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Housing Preferences of an Ageing Population

Investigation in the Diversity Among Dutch Older Adults

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Housing preferences of an ageing population: Investigation in the diversity among Dutch older adults

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Abstract

Mobility on the housing market strongly declines with age. In contrast to younger age groups, older adults show a tendency to 'stay put'. There is little evidence whether this immobility of older adults is due to choice or to constraint. This study makes an empirical analysis of the underlying preferences for housing of Dutch older adults by reporting the stated preferences of Dutch older adults for bundles of housing characteristics. It offers insight in the relative importance of various aspects of housing and explores whether these preferences are stable for different age groups. The study found a strong preference for the current dwelling (i.e. staying put), especially for the older age groups. Running separate models for different age groups results in an improvement of the log likelihood, indicating the presence of heterogeneity among Dutch older adults. The heterogeneity among older adults is further analysed by differentiating older adults on their attitudes and personality traits. This results in the identification of five groups of older adults who have (more or less) the same view, motivations and attitude with respect to housing. Between these five groups the heterogeneity in housing characteristics is apparent.

Keywords: elderly, housing, stated preferences, conjoint analysis, latent class analysis

Introduction

In the year 2012, 16 % of the Dutch population is aged 65 years and older. By the year 2040 this figure will rise to approximately 26 % (CBS, 2012). The change in the number and the proportion of older adults in our society will have numerous implications (Kim, 2011). The increase of older adults will place a burden on existing income systems, health care systems, social services and retirement programs. Older adults are also likely to demand a wide array of new services to meet their unique and diverse needs (Choi and Dinse, 1998). The changing age composition will affect the spatial mobility of populations (Plane and Rogerson, 1991), therefore reshaping the physical environment as we know it (Kim, 2011).

Spatial mobility varies considerately depending on age (Kramer and Pfaffenbach, 2009). From previous studies it is known that older adults do not change residence to a large extent, especially compared to younger age groups (Geist and McManus, 2008; Tatsiramos, 2006 and Walters, 2000).

Rather, they have a tendency to 'stay put' where they have lived for a long time (Andersson and Abramsson, 2011; Feinstein, 1996). Previous studies also demonstrate that this tendency to stay put increases with age (Andersson and Abramsson, 2011; Costa-Font et al., 2009; Robison and Moen, 2000).

The low mobility of older adults has led to two hypotheses (Reschovsky, 1990). The first is that older adults remain near equilibrium and find little reason to move (Lawton, 1986; Rabushka and Jacobs, 1980). Evidence in support of this hypothesis comes from survey results indicating that levels of residential satisfaction are higher for older adults than for younger age groups (see among others: Van Iersel et al., 2010). The second hypothesis is that older households face larger obstacles to moving that force them to remain in inappropriate dwellings (Reschovsky, 1990). Support for this hypothesis is largely anecdotal, although there is some empirical evidence that older adults are substantially less likely to fulfill stated intentions to move than younger age groups (see among others: De Groot et al., 2011; Duncan and Newman, 1976; Ferraro,1981).

In this study, the immobility of (Dutch) older adults is examined by analyzing the stated preferences of Dutch older adults for bundles of housing characteristics. This provides us with more insight if the tendency of Dutch older people to 'stay put' is caused by choice (i.e. hypothesis 1) or by constraint (i.e. hypothesis 2). In addition, this study intends to improve the estimation of housing preferences by offering insight in the relative importance older adults give to various housing attributes and by differentiating older adults on their age as well as on their attitudes and personality traits.

Empirical and theoretical background

The study of housing preferences and housing choice has been, and still is, attracting the interest of researchers from a variety of disciplines such as environmental psychology, geography, urban planning, urban sociology and regional economics (Timmermans et al., 1992). As a result, housing preferences have been studied from different theoretical perspectives and with a great variety of methodological approaches (Coolen and Hoekstra, 2001).

Even though there is a large variety in methodology, the studies for housing preferences have many commonalities. According to Timmermans et al., (1994) all studies assume that houses can be described and qualified in terms of a set of attribute levels. Furthermore, they assume that individuals or households obtain some utility from each of these attribute levels. At last, they assume that individuals or households combine their part-worth utility according to some rule to arrive at an overall preference or choice. Nevertheless, many differences appear in the specification of these rules (i.e. the assumptions made about the underlying decision-making process) (Timmermans et al., 1994). Differences in data collection procedures also exist, especially in the choice between stated and revealed preferences.

Revealed preferences are based on observed choices in real markets. Deriving the utility function from such observational data is based on the assumption that in the act of choice individuals or households reveal their preferences. Hence, observational choice data are interpreted in terms of utility-maximizing behaviour and a utility function is derived from such data (Timmersmans et al., 1994). Observed choices will always reflect the influence of market conditions and availability. The

model used by a researcher to interpret these data does not always include all factors that are relevant in reality and may therefore be biased. According to Timmermans et al. (1994) is it therefore difficult, if not impossible, to interpret observed choices in terms of utilities and preferences.

Stated preferences are based on individuals' and households' expressed preferences and choices in an environment that can to some extend be controlled by the researcher. In some situations stated choice information is therefore more informative than observed choices. In this study the main concern is with measuring the stated housing preferences of older adults. By measuring stated preferences based on their expressed preferences, this study aims to expose whether the revealed preference of older adults (i.e. 'stay put') is caused by choice or by constraint (compare Timmermans et al., 1994).

Stated preferences have been studied extensively (see among others Louviere et al., 2000). Numerous factors have been suggested in the literature as influencing individuals housing choice. These range from macro-level factors such as housing market, housing system, economic situation, to micro level factors such as age, household composition, income and current housing situation (Clark and Dieleman, 1996). Even though much work has been done on housing preferences, few researchers gave attention to the deeper motivations of individuals behind the housing choice, such as goals, attitudes and values. When motivation is taken into account, the most looked at motivational factor is the reason to move (Coolen and Hoekstra, 2001). This gap in the literature indicates that much more research needs to be done on the influence of micro-level motivational factors such as values on housing preferences (Coolen and Hoekstra, 2001).

Values play an important part in explaining the behaviour of people in general (Rokeach, 1973) and their choice behaviour in particular (Bettman, 1979). Explaining the effect of attitudes and personality traits on the behaviour of people has a long and distinguished history in personality psychology (Ajzen, 2005). This is a branch of psychology that studies personality and individual differences. "Personality" can be defined as a dynamic and organized set of characteristics possessed by a person that uniquely influences his or her cognitions, motivations and behaviours in various situations (Ryckman, 2004). In research, personality psychology has been applied to explore the power of personality traits both as predictors and as causes of academic and economic success, health, and criminal activity (see for example Almlund et al., 2011). As stated in the introduction, this study intends to improve the estimation of housing preferences by differentiating older adults on their age as well as on their attitudes and personality traits.

Design of the stated preferences experiment

In this paper the stated housing preferences of older adults is analysed based on a carefully constructed questionnaire, which is designed as conjoint choice experiment. It involves confronting the respondents with a choice between several alternatives. In the present context, an alternative is a bundle of housing characteristics. A general characteristic is called an attribute and specific value of the characteristic is called an attribute level. An example of an attribute is the type of dwelling, with a possible attribute level being an apartment. In conjoint choice experiments, respondents indicate their preference by choosing the most preferred alternative or by rank ordering the alternatives from

the most preferred to least preferred. The choices made reflect the preferences for certain characteristics of dwellings.

All respondents in our sample made a sequence of such choices. In our experiment, each choice refers to three alternative combinations of housing characteristics, one among them being the respondent's current dwelling. The respondents were asked to indicate the first and the second most preferred alternative, thereby revealing their complete preference orderings of the three.

Selection of attributes:

The attributes used in the conjoint choice experiment were selected on the basis of two criteria: importance and policy relevance. To avoid complicating the task of the respondents too much, the number of attributes that may describe an alternative should not be too large. Therefore, the task for the respondents was simplified by taking their current dwelling as the starting point. All characteristics of their current housing situation remained equal to their current values in the hypothetical alternatives, except five attributes on which the specific choice focused. Therefore, by definition, the remaining (unspecified) attributes were the same for all three alternatives.

