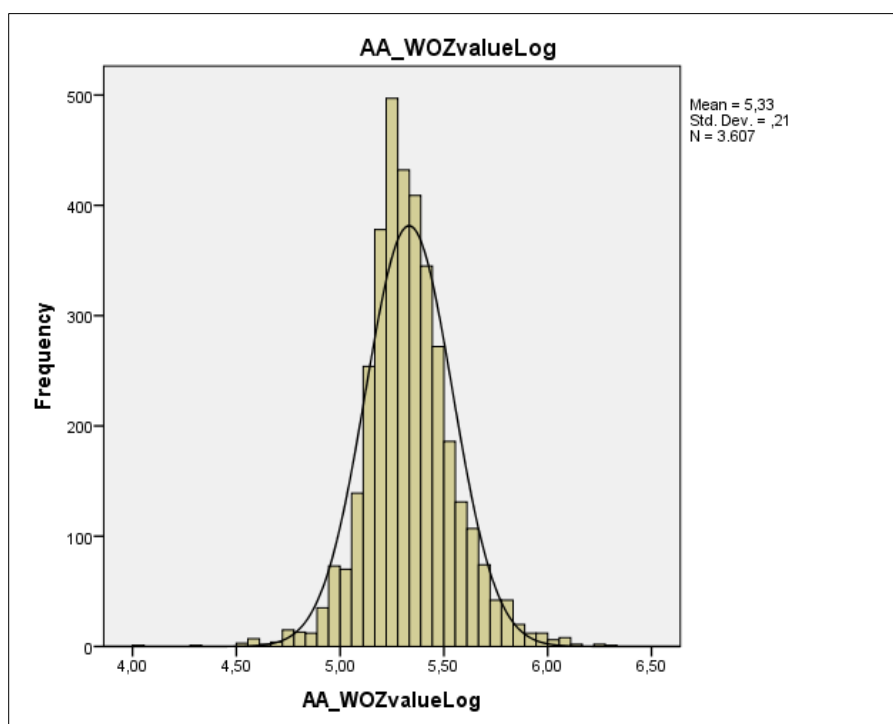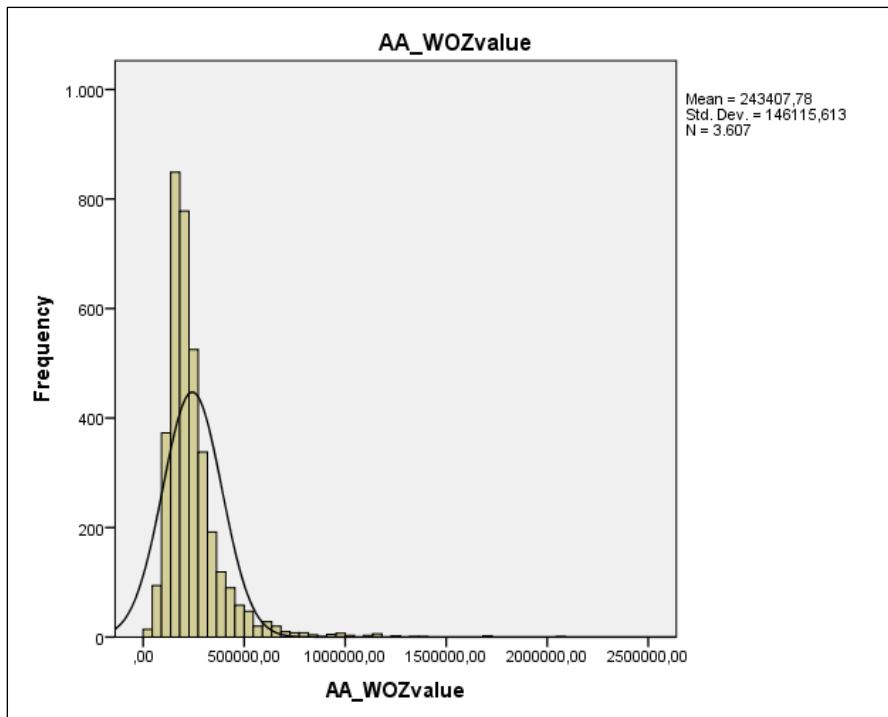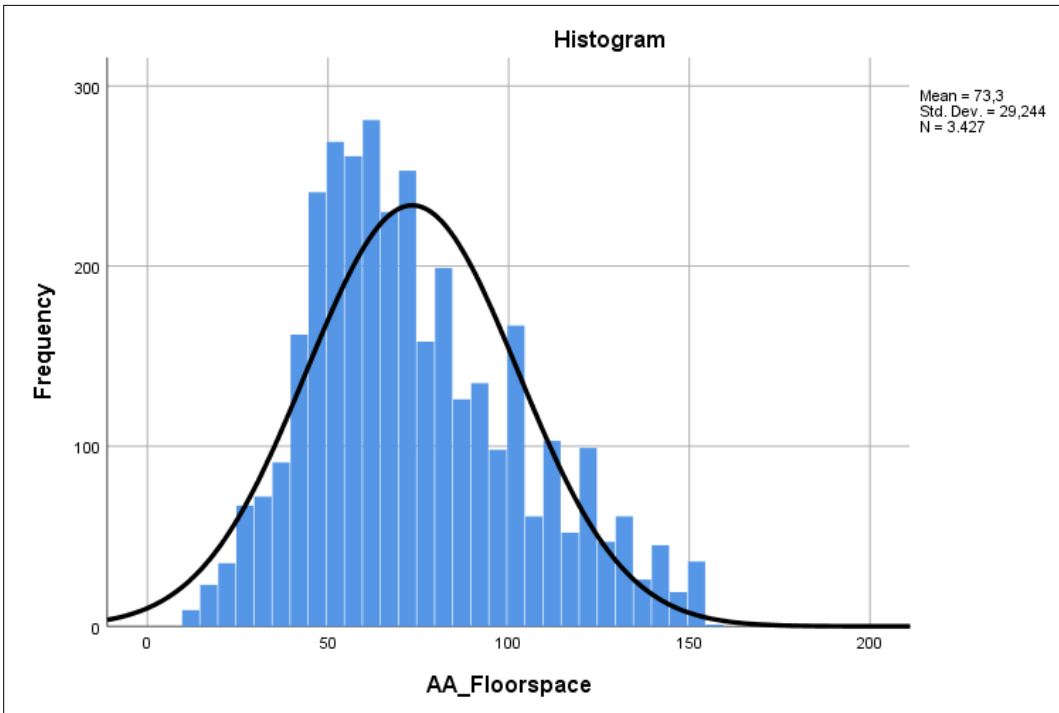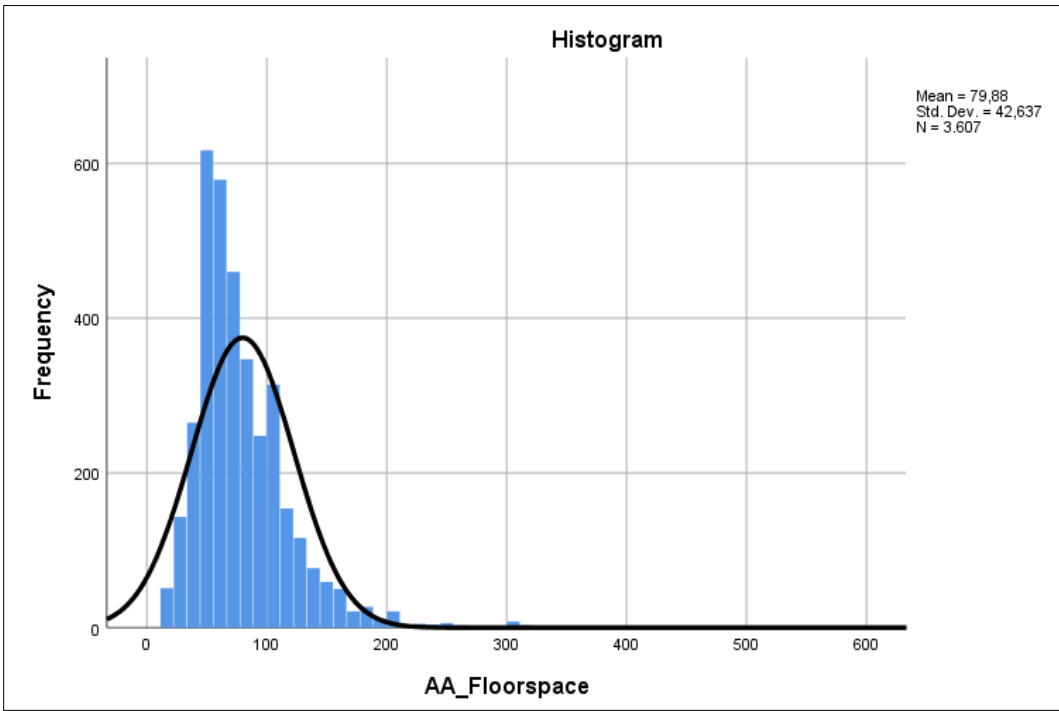
APPENDIX B: Bivariate correlation test of variables used in research

The matrix is based on the correlation coefficients referred as r (Pearson's product moment).