Since we were interested in more than five attributes, the conjoint choice experiment was subdivided into four games. In each game, the levels of at most five attributes were varied. The monthly cost of housing and the size of the dwelling (i.e. the amount of bedrooms) were an attribute in each game, because these two dwelling characteristics are assumed to be key aspects in explaining the trade-off older adults make. The resulting overlap in the attributes of the different games makes it possible to estimate a model for all sequential choices jointly.

The complete list of attributes used in the four games is:

Housing game 1: Monthly cost of housing, number of rooms, type of dwelling, ownership, and having a say in the finishing of the dwelling.

Housing game 2: Monthly cost of housing, number of rooms, the location of the neighbourhood, the ownership of dwellings in the neighbourhood, and the type of inhabitants living in the neighbourhood.

Housing game 3: Monthly cost of housing, number of rooms, accessibility of the residential location by public transport, the distance to daily supplies, and the distance to care facilities.

Housing game 4: Monthly cost of housing, number of rooms, access to the dwelling, access within the dwelling, and the presence of home automation (i.e. domotics) in the dwelling.

Realism of the alternatives:

The alternatives presented to the respondents had to be as clear and as real as possible. Consequently, the alternatives presented should be relatively close to the current situation of the respondents. It cannot be expected that someone who currently lives in a small rental apartment can make a serious and reliable choice between buying a detached dwelling of 400.000 euro and buying a semi-detached dwelling of 120.000 euro. Therefore, some of the attribute levels were chosen on the basis of the current situation of the respondent (following Fowkes and Wardman, 1988). In this way

we ensure that the monthly housing costs of the alternatives were not too far from the respondent's current situation. The same holds for the type of dwelling and the number of rooms.

Experimental design:

In each game, eight alternatives were defined. As indicated above, the specific attribute levels of these eight alternatives could be different for different respondents, depending on their current housing situation. The eight alternatives were chosen such that there was sufficient variation in their attribute levels and there were no obvious attractive and unattractive alternatives, in order to avoid trivial uninformative choices. Because the alternatives depended on the current situation of the respondent, they had to be generated by computer, based on answers given prior in the questionnaire. This implied that the alternatives could not be presented on physical cards, but had to be presented on a computer screen. To extract as much information as possible from the eight alternatives, a sorting task, in which the subjects rank-order the eight alternatives from most preferred to least preferred, would be ideal. With the alternatives presented on a computer screen this was impossible. That is, the necessity to browse through several computer screens in order to compare the various alternatives was expected to give unreliable information. Therefore, the respondents were asked to compare only two alternatives at a time, with the current situation of the subject as a third alternative. The respondents were then asked for their first and second choice.

On the basis of earlier experiences with conjoint choice experiments, it was expected that the subjects could be asked to do twenty-four such comparisons without increasing the cognitive burden too much (see among others Louviere et al., 2000; Hensher et al., 2005). Although the number of comparisons may seem large, nevertheless, its consequence is that only a small fraction of all possible combinations of alternatives could be presented to the respondents. Therefore, the respondents were also randomly assigned to one of six groups. Each group evaluated different combinations of alternatives. The combinations that were presented in each group were selected such that in each pair of alternatives, neither alternative (approximately) dominated the other, but they were also not too similar.

Design of personality psychology questionnaire

In order to include the influence of values on housing preferences, the conjoint choice experiment is extended with the Brand Strategy Research (BSR) questionnaire (Brethouwer et al., 1995; Oppenhuisen, 2000). The BSR questionnaire is based on the personality psychology theory (Callebaut et al., 1999) and provides a framework for understanding customers at the 'deepest' level. This motivational level gives knowledge of consumer's fears, beliefs and values, thus providing an understanding of the fundamental motivations that drive (future) choice behaviour of individuals.

BSR questionnaire:

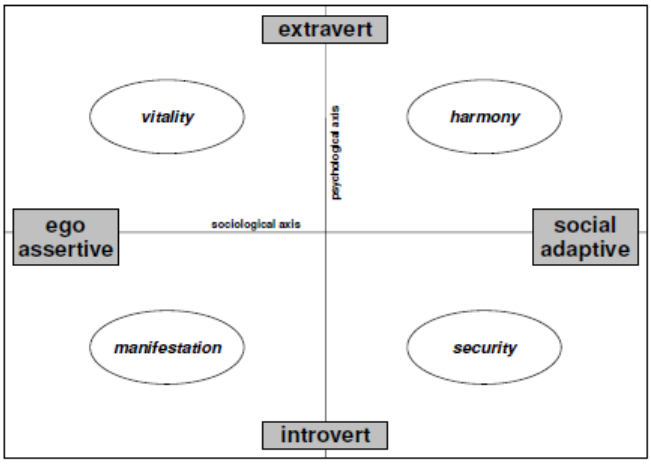
The whole BSR questionnaire consists of five questions, each containing multiple psychographic items (see Appendix I). The first question contains items that describe a person's character. The second question tells something about a person's type of household. The third gives a person's occupations, the fourth question tells something about a person's hobbies and interests and the last question tells which values a person can have in life. For each question, a respondent has to pick the

items which describe him or her, the best. Because each question contains a broad range of items it is unlikely that a respondent cannot pick an item from the item list. In total there are 148 psychographic items to choose from. The respondents are consequently clustered according to these psychographic items. The different clusters are described on the basis of the BSR framework.

BSR framework

The BSR framework consists of a strategic map in which all 148 psychographic items are presented. Two axes divide the map. The first (horizontal) axis is called the 'sociological' axis and indicates how a person relates to their social environment: the right side indicates involvement (belonging); the left side indicates independent (affirmation). The second (vertical) axis is called the 'psychological' axis and indicates how a person handles with 'tensions': the top side indicates an expression of 'tensions' (extravert) and the bottom side indicates a suppression or ignorance of 'tensions' (introvert). The result is a four-quadrant strategic map as shown in Figure 1.

Figure 1. BSR Strategic map



The idea behind BSR is that the four quadrants in the strategic map represent four main motivational clusters. Each of these clusters demonstrates unique needs, motivations and products or services and communication requirements. In a researched domain it is also possible that mixtures of these four main clusters are found. The four main motivational clusters are:

Cluster 1. In the upper left quadrant a cluster that is described with the word 'vitality'. Persons from this cluster are self-conscious, self-confident in their attitude towards (choices in) life and energetic, vital and passionate in their behaviour.

Cluster 2. In the lower left quadrant a cluster that is described with the word 'manifestation'. Persons from this cluster are career oriented and aspire to have a certain (high) status in life in connection with certain status symbols and conspicuous consumption.

Cluster 3. In the upper right quadrant a cluster that is described with the word 'harmony'. Persons from this cluster strive for harmony in every aspect of life and harmonious relations with all people they meet in daily life.

Cluster 4. In the lower right quadrant a cluster that is described with the word 'security'. Persons from this cluster are mainly oriented on their peer group and the rules and values of this group.

Data collection

The data were collected in the summer of 2011 in cooperation with a housing association in Groningen, the Netherlands. The respondents were drawn initially from the directory of the housing association. Since this sample consisted solely out of tenants, the sample was extended with owner-occupiers. The total sample consisted of 6684 respondents, which are aged 55 years or older[1], all living in the municipality of Groningen.

The respondents were invited to participate in the research by letter. In the letter the respondents could find a URL to the online questionnaire and a personal code. The personal code connected each of the respondents to one of the six groups as mentioned in the design of stated preferences experiment.

In total 1010 respondents participated in the research (response rate of 15%). Ultimately 952 of the 1010 data records (i.e. respondents) were suitable for analyses. Table 1 gives some information about the sample of respondents.

Table 1. Descriptive statistics individual characteristics

Variable	Categories	Mean sample	Mean Groningen*	Mean the Netherlands*
Age				
	55-64	65,50%	43,70%	44,70%
	65-74	24,00%	27,70%	31,90%
	75+	9,50%	28,60%	23,40%
Gender				
	Male	54,00%	36,90%	42,80%
	Female	46,00%	63,10%	57,20%
Education				
	Low	32,80%	53,40%	53,60%
	Middle	23,80%	20,90%	23,00%
	High	42,80%	25,70%	23,20%
Children living at home		8,90%	5,80%	9,30%
N		952	206	29129

* HRN 2009 survey

In order to compare our sample data to existing databases, we included the last two columns which are based on data of the Housing Research Netherlands (HRN) 2009 survey. The HRN survey is a large cross sectional survey in which information is gathered about the housing situation of people living in the Netherlands. The HRN dataset is representative of the Dutch population aged 18 years and older, who are not living in an institution. The dataset of 2009 includes 78,071 observations, of which 29,129 persons are aged 55 years or older.

[1]In general, a lower limit of 55 years of age is accepted when defining the “mature market” (Shoemaker, 2000).

Compared to the HRN dataset, the pre-elderly (i.e. 55-64 year olds) and higher educated older adults are overrepresented. The interactive character of the questionnaire implied that the questionnaire was highly individual and could not be presented on paper. As a consequence older and lower educated respondents are underrepresented in our dataset. In the analysis we correct for a potential education effect and run separate models for the different age groups.

Discrete choice model

In the housing games the respondents indicated a sequence of preference orderings, each of them referring to three alternatives. The small number of alternatives suggests the use of a discrete choice model as a suitable tool for analysis. Among such models the conditional logit model is the easiest to handle because of its closed form expression for the choice probabilities. The logit model is the standard model for the analysis of the type of data at hand (see e.g. Ortúzar and Willumsen, 1994).

Model specifications:

The standard logit model has choice probabilities p_i that can be written in closed form

$$p_i = \frac{e^{v_i}}{\sum_{j=1}^{I} e^{v_j}}$$

Where p_i denotes the probability that alternative *I* is ranked among the first among *I* alternatives (see for example Ben-Akiva and Lerman, 1985 for an elaborate discussion of the model) and v_i is the deterministic part of the utility that the consumer attaches to alternative *i*. It is conventional to assume that v_i is a linear function of a vector of explanatory variables **x**, that is, $v_i = \beta \mathbf{x}_i$, with β a vector of the parameters. Total utility u_i is the sum of the deterministic part v_i and a random variable ε_i.

The probability that alternative *i'* is ranked second in the preference ordering of an individual, given that alternative *i* is ranked first can be written as

$$p_{i\prime|i} = \frac{e^{v_i\prime}}{\sum_{j \neq i} e^{v_j}}$$

Where $p_{i'|i}$ denotes the probability that *i'* is ranked second among the *I* alternatives, given that *i* is ranked first. Clearly $p_{i'|i}$ is identical to the probability that *i'* is ranked highest among the *I*-1 alternatives that remain if the most preferred alternative *i* is deleted from the choice set.[2]

Now consider the choices made by an arbitrary respondent *j, j*=1, …, *J* in our sample. This respondent has repeatedly indicated his or her first and second choice among groups of three alternatives. The model explains these choices as well as possible by finding the optimal values of the regression coefficients β. Hence, the dependent variables are the observed choices and the parameters are the elements of β. These will be estimated by maximum likelihood.

[2] See Beggs, Cardell, and Hausman (1980) for discussion.

Let the choice set offered to individual *j* be denoted as A_{jk}, *k*=1, …, *K,* with *K* = 24 being the total number of choice sets from which the respondent had to choose. Let A_{jk} = {*a,b,c*} and suppose that alternative *c* was ranked first, alternative *b* second and (hence) alternative *a* third. Given the logit assumptions made above, the probability that the respondent indicates this ranking equals

$$P_{jk} = \frac{e^{v_c}}{e^{v_a} + e^{v_b} + e^{v_c}} \frac{e^{v_b}}{e^{v_a} + e^{v_b}}$$

Thus P_{jk} is the probability that alternative *c* is ranked first among the three alternative {*a*,*b*,*c*}, multiplied by the probability that *b* is ranked first among the remaining alternatives {*a*,*b*}. The probability of the ranking indicated by the respondent can be written in this way for each choice set A_{jk}. The probability that respondent *j* would make the particular sequence of rankings he or she indicated will be denoted as P_j and is the product of the probabilities P_{jk} over all *k*

$$P_j = \prod_{k=1}^{K} P_{jk}$$

This formulation reflects our assumption that a single preference ordering over all relevant attributes of the possible housing combinations governs the choices of our respondents. Each choice made by them adds to our information about the preference ordering and all information is used to estimate the parameters of the utility function representing that ordering simultaneously. The likelihood of the sequences of rankings indicated by all respondents is the product of all P_js over *j* and from this expression the log likelihood can be easily derived by taking logarithms.

The maximum likelihood estimators are then obtained by maximizing log *L* over the parameters.

$$L = \prod_{j=1}^{J} P_j$$

Explanatory variables:

Many of the explanatory variables that we use are simply attributes that differ among the alternatives that occur in the choice set of the respondents. They are listed in table 2. These variables are grouped into variables referring to housing characteristics and variables referring to the neighbourhood (i.e. living environment) characteristics. In the fourth column of the table the expected sign for the coefficient referring to a variable is indicated.

Table 2. Descriptive statistics housing attributes

Variable	Type/ Categories	Minimum	Maximum	Mean	Standard devation	Expected sign of coefficient
General						
Net monthly income	Continous	737,00	87371,00	2487,55	3922,050	
Housing costs	Continous	102,00	2700,00	706,31	317,341	
Disposable income	Continous	67,00	86832,00	1781,24	3879,718	+
Dwelling						
Current dwelling	Dummy					+
Number of rooms	Continous	1	7	2,78	1,030	-
Finishing	Dummy					+
Domotics	Dummy					+
Type						
	Detached			6,17%		+
	Non-detached, with garden			41,27%		-
	Non-detached, no garden			3,76%		+
	Apartment			48,80%		Reference case
Tenure						
	Rental dwelling			51,62%		-
	Owner occupied			48,38%		Reference case
Internal access						
	Multiple floors			47,96%		-
	One floor			52,04%		Reference case
External entrance						
	Elevator			28,84%		-
	Staircase			22,99%		-
	No staircase or elevator needed			48,17%		Reference case
Neighbourhood						
Ownership of dwellings						
	Mixture of owner occupied and and rental dwellings			54,13%		-
	Mainly rental dwellings			13,48%		-
	Mainly owner-occupied			32,39%		Reference case
Inhabitants						
	Mixture of single households, families and older adults			73,25%		-
	Mainly older adults			8,88%		-
	Mainly families			17,87%		Reference case
Location						
	Edge of the city			52,56%		-
	Around inner city			34,27%		+
	Inner city			13,17%		Reference case
Distance to daily supplies						
	Walking distance			68,97%		+
	Cycling distance			27,06%		+
	By car			3,97%		Reference case
Distance to care facilities						
	Walking distance			47,65%		+
	Cycling distance			43,89%		+
	By car			8,46%		Reference case
Access by public transport						
	Good			93,00%		+
	Bad			7,00%		Reference case

Disposable income is defined as the net monthly income[3] of the respondents minus the cost of housing. Therefore, disposable income is equal to the amount of money that remains after the cost of the particular housing combination to which the alternative refers have been taken into account. This method of treating the monetary aspects of the choice alternatives is suggested by economic theory, which interprets the utility *u* as a conditional indirect utility function. In other words: the maximum utility that can be attained when the attributes of the alternatives concerned are taken into account. The maximum utility depends on the amount of money that can be spent (or saved) on consumption goods other than housing and this is what we have termed disposable income. Respondents have indicated their net monthly income, and if they are renters the monthly rent, or if they are owner-occupiers the monthly payments for interest and redemption.