The correlations can be interpreted as follows: low correlation ($r \leq 0,35$), medium correlation
($0,35 < r \leq 67$) & high correlation ($r \geq 0,68$) (Taylor, 1990). There are no observed high
correlations and only seven medium correlations. Hence, following this test no variables
need to be removed from the model.

Variables	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Income	1											
2. Ln(WOZvalue)	.088**	1										
3. Age	-0.01	0.03	1									
4. Crowdedness	-.098**	.062**	.287**	1								
5. Floorspace	.383**	.091**	.284**	.165**	1							
6. Household composition	.167**	-0.03	-.192**	-.470**	.218**	1						
7. Satisfaction residence	-.197**	-.075**	0.01	-.179**	-.242**	.097**	1					
8. Satisfaction neighborhood	-.094**	-.091**	.087**	0.00	-0.03	0.01	.361**	1				
9. Employment	.425**	-.035*	-.322**	-.124**	.069**	.108**	-.090**	-.080**	1			
10. Education	.269**	.135**	-.298**	.036*	0.01	-.072**	-.176**	-.112**	.319**	1		
11. Ethnicity	-.072**	-.047**	-.046**	-.126**	-.091**	.096**	.187**	.058**	-0.01	-.054**	1	
12. Tenure	-.403**	-.128**	-.106**	-.094**	-.395**	0.02	.301**	.101**	-.193**	-.159**	.136**	1

Note: **, * Correlation is significant at 1% and 5%, respectively.
N.A. Cannot be computed because at least one of the variables is constant.

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APPENDIX C: Values of the Chi-squared distribution
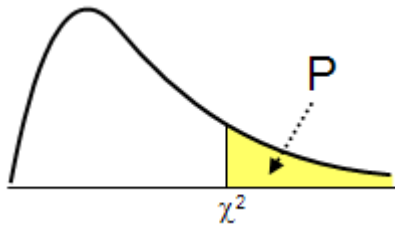
	P										
DF	0.995	0.975	0.20	0.10	0.05	0.025	0.02	0.01	0.005	0.002	0.001
1	0.0000393	0.000982	1.642	2.706	3.841	5.024	5.412	6.635	7.879	9.550	10.828
2	0.0100	0.0506	3.219	4.605	5.991	7.378	7.824	9.210	10.597	12.429	13.816
3	0.0717	0.216	4.642	6.251	7.815	9.348	9.837	11.345	12.838	14.796	16.266
4	0.207	0.484	5.989	7.779	9.488	11.143	11.668	13.277	14.860	16.924	18.467
5	0.412	0.831	7.289	9.236	11.070	12.833	13.388	15.086	16.750	18.907	20.515
6	0.676	1.237	8.558	10.645	12.592	14.449	15.033	16.812	18.548	20.791	22.458
7	0.989	1.690	9.803	12.017	14.067	16.013	16.622	18.475	20.278	22.601	24.322
8	1.344	2.180	11.030	13.362	15.507	17.535	18.168	20.090	21.955	24.352	26.124
9	1.735	2.700	12.242	14.684	16.919	19.023	19.679	21.666	23.589	26.056	27.877
10	2.156	3.247	13.442	15.987	18.307	20.483	21.161	23.209	25.188	27.722	29.588
11	2.603	3.816	14.631	17.275	19.675	21.920	22.618	24.725	26.757	29.354	31.264
12	3.074	4.404	15.812	18.549	21.026	23.337	24.054	26.217	28.300	30.957	32.909