Current dwelling. This dummy variable used as in indicator for the preference of older adults to 'stay put'. The variable has a value of 1 if the current dwelling was ranked first among the three alternatives. Since studies have shown that older residents have a strong will to stay and age in place (Costa-Font et al., 2009; Robinson and Moen, 2000), the expected sign for this coefficient is positive.

Number of rooms[4] is used as an indicator for the size of the dwelling. We expect that older adults in general prefer a smaller dwelling. From previous studies it is known that certain life events or circumstances may lead older adults to consider relocation (Gonyea, 2006). These life events or circumstances include the entering of the empty nest stage, worsening of health, the death of a spouse/ partner, but also the desire for more comfort (i.e. less maintenance).

Finishing. This dummy variable is used as indicator for the level of finishing. In the questionnaire 'finishing' was defined as having a say in the finishing of the kitchen and bathroom. Alternatives in which respondents were given a say in the finishing of the kitchen and bathroom were always more expensive (i.e. higher cost of housing) than alternatives in which respondent did not have a say in the finishing. The expected sign for this coefficient is positive.

Domotics This dummy variable is used as indicator for the presence of home automation. In the questionnaire 'domotics' is defined as the presence of home automation designed to increase the comfort and safety of the dwelling. Alternatives in which domotics were present in the dwelling were always more expensive (i.e. higher cost of housing) than alternatives in which domotics were absent in the dwelling. The expected sign for this coefficient is positive.

Type. In general most Dutch adults live in a non-detached dwelling (e.g. a terraced single family home) However, starting from the age of 65, the apartment becomes the dominant form of housing (CBS, 2012). For most respondents in our sample the non-detached dwelling without garden is probably preferred. The non-detached dwelling with garden is expected to be less attractive than the other types of dwellings, because of maintenance issues. The detached dwelling is attractive to most adults. This might possibly become less attractive as adults grow older, due to maintenance issues.

[3] Respondents were asked to report their net monthly income. If they were unable and/or unwilling to report their net monthly income, they could indicate which income class they belonged to. In case the exact net monthly income is not reported, we use class averages to determine the disposable income in the analysis. The class average is determined based on the lognormal distribution of the net monthly income.

[4] The logarithm of this variable is used in the analysis.

Tenure. In the Netherlands it is quite common to own your dwelling. Only young adults aged 35 or less and older adults aged 75 years and older are predominantly tenants (CBS, 2012). Due to the way our sample was chosen, nearly 52% of the respondents in our sample live in a rental accommodation. Despite the dominance of tenants in our sample, we expect that most respondents prefer to be owner-occupiers.

Internal access is based on the location of the living room, the kitchen, the toilet, the bathroom and at least one bedroom. These spaces are either located on the same floor or are located on multiple floors. We expect that the respondents dislike having to climb stairs to access these spaces, and prefer the convenience of having these types of spaces located on the same floor (see for example Van Iersel et al., 2010)

External entrance is based on the mode of access of the dwelling. A dwelling can be located on street level. In this case there is no need to use an elevator and/or staircase. For most respondents this probably preferred to having to climb stairs or to using an elevator before being able to enter the home (Van Iersel et al., 2010).

Ownership of dwellings in the neighbourhood is used as indicator for the type of living environment the respondents want like to reside in. The respondents can choose between a neighbourhood with predominantly owner-occupied dwellings, a neighbourhood with predominantly rental dwellings and a neighbourhood with a mixture of both types. Since owner-occupiers are considered to be more involved in the safety and maintenance of their residential area, we expect that the respondents prefer living in a neighbourhood with predominantly owner-occupied houses (Parkes et al., 2002). No strong expectation exists with respect to neighbourhoods with a mixture of owner-occupied and rental dwellings. This type is possibly less preferred to neighbourhoods with predominantly owner-occupied dwellings.

Inhabitants of the neighbourhood. This variable is used as second indicator for the preferred type of living environment. Previous studies have shown that Dutch older adults do not necessarily want to live with other only older adults (see for example Van Iersel et al., 2010). Neighbourhoods inhabited mainly by families are probably preferred to neighbourhoods with a mixture of single households, families and older adults.

Location of neighbourhood indicates the degree of urbanization. We distinguished three categories: the inner city area, the areas directly surrounding the inner city and the areas located on the edge of the city. The inner city area is considered unattractive to respondents with children (living at home), but possibly attractive to other household types. The areas directly surrounding the inner city are probably preferred to the inner city for most household types in our sample. The areas located in the edge of the city are possibly less preferred than the other two types, but no strong expectation expects with respect to the sign of this variable.

Distance to daily supplies/care facilities. From previous studies is known that a desire for amenities and comfort are important motivations for the residential moving behaviour (i.e. the housing choice) of older adults (Litwak and Longino, 1987). We therefore expect that the respondents in our sample prefer to have their daily supplies and care facilities nearby; that is within walking or cycling distance of their homes (see for example Kim et al., 2003).

Access by public transport. Most respondents probably prefer to have public transport facilities located near their home. The expected sign is therefore positive.

Apart from the housing variables listed in table 2, we consider some individual characteristics into the model, because we expect that people with different characteristics also give different weights to various attributes of choice alternatives. It is possible to take into account this influence of individual characteristics by means of additional variables *x* in the utility function that are products of individual characteristics and attributes of the alternatives (i.e. interaction effects).

Education level. Higher educated older adults are overrepresented in our sample and could potentially show a different preference pattern than lower educated older adults. Therefore, this interaction effect is included to correct for education effects. In addition, it is been suggested that the level of education is closely related to an individual's health status. Higher educational levels are found to be related with better health (SCP, 2011). Since, respondents were not asked about their health status, this variable might also act as a proxy for health.

Children living at home. This interaction effect is included, because it is conceivable that households with children living at home have other preferences with respect to their residential location than household without children (living at home).

Results discrete choice model

The estimation results for the logit models based on the whole sample are listed in table 3. Model I has attributes of the alternatives as the only determinants of the utility function. Model II also incorporates the effects of some individual characteristics. A log likelihood ratio test reveals that adding individual characteristics (i.e. interaction effects) results in a statistically significant improvement of the fit of the model (see Appendix II).

The estimated coefficient of the variable disposable income is, as expected, highly significant. With this estimate we can compute the estimated willingness-to-pay for a particular housing attribute. The willingness to pay is the amount of money by which the disposable income can be reduced after the including a particular housing attribute while keeping the consumer at the same utility level. The willingness to pay is the ratio of the coefficients of the particular housing attribute and disposable income. For example, for model I the willingness to pay for an extra room equals (0.081/0.325)= 0.2492 implying that an addition of the number of rooms by one room would be worth 25 euro per month. The willingness to pay for the presence of domotics, on the other hand, equals (-0,124/0.325) =- 0.3815 implying that the absence of home automation designed to increase the comfort and safety of the dwelling would be worth 38 euro per month.

The respondents show a very strong preference for the current dwelling. The estimated coefficient for this variable is positive and highly significant. This strong will to stay put, is further illustrated by the fact that among the three presented alternatives, the current dwelling is chosen first 75% of the time by the respondents. In other words: when given a choice (albeit a hypothetical one), the majority of older adults would still choose their current dwelling as the most favourable housing option.

Table 3. Estimation results discrete choice model

	Whole sample			
	Model I		Model II	
	B-coeff.	S.E.	B-coeff.	S.E.
Disposable income (x100)	0,325 ***	0,010	0,338 ***	0,010
Current dwelling	1,750 ***	0,021	1,752 ***	0,021
Housing attributes				
Number of rooms	0,081 *	0,042	0,069	0,130
Number of rooms x no children living at home			0,033	0,133
Finishing	0,060 *	0,034	0,104 *	0,057
Finishing x low educational level			-0,322 ***	0,073
Finishing x high educational level			0,191 ***	0,067
Domotics	-0,124 ***	0,034	-0,133 **	0,059
Domotics x low educational level			-0,226 ***	0,075
Domotics x high educational level			0,219 ***	0,069
Non-detached, without garden	-0,917 ***	0,051	-0,948 ***	0,051
Non-detached, with garden	-0,490 ***	0,043	-0,505 ***	0,043
Detached	0,080	0,063	0,070	0,063
Rental dwelling	-0,046	0,031	-0,064 **	0,031
Multiple floors	-0,761 ***	0,029	-0,863 ***	0,059
Multiple floors x low educational level			0,064	0,080
Multiple floors x high educational level			0,194 ***	0,074
Elevator	0,132 ***	0,035	0,394 ***	0,066
Elevator x low educational level			-0,069	0,089
Elevator x high educational level			-0,540 ***	0,082
Staircase	-0,956 ***	0,040	-0,954 ***	0,041
Staircase x low educational level			0,082 **	0,036
Staircase x high educational level			-0,085 **	0,033
Neighbourhood attributes				
Mainly rental dwellings	-0,147 ***	0,049	-0,171 ***	0,049
Mixture of owner-occupied and rental dwellings	0,057	0,045	0,044	0,045
Mixture of single households, families and older adults	0,420 ***	0,041	0,437 ***	0,041
Mainly older adults	0,089 *	0,047	0,113 **	0,047
Around inner city	0,020	0,041	0,018	0,042
Edge of the city	-0,186 ***	0,048	-0,182 ***	0,048
Daily supplies on walking distance	0,790 ***	0,050	0,518 ***	0,095
Walking distance x low educational level			0,211	0,130
Walking distance x high educational level			0,467 ***	0,119
Daily supplies on cycling distance	0,199 ***	0,053	-0,055	0,099
Cycling distance x low educational level			-0,056	0,140
Cycling distance x high educational level			0,621 ***	0,122
Care facilities on walking distance	0,375 ***	0,050	0,124	0,093
Walking distance x low educational level			0,388 ***	0,128
Walking distance x high educational level			0,292 **	0,117
Care facilities on cycling distance	-0,051	0,049	-0,247 ***	0,091
Cycling distance x low educational level			0,093	0,131
Cycling distance x high educational level			0,376 ***	0,112
Good access by public transport	0,997 ***	0,044	0,880 ***	0,082
Good access x low educational level			0,185	0,113
Good access x high educational level			0,159	0,102
Log likelihood	-27705,621		-27552,089	
N	952		952	

Notes: * p<0.10; ** p< 0.05; ***p< 0.01

The number of rooms has a small significant effect on the evaluation of choice alternatives. We already demonstrated that the respondents would be willing to pay 25 euro per month for a dwelling bigger in size. This is contrary to our expectation that older adults would prefer a smaller dwelling when they age. However when this attribute is interacted with the household composition the coefficient is not significant anymore.

Having a say in the finishing of the kitchen and bathroom is a moderately desirable attribute. When this dummy is interacted with the level as education it becomes clear that this attribute is strongly preferred by respondents with a relatively high educational level. Respondents with a relatively low educational level, on the other hand, would rather not have a say in the finishing of the kitchen and bathroom (and in return pay a lower housing cost).

In general, the presence of domotics is not regarded as a desirable housing attribute. When this dummy is interacted with the level as education (as a potential proxy for health) it becomes clear that the presence of domotics is not preferred by respondents with a relatively low educational level and is preferred by respondents with a relatively high educational level. This is an unexpected result, since we expected that respondents with a poorer health would benefit the most from electronics designed to increase comfort and safety in the house. This illustrates that education does not perform as a proxy for health, but performs as a proxy for consumption patterns.

The housing type is an important attribute. Model I shows that apartments (the reference category) are preferred to non-detached houses either with or without a garden. This corresponds with our expectations that older adults express a preference for dwellings that require less maintenance. In model I Tenure does not seem to have an effect on the evaluation of the choice alternatives. However in model II, which also incorporates the effects of some individual characteristics, it does. In accordance to our expectations, home ownership is preferred to renting a home.

The location of the living room, kitchen, bathroom and at least one bedroom on the same floor is preferred to having these located on multiple floors. This is in accordance to our expectations. The estimation results for model II show that the educational level does not affect the significance of this attribute. In addition, model II reveals that higher educated do seem to prefer a house with multiple floors.

The entrance of the dwelling is a significant housing attribute. Model I shows that access by elevator is strongly preferred to a dwelling with an entrance on street level (i.e. the reference case). The latter is preferred to a dwelling in which the respondent has to climb stairs in order to enter his or her dwelling. These results are partly according to expectations. Previous studies have shown that deteriorating competencies can lead to incompatibility between the individual and his or her housing (Pope and Kang, 2010). As a preventative measure, older adults might be more prone relocate to an environment that better fits their physical abilities, such as an apartment with no stairs. This might explain the overall preference for a dwelling which is accessible by an elevator, which can be found in an apartment building. It does, however, not explain why access by elevator is preferred to a dwelling with an entrance on street level. The results of model II demonstrate that higher educated do have strong preference for a dwelling which is accessible on street level. Knowing they also show a preference for a house with multiple floors, this result could potentially illustrate the desire for a single family home.

With respect to the neighbourhood we find that a neighbourhood with a mixture of single households, families and elderly is most preferred and a neighbourhood with predominantly families (the reference case) is least preferred. Contrary to previous studies we find that older adults do want to live with other older adults. As expected, older adults show a preference for neighbourhoods with predominantly owner-occupied dwellings. For the location of the neighbourhood we find that neighbourhoods located at the edge of the city are least preferred. We expected older adults to prefer to have their daily supplies and care facilities nearby; that is within walking or cycling distance of their homes. The estimation results of both model I and II confirm this expectation. Model II also demonstrates that this is particularly true for higher educated older adults. Public transport is, as expected, regarded as an attractive attribute.

Results discrete choice model by age

To correct for the overrepresentation of young older adults in our sample, we ran separate models for the "pre-elderly" (55-64 years), the "young-elderly" (65-74 years) and the "old-elderly" (75 years and older). In doing so, it was also possible to shed some light on the possible heterogeneity in preferences by age. The estimation results for the discrete choice models by age are listed in table 4. We will only discuss the preferences that differ from the results of the whole sample and/or differ among the different age groups.

Judging by model V and model VII the numbers of rooms does not seem to have a significant effect on the evaluation of the choice alternatives for older adults aged 65 years and older. Yet, when this attribute is interacted with the household composition (model VIII) it becomes clear that for respondents aged 75 years or older without any children living at home the estimate has the expected negative sign, indicating that they do prefer a smaller dwelling. From the age of 65 domotics does appear to be a desirable housing attribute, especially for the higher educated in these age-groups. For the young-elderly (aged 65-74) both domotics and finishing have a significant effect on the evaluation of the choice alternatives. Their willingness to pay for these 'luxuries' are respectively 40,55 euro and 49,87 euro per month. With regard to the type of dwelling the youngest age group we find a clear hierarchy: non-detached houses with or without a garden are the least preferred, and detached houses are the most preferred type of dwellings. If we look at the oldest age group(s) we find further evidence for older adults' desire for houses that require less maintenance and better fit their physical abilities. Where pre-elderly show a strong preference for owner-occupied dwelling, old-elderly show an even stronger preference for rental dwellings.

With respect to the neighbourhood characteristics, it becomes clear that these play a more important role for the younger age groups than the oldest age group (75+). For the old-elderly, compared to the other age-groups, the characteristics of the dwelling play a more significant role in the evaluation of the choice alternatives. We do, however, find that the desire to live among people of the same age becomes stronger by age. In fact only pre-elderly have a negative coefficient for predominantly living with older adults (although this result is not significant). From the age 65 we find that older adults have preference for their daily supplies and care facilities within walking distance. From this age on cycling is also not considered to be attractive anymore (although not all results suggesting this pattern are significant).