13	3.565	5.009	16.985	19.812	22.362	24.736	25.472	27.688	29.819	32.535	34.528
14	4.075	5.629	18.151	21.064	23.685	26.119	26.873	29.141	31.319	34.091	36.123
15	4.601	6.262	19.311	22.307	24.996	27.488	28.259	30.578	32.801	35.628	37.697
16	5.142	6.908	20.465	23.542	26.296	28.845	29.633	32.000	34.267	37.146	39.252
17	5.697	7.564	21.615	24.769	27.587	30.191	30.995	33.409	35.718	38.648	40.790
18	6.265	8.231	22.760	25.989	28.869	31.526	32.346	34.805	37.156	40.136	42.312
19	6.844	8.907	23.900	27.204	30.144	32.852	33.687	36.191	38.582	41.610	43.820
20	7.434	9.591	25.038	28.412	31.410	34.170	35.020	37.566	39.997	43.072	45.315
21	8.034	10.283	26.171	29.615	32.671	35.479	36.343	38.932	41.401	44.522	46.797
22	8.643	10.982	27.301	30.813	33.924	36.781	37.659	40.289	42.796	45.962	48.268
23	9.260	11.689	28.429	32.007	35.172	38.076	38.968	41.638	44.181	47.391	49.728
24	9.886	12.401	29.553	33.196	36.415	39.364	40.270	42.980	45.559	48.812	51.179
25	10.520	13.120	30.675	34.382	37.652	40.646	41.566	44.314	46.928	50.223	52.620
26	11.160	13.844	31.795	35.563	38.885	41.923	42.856	45.642	48.290	51.627	54.052
27	11.808	14.573	32.912	36.741	40.113	43.195	44.140	46.963	49.645	53.023	55.476
28	12.461	15.308	34.027	37.916	41.337	44.461	45.419	48.278	50.993	54.411	56.892
29	13.121	16.047	35.139	39.087	42.557	45.722	46.693	49.588	52.336	55.792	58.301
30	13.787	16.791	36.250	40.256	43.773	46.979	47.962	50.892	53.672	57.167	59.703
31	14.458	17.539	37.359	41.422	44.985	48.232	49.226	52.191	55.003	58.536	61.098
32	15.134	18.291	38.466	42.585	46.194	49.480	50.487	53.486	56.328	59.899	62.487
33	15.815	19.047	39.572	43.745	47.400	50.725	51.743	54.776	57.648	61.256	63.870
34	16.501	19.806	40.676	44.903	48.602	51.966	52.995	56.061	58.964	62.608	65.247
35	17.192	20.569	41.778	46.059	49.802	53.203	54.244	57.342	60.275	63.955	66.619
36	17.887	21.336	42.879	47.212	50.998	54.437	55.489	58.619	61.581	65.296	67.985
37	18.586	22.106	43.978	48.363	52.192	55.668	56.730	59.893	62.883	66.633	69.346
38	19.289	22.878	45.076	49.513	53.384	56.896	57.969	61.162	64.181	67.966	70.703
39	19.996	23.654	46.173	50.660	54.572	58.120	59.204	62.428	65.476	69.294	72.055
40	20.707	24.433	47.269	51.805	55.758	59.342	60.436	63.691	66.766	70.618	73.402

(Source: Sanimal, 2019)

APPENDIX D: Table 8 Logistic regression models results throughout the business cycle in Greater-Amsterdam

	(5)		(6)	
HS Year	2009		2012	
Business cycle stage	Peak		Recession	
	B	Odds ratio	B	Odds ratio
Income (Low)	-	-	-	-