Table 4. Estimation results discrete choice model by age

	Pre- elderly (aged 55-64)				Young-elderly (aged 65-74)				Old-elderly (aged >74)			
	Model III		Model IV		Model V		Model VI		Model VII		Model VIII	
	B-coeff.	S.E.	B-coeff.	S.E.	B-coeff.	S.E.	B-coeff.	S.E.	B-coeff.	S.E.	B-coeff.	S.E.
Disposable income (x100)	0,303 ***	0,011	0,317 ***	0,011	0,397 ***	0,025	0,399 ***	0,026	0,500 ***	0,043	0,507 ***	0,046
Current dwelling	1,574 ***	0,025	1,571 ***	0,025	2,135 ***	0,048	2,140 ***	0,048	2,181 ***	0,085	2,190 ***	0,088
Housing attributes												
Number of rooms	0,151 ***	0,050	-0,084	0,143	0,003	0,093	-0,302	0,428	-0,238	0,159	1,419 *	0,729
Number of rooms x no children living at home			0,282 *	0,146			0,335	0,431			-1,717 **	0,737
Finishing	0,030	0,041	0,065	0,068	0,198 ***	0,072	0,400 ***	0,121	0,037	0,131	-0,492 *	0,252
Finishing x low educational level			-0,401 ***	0,095			-0,370 ***	0,141			0,483 *	0,268
Finishing x high educational level			0,180 **	0,079			-0,100	0,144			1,268 ***	0,309
Domotics	-0,238 ***	0,041	-0,258 ***	0,070	0,161 **	0,072	0,085	0,123	0,345 ***	0,131	0,383	0,248
Domotics x low educational level			-0,283 ***	0,096			-0,115	0,145			-0,239	0,270
Domotics x high educational level			0,178 **	0,081			0,350 **	0,149			0,554 *	0,311
Non-detached, without garden	-0,835 ***	0,063	-0,868 ***	0,063	-0,866 ***	0,106	-0,881 ***	0,107	-1,197 ***	0,190	-1,248 ***	0,192
Non-detached, with garden	-0,244 ***	0,054	-0,258 ***	0,054	-0,655 ***	0,087	-0,662 ***	0,088	-1,476 ***	0,152	-1,522 ***	0,157
Detached	0,284 ***	0,075	0,272 ***	0,075	-0,022	0,140	-0,019	0,141	-0,879 ***	0,278	-0,907 ***	0,288
Rental dwelling	-0,147 ***	0,036	-0,164 ***	0,036	0,104	0,071	0,098	0,072	0,561 ***	0,123	0,536 ***	0,123
Multiple floors	-0,647 ***	0,035	-0,816 ***	0,071	-0,910 ***	0,062	-0,927 ***	0,123	-1,165 ***	0,116	-1,013 ***	0,253
Multiple floors x low educational level			0,239 **	0,101			0,079	0,159			-0,300	0,298
Multiple floors x high educational level			0,289 ***	0,086			-0,124	0,162			-0,073	0,359
Elevator	-0,016	0,043	0,307 ***	0,078	0,351 ***	0,077	0,610 ***	0,142	0,520 ***	0,127	0,337	0,288
Elevator x low educational level			-0,062	0,114			-0,150	0,185			0,248	0,322
Elevator x high educational level			-0,490 ***	0,096			-0,664 ***	0,184			-0,057	0,374
Staircase	-1,002 ***	0,048	-0,987 ***	0,049	-0,826 ***	0,088	-0,845 ***	0,089	-0,823 ***	0,157	-0,865 ***	0,160
Staircase x low educational level			-0,089	0,055			0,227 ***	0,061			0,072	0,093
Staircase x high educational level			-0,165 ***	0,039			-0,041	0,075			0,113	0,131
Neighbourhood attributes												
Mainly rental dwellings	-0,183 ***	0,059	-0,212 ***	0,059	-0,155	0,103	-0,166	0,103	-0,077	0,185	-0,130	0,187
Mixture of owner-occupied and rental dwellings	0,012	0,054	0,001	0,055	0,007	0,098	-0,009	0,098	0,051	0,160	0,023	0,162
Mixture of single households, families and older adults	0,361 ***	0,050	0,380 ***	0,050	0,502 ***	0,092	0,508 ***	0,092	0,467 ***	0,148	0,478 ***	0,150
Mainly older adults	-0,044	0,057	-0,013	0,057	0,308 ***	0,101	0,320 ***	0,102	0,454 ***	0,171	0,491 ***	0,174
Around inner city	0,054	0,051	0,055	0,051	-0,129	0,086	-0,131	0,086	0,123	0,147	0,107	0,148
Edge of the city	-0,240 ***	0,061	-0,234 ***	0,061	-0,276 ***	0,096	-0,280 ***	0,096	0,215	0,150	0,199	0,152
Daily supplies on walking distance	0,873 ***	0,059	0,696 ***	0,111	0,665 ***	0,121	0,379	0,232	0,520 ***	0,199	0,129	0,472
Walking distance x low educational level			0,030	0,160			0,308	0,296			0,228	0,521
Walking distance x high educational level			0,338 **	0,136			0,499	0,304			2,120 **	0,992
Daily supplies on cycling distance	0,363 ***	0,062	0,203 *	0,117	-0,147	0,124	-0,681 ***	0,225	-0,180	0,253	-0,009	0,533
Cycling distance x low educational level			-0,307 *	0,175			0,700 **	0,300			-0,466	0,616
Cycling distance x high educational level			0,473 ***	0,142			0,816 ***	0,304			1,467	1,011
Care facilities on walking distance	0,430 ***	0,059	0,190 *	0,107	0,326 ***	0,120	0,256	0,226	0,104	0,197	-0,156	0,503
Walking distance x low educational level			0,376 **	0,162			0,171	0,285			0,223	0,541
Walking distance x high educational level			0,284 **	0,133			0,076	0,306			1,278	0,932
Care facilities on cycling distance	0,064	0,057	-0,103	0,107	-0,305 ***	0,116	-0,485 **	0,202	-0,226	0,234	-0,278	0,531
Cycling distance x low educational level			-0,022	0,161			0,414	0,280			-0,231	0,602
Cycling distance x high educational level			0,333 **	0,130			0,177	0,280			1,732 *	0,911
Good access by public transport	0,957 ***	0,052	0,914 ***	0,096	1,079 ***	0,107	1,084 ***	0,197	1,325 ***	0,182	0,879 **	0,411
Good access x low educational level			-0,039	0,140			0,166	0,260			0,288	0,453
Good access x high educational level			0,119	0,117			-0,059	0,264			2,451 ***	0,856
Log likelihood	-19037,934		-18930,508		-6040,068		-5991,334		-2117,376		-2085,350	
N	625		625		229		229		89		89	

Notes: * p<0.10; ** p< 0.05; ***p< 0.01

Latent class analysis

In addition to the housing games the respondents are also asked to choose items which describe him or her best from a list of 148 psychographic items. The respondents are consequently clustered according to these psychographic items by conducting a latent class analysis. In recent years latent class analysis (e.g. model based clustering) has become a popular clustering technique, resulting in numerous papers with specific latent class analyses approaches and their applications (see e.g. Fraley and Raftery, 1998; Hoijtink and Notenboom, 2004; Ter Braak et al., 2003; Van Hattum and Hoijtink, 2009; Vermunt and Magidson, 2000; Wedel and Kamakura, 2000,).

An important difference between standard clustering (Hair et al., 1984) and latent class analysis (Banfield and Raftery, 1993; Bensmail et al., 1997; Fraley and Raftery, 1998; Newcomb, 1886; Pearson, 1894; Vermunt and Magidson, 2000) is that in the latter it is assumed that the data are generated by a certain mixture of underlying probability distributions. An advantage of this probabilistic approach is that the cluster criterion (Hair et al., 1984; Wedel and Kamakura, 2000), which is usually difficult to define and calculate for complex models, is not needed. A further advantage of this approach is that uncertainty about a respondent's cluster membership is taken into account.

Model specifications:

Let x_{ij} represent the response of respondent i=1, …, N, to item j=1, …, J, x_{ij} ε{0,1}, where 1 indicates that respondent i picked item j and 0 indicates that respondent i did not pick item j. The N x J matrix X contains the item responses. The J vector x_i is defined as a vector containing the response pattern or item responses of respondent i . The N vector x_j is defined as a vector containing the responses of the respondents to item j.

Each of the J items is characterized by a parameter $\pi_{j|q}$, that is the probability of responding 1 to item j in cluster q. Note that, $\pi=\{\pi_1, ..., \pi_q, ..., \pi_Q\}$ and $\pi_q= \{\pi_{1|q}, ..., \pi_{j|q}, ..., \pi_{J|q}\}$.

Let $\omega=\{\omega_1, ..., \omega_q , ..., \omega_Q\}$ be the Q vector containing the cluster weights, that is, the proportion of persons allocated to each cluster and let $\omega_{q|i}$ denotes the probability that respondent i belongs to latent cluster q. The N vector τ contains the unobserved cluster memberships for each person $\tau=\{\tau_1, ..., \tau_i, ..., \tau_N\}$, where $\tau_1 \varepsilon \{1, ..., Q\}$.

The general form of the data likelihood of the model based cluster model is given by

$$L(X|\pi, \lambda, \omega) = \prod_{i=1}^{N} \sum_{q=1}^{Q} \omega_q \, P(x_i|\tau_i = q).$$

The probability $P(x_i|\tau_i = q)$ is defined as follows

$$P(x_i|\tau_i = q) = \prod_{j=1}^{J} P(x_{ij}|\tau_i = q),$$

with

$$P(x_{ij}|\tau_i = q) = \pi_{j|q}^{x_{ij}}(1 - \pi_{j|q})^{1-x_{ij}}.$$

A commonly used criterion for estimating the parameters cluster specific probabilities (π) and cluster weights (ω) is maximum likelihood (ML)). In order to find the ML estimaters we used the software package for latent class analyses LatentGold[5] by Vermunt and Magidson (2000). LatentGold uses two well-known algorithms: EM (Dempster et al., 1977) and Newton-Raphson (Haberman, 1988) (see Appendix III).

Number of clusters:

The problem of identifying the number of latent clusters is still without a satisfactory statistical solution and one of the main research topics in model based clustering (Wedel and Kamakura, 2000). The most popular method of determining the number of latent clusters is by using the information criteria BIC and CAIC (Wedel and Kamakura, 2000). The researcher pre-specifies a range of cluster solutions. The cluster solution with the lowest value of the information criterion is preferred, because information criteria can be seen as the distance between the current model and the true model.

However, finding the desired number clusters is a trade-off between statistics and marketing. As such, besides looking at the information criteria the cluster solutions are also tested against the six criteria of good segmentation by Wedel and Kamakura (2000). Below, brief descriptions of these six criteria are given:

1. Identifiability: a cluster must be clearly defined. It must be clear who is in the cluster.

2. Substantiality: a cluster must be large enough to ensure the profitability of developing a differentiated marketing strategy.

3. Accessability: a cluster must be reachable through promotional or distributional marketing activities.

4. Responsiveness: a cluster must respond uniquely to marketing activities.

5. Stability: a cluster must be stable in time, at least for a period long enough for identification of the clusters, implementation of a differentiated marketing strategy and to produce profitable results.

6. Actionability: a cluster and the differentiated marketing strategy must be consistent with the goals and core competencies of the company.

[5]In this chapter LatentGold version 4.5 is used

Results latent class analysis

Running the clustering algorithm in LatentGold, and taking into account both the statistical information criteria and the six criteria of good segmentation, it turns out that with the dataset at hand the number of clusters should be Q=6. The row 'ω_q' in table 5 displays the cluster weights for the Q=6 solutions. From the row 'ω_q' it can be seen that Cluster 1 (ω_1=0,240), 2 (ω_2=0,211), 3 (ω_3=0,200), 4 (ω_4=0,172) and 5 (ω_5=0,168) have relatively large cluster weights and are supposed to be substantial. Cluster 6 (ω_6=0,010) has a relatively small cluster weight, representing only 10 respondents from the data set. Due to this small cluster weight this cluster is considered to be an outlier and not substantial. Therefore we focus on the five remaining clusters, which are considered to be profitable according to their cluster weights. Table 5 shows the item probability per cluster for the items from the first question (character traits). These item probabilities $P(x_{ij}=1|\tau_i=q)$, for j=1,...,148) are used in the cluster descriptions, and can be calculated as follows:

$$P(x_{ij} = 1|\tau_i = q) = P(x_{ij} = 1|x_i, \pi_q, \tau_i = q) = \pi_{j|q}$$

Describing the motivational clusters:

Using the item probabilities from table 5 each of the five remaining latent clusters can be described in terms of probabilities. As illustrated in Figure 1, the idea behind the BSR framework is that there are four main motivational clusters, which has been found useful in marketing (Brethouwer et al., 1995). All other clusters are considered to be combinations in terms of description of these four main clusters.

It turns out that Cluster 1, with higher cluster specific probabilities on the items 'Honest' $P(x_{i4}=1|\tau_i=1=0,611)$, 'Neat' $P(x_{i10}=1|\tau_i=1=0,305)$ and 'Helpful' $P(x_{i31}=1|\tau_i=1=0,607)$, is a combination of two main motivational clusters, that are the ones that can be described with the word 'Harmony' and 'Security' in Figure 1. Cluster 2 corresponds with the cluster in the upper right quadrant in the BSR strategic map (see Figure 1). This cluster is described with the word 'Harmony'. Looking at table 5, it can be seen that, for example, the items 'Spontaneous' $(P(x_{i13}=1|\tau_i=2)=0,276)$, 'Cozy' $(P(x_{i24}=1|\tau_i=2)=0,405)$ and 'Helpful' $(P(x_{i31}=1|\tau_i=2)=0,671)$ has higher cluster specific probabilities for Cluster 2, which corresponds with the description of this main motivational cluster in Figure 1. Likewise, the items 'A little bit shy' $(P(x_{i1}=1|\tau_i=3)=0,271)$, 'Ordinary' $(P(x_{i11}=1|\tau_i=3=0,427)$ and 'Down-to-earth' $(P(x_{i32}=1|\tau_i=3=0,427)$ has higher cluster specific probabilities for Cluster 3, which corresponds with the description of the main motivational cluster that can be described with the word 'Security' in Figure 1. The items 'Adventurous' $P(x_{i15}=1|\tau_i=4=0,281)$, 'Energetic' $(P(x_{i17}=1|\tau_i=4)=0,222$) and 'Opinionated' $P(x_{i30}=1|\tau_i=4=0,216)$ has higher cluster specific probabilities for Cluster 4, which corresponds with the description of the main motivational cluster that can be described with the word 'Vitality' in Figure 1. The items 'Critical' $P(x_{i6}=1|\tau_i=5=o,359)$, 'Leader' $P(x_{i91}=1|\tau_i=5=0,413)$ and 'Commercial' $P(x_{i23}=1|\tau_i=5=0,216)$ has higher cluster specific probabilities for Cluster 5, which corresponds with the description of the main motivational cluster that can be described with the word 'Manifestation' in Figure1.