Income (Lower Middle)	-0.488 (0.323)	0.614	-0.461 (0.309)	0.63
Income (Upper Middle)	-0.434 (0.328)	0.648	-0.734** (0.34)	0.48
Income (Higher)	-0.406 (0.33)	0.666	-0.738** (0.344)	0.478
Income (Highest)	-0.254 (0.338)	0.776	-0.723** (0.352)	0.485
ln(WOZ Value)	0.128 (0.515)	1.136	-0.732 (0.486)	0.481
Age 18 - 24	-	-	-	-
Age 25 - 34	-0.438 (0.335)	0.645	-1.003*** (0.325)	0.367
Age 35 - 44	-0.149 (0.348)	0.862	-1.006*** (0.357)	0.366
Age 45 - 54	-0.118 (0.369)	0.889	-0.832** (0.369)	0.435
Age 55 - 64	-0.237 (0.389)	0.789	-0.929** (0.367)	0.395
Age 65 - 74	-0.695 (0.476)	0.499	-1.456*** (0.427)	0.233
Age > 75	-1.042* (0.548)	0.353	-1.795*** (0.633)	0.166
HC (Single-person household)	-	-	-	-
HC: Couple	0.173 (0.241)	1.189	0.255 (0.258)	1.291
HC: Couple with child(+)	-0.305 (0.308)	0.737	0.228 (0.343)	1.256
HC: Single parent family	-0.94*** (0.349)	0.391	-0.294 (0.381)	0.745
HC: Non-family household	-0.783* (0.442)	0.457	-0.313 (0.379)	0.731
Employment (1= Employed)	-0.269 (0.235)	0.764	-0.25 (0.241)	0.779
Ethnicity (Native)	-	-	-	-
Ethnicity (Non-Western)	-0.469** (0.213)	0.626	-0.224 (0.23)	0.799
Ethnicity (Western)	-0.241 (0.244)	0.786	0.337 (0.234)	1.4
Education (Low)	-	-	-	-
Education (Medium)	0.121 (0.22)	1.128	-0.064 (0.245)	0.938
Education (High)	0.416* (0.214)	1.515	0.241 (0.234)	1.272
Floorspace	0.008** (0.004)	1.008	0.005 (0.003)	1.005
Crowdedness (Over)	-	-	-	-
Crowdedness (Medium)	0.42 (0.359)	1.522	0.589 (0.39)	1.803
Crowdedness (Under)	0.183 (0.434)	1.201	0.927* (0.475)	2.526
Tenure (Owner-Occupier)	-	-	-	-
Tenure (Rental)	-0.563** (0.198)	0.569	-0.225 (0.192)	0.798
SR: Very Satisfied	-	-	-	-
SR: Satisfied	-0.3 (0.221)	0.741	-0.111 (0.229)	0.895
SR: Neutral	-0.428 (0.277)	0.652	-0.246 (0.299)	0.782
SR: Unsatisfied	-0.301 (0.329)	0.74	-0.264 (0.36)	0.768
SR: Very Unsatisfied	-0.063 (0.501)	0.939	-0.572 (0.507)	0.565
SN: Very Satisfied	-	-	-	-
SN: Satisfied	0.794*** (0.244)	2.213	0.444* (0.235)	1.558
SN: Neutral	1.274*** (0.28)	3.575	1.191*** (0.264)	3.291
SN: Unsatisfied	0.757** (0.316)	2.131	1.168*** (0.322)	3.216
SN: Very Unsatisfied	1.212*** (0.428)	3.36	1.065** (0.487)	2.901
Constant	-1.021 (1.404)	0.36	3.287 (2.692)	26.754
Observations	1,059		950	
Model Chi-square	113.220		92.895	
Pseudo R-squared	0.15		0.135	
-2Loglikelihood	1080.545		1016.291	
Degrees of freedom	32		32	

	(7)		(8)	
HS Year	2015		2018	
Business cycle stage	Trough		Expansion	
	B	Odds ratio	B	Odds ratio
Income (Low)	-	-	-	-
Income (Lower Middle)	0.209 (0.488)	1.233	-0.101 (0.34)	0.904
Income (Upper Middle)	0.014 (0.517)	1.014	-0.314 (0.389)	0.73
Income (Higher)	0.101 (0.52)	1.106	-0.351 (0.396)	0.704
Income (Highest)	0.528 (0.531)	1.695	-0.238 (0.452)	0.788
ln(WOZ Value)	-1.495* (0.801)	0.224	0.186 (0.565)	1.204
Age 18 - 24	-	-	-	-
Age 25 - 34	0.054 (0.459)	1.055	-0.034 (0.408)	0.967
Age 35 - 44	0.004 (0.516)	1.004	-0.277 (0.441)	0.758
Age 45 - 54	-0.011 (0.514)	0.989	-0.115 (0.44)	0.892
Age 55 - 64	0.238 (0.555)	1.268	-0.581 (0.46)	0.559
Age 65 - 74	-0.649 (0.682)	0.522	-0.304 (0.509)	0.738
Age > 75	-19.126 (9122.888)	0	-1.133 (0.707)	0.322
HC (Single-person household)	-	-	-	-
HC: Couple	0.717* (0.367)	2.048	-0.309 (0.325)	0.735
HC: Couple with child(+)	0.359 (0.438)	1.431	-1.105** (0.441)	0.331
HC: Single parent family	0.489 (0.482)	1.631	-0.445 (0.436)	0.641
HC: Non-family household	0.291 (0.537)	1.338	-1.422** (0.571)	0.241
Employment (1= Employed)	0.611* (0.333)	1.842	0.513** (0.281)	1.67
Ethnicity (Native)	-	-	-	-
Ethnicity (Non-Western)	-0.616* (0.326)	0.54	-0.75** (0.304)	0.472
Ethnicity (Western)	-0.078 (0.329)	0.925	-0.917*** (0.33)	0.4
Education (Low)	-	-	-	-
Education (Medium)	0.738* (0.385)	2.092	0.513 (0.328)	1.67
Education (High)	0.802** (0.395)	2.229	0.369 (0.326)	1.447
Floorspace	0.011* (0.006)	1.011	0.014*** (0.005)	1.014
Crowdedness (Over)	-	-	-	-
Crowdedness (Medium)	-0.259 (0.459)	0.772	0.198 (0.542)	1.219
Crowdedness (Under)	-0.342 (0.603)	0.71	-0.249 (0.619)	0.78
Tenure (Owner-Occupier)	-	-	-	-
Tenure (Rental)	-0.505** (0.253)	0.604	-0.115** (0.242)	0.891
SR: Very Satisfied	-	-	-	-
SR: Satisfied	-0.807** (0.314)	0.446	-0.532** (0.259)	0.588
SR: Neutral	-0.863** (0.386)	0.422	-0.814** (0.352)	0.443
SR: Unsatisfied	-0.887* (0.501)	0.412	-0.137 (0.397)	0.872
SR: Very Unsatisfied	-1.068 (0.708)	0.344	-0.398 (0.599)	0.672
SN: Very Satisfied	-	-	-	-
SN: Satisfied	0.82** (0.334)	2.271	0.757*** (0.278)	2.133
SN: Neutral	1.214*** (0.387)	3.368	1.21*** (0.333)	3.353
SN: Unsatisfied	1.613*** (0.428)	5.02	1.669*** (0.406)	5.309
SN: Very Unsatisfied	0.926 (0.768)	2.525	2.074*** (0.504)	7.956
Constant	5.038 (4.049)	154.219	-3.27 (3.181)	0.038
Observations	649		769	
Model Chi-square	83.630		91.540	
Pseudo R-squared	0.189		0.172	
-2Loglikelihood	580.052		723.426	
Degrees of freedom	32		32	

Note: Standard errors in parentheses with *** , **, * indicating significant at 1%, 5% and 10%, respectively. All model Chi-squares are significant at 1%, respectively.