Table 5: Cluster Specific Item Probabilities for the Q=6 Solution. $P1=P(x_{i1}=1|\tau_i=q)$,..., $P35(x_{i30}=1|\tau_i=q)$

q		1	2	3	4	5	6
ω_q		0.240	0.211	0.200	0.172	0.168	0.010
P1	A little bit shy	0.130	0.057	0.271	0.082	0.042	0.200
P2	Easy going	0.096	0.110	0.020	0.058	0.018	0.100
P3	A little bit impatient	0.134	0.138	0.196	0.135	0.186	0.200
P4	Honest	0.611	0.490	0.407	0.421	0.497	0.600
P5	Assertive	0.151	0.067	0.055	0.123	0.162	0.000
P6	Critical	0.238	0.114	0.347	0.450	0.359	0.500
P7	Interested in others	0.569	0.433	0.080	0.561	0.281	0.100
P8	Gentle	0.205	0.181	0.206	0.216	0.024	0.300
P9	Jovial	0.033	0.076	0.015	0.023	0.036	0.000
P10	Neat	0.305	0.262	0.196	0.035	0.108	0.000
P11	Ordinary	0.251	0.381	0.427	0.041	0.138	0.400
P12	Capable	0.029	0.000	0.050	0.135	0.150	0.200
P13	Spontaneous	0.209	0.276	0.035	0.164	0.108	0.200
P14	Strong character	0.138	0.124	0.055	0.216	0.156	0.400
P15	Adventurous	0.004	0.057	0.050	0.281	0.114	0.100
P16	Sympathetic	0.188	0.210	0.126	0.211	0.138	0.000
P17	Energetic	0.113	0.138	0.030	0.222	0.168	0.200
P18	Self-confident	0.151	0.100	0.131	0.292	0.198	0.300
P19	Leader	0.054	0.124	0.025	0.170	0.413	0.100
P20	Classy	0.029	0.019	0.015	0.041	0.054	0.000
P21	Serious	0.322	0.276	0.392	0.251	0.317	0.500
P22	A little impudent	0.000	0.024	0.020	0.023	0.012	0.000
P23	Commercial	0.063	0.090	0.136	0.041	0.216	0.100
P24	Cosy	0.410	0.405	0.040	0.158	0.108	0.000
P25	Self-assured	0.092	0.148	0.075	0.123	0.251	0.100
P26	Deliberate	0.130	0.152	0.332	0.129	0.174	0.400
P27	Passionate	0.000	0.043	0.015	0.047	0.024	0.000
P28	Serene	0.130	0.243	0.377	0.105	0.198	0.000
P29	Intelligent	0.167	0.048	0.196	0.520	0.389	0.300
P30	Opinionated	0.100	0.110	0.161	0.216	0.138	0.400
P31	Helpful	0.607	0.671	0.322	0.433	0.341	0.300
P32	Down-to-earth	0.272	0.386	0.427	0.234	0.353	0.400
P33	Enthusiastic	0.230	0.171	0.015	0.205	0.204	0.000
P34	Balanced	0.176	0.152	0.136	0.222	0.317	0.000
P35	Cheerful	0.218	0.295	0.045	0.135	0.114	0.100

Likewise the cluster specific probabilities for the items of the other 113 personality questions (these are not shown in table 5) can be interpreted and used for identifying and describing the motivational clusters.

We can further describe the motivational clusters by relating the five motivational clusters to several characteristics of the respondents and attibutes of their current housing situation. Cluster 1 (i.e. Harmony and security) is characterized by a relatively large portion of older females, with a relative low educational level. Respondents in this cluster are often living in rental apartments situated in neighbourhoods with a mixture of single households, families and older adults. Cluster 2 (i.e. Harmony) has a relatively large share of couples without children (living at home). Respondents in this cluster tend to live in neighbourhoods with predominantly (other) families. The majority of respondents in cluster 3 (i.e. Security) are males with a relatively low educational level. They tend to live alone in rental apartment (accessible by a staircase) in a neighbourhood with predominantly other rental dwellings. Cluster 4 (i.e. Vitality) is characterized by a relatively large of young (i.e. pre elderly) and high educated females. Non detached dwellings with a garden (e.g. single family house) are overrepresented in this cluster. These dwellings tend to be situated in neighbourhoods with a mixture of single households, families and older adults, located around the inner city area. The respondents in cluster 5 (i.e. Manifestation) can be characterized as highly educated couples without children (living at home). They tend to be owner-occupiers and tend to live in neighbourhoods where the other dwellings are also owner-occupied. Respondents living in detached dwellings are overrepresented in this cluster. Respondents in this cluster tend to have an active lifestyle.

Results discrete choice model by motivational cluster

The model based clustering results in six clusters of which five can be further analysed in several additional logit models. The estimation results for the discrete choice models by motivational cluster are listed in table 6.

Cluster 1: The estimate results show that the respondents in cluster 1 have the strongest preference for their current dwelling. The satisfaction with their current type of dwelling is further illustrated by their preference for (rental) apartments. The respondents in this cluster are most willing to pay for having a say in the finishing of the dwelling. However, after controlling for a possible education (e.g. consumption) effect, it becomes clear that the lower educated in this cluster do not share this preference. This is an important find, since this cluster is characterized by a relatively large proportion of lower educated (women). In general, the respondents have a preference for a dwelling in which the living room, kitchen, bathroom and at least one bedroom are located on the same floor. They also show a preference for dwellings accessible by elevator. Model X, again, demonstrates that the lower educated in this model have a divergent preference pattern.

When given a choice, the estimation results reveal that the older adults in cluster 1 would choose to live in a neighbourhood with a mixture of single households, families and older adults again. Living with predominantly (other) older adults also has a significant effect on the evaluation of choice alternatives. This preference is strong compared to the other motivational clusters.

Table 6. Estimation results by motivational cluster

	Cluster 1				Cluster 2				Cluster 3				Cluster 4				Cluster 5			
	Model IX		Model X		Model XI		Model XII		Model XIII		Model XIV		Model XV		Model XVI		Model XVII		Model XVII	
	B-coeff.	S.E.	B-coeff.	S.E.	B-coeff.	S.E.	B-coeff.	S.E.	B-coeff.	S.E.	B-coeff.	S.E.	B-coeff.	S.E.	B-coeff.	S.E.	B-coeff.	S.E.	B-coeff.	S.E.
Disposable income (x100)	0,445 ***	0,025	0,460 ***	0,026	0,350 ***	0,022	0,376 ***	0,023	0,395 ***	0,025	0,407 ***	0,026	0,397 ***	0,023	0,394 ***	0,023	0,233 ***	0,019	0,249 ***	0,019
Current dwelling	1,993 ***	0,049	2,015 ***	0,050	1,896 ***	0,050	1,916 ***	0,051	1,454 ***	0,046	1,463 ***	0,048	1,603 ***	0,050	1,579 ***	0,050	1,894 ***	0,049	1,918 ***	0,050
Housing attributes																				
Number of rooms	0,124	0,091	0,279	0,382	0,045	0,100	-0,730 ***	0,253	-0,120	0,090	0,175	0,258	0,273 ***	0,092	-1,124 **	0,469	0,142	0,108	1,548 ***	0,304
Number of rooms x no children living at home			-0,135	0,381			0,914 ***	0,266			-0,317	0,268			1,470 ***	0,470			-1,466 ***	0,310
Finishing	0,266 ***	0,076	0,523 ***	0,114	-0,056	0,078	0,160	0,122	-0,032	0,078	-0,044	0,130	0,216 ***	0,080	-0,006	0,183	0,175 **	0,080	0,102	0,133
Finishing x low educational level			-0,435 ***	0,131			-0,453 ***	0,149			-0,169	0,161			0,215	0,301			-0,546 **	0,238
Finishing x high educational level			-0,056	0,161			0,243	0,169			0,218	0,150			0,282	0,191			0,258 *	0,151
Domotics	0,072	0,075	-0,129	0,132	-0,140 *	0,078	0,031	0,123	-0,283 ***	0,080	-0,116	0,125	-0,106	0,082	-0,248	0,168	0,078	0,080	-0,015	0,141
Domotics x low educational level			0,080	0,146			-0,499 ***	0,150			-0,482 ***	0,168			0,756 *	0,393			-0,358	0,264
Domotics x high educational level			0,675 ***	0,171			0,345 **	0,165			0,011	0,153			0,085	0,177			0,210	0,157
Non-detached, without garden	-0,978 ***	0,107	-0,999 ***	0,108	-1,095 ***	0,127	-1,158 ***	0,129	-0,731 ***	0,104	-0,743 ***	0,104	-0,751 ***	0,125	-0,769 ***	0,125	-1,056 ***	0,135	-1,093 ***	0,135
Non-detached, with garden	-0,529 ***	0,089	-0,539 ***	0,090	-0,816 ***	0,103	-0,849 ***	0,105	-0,434 ***	0,089	-0,440 ***	0,089	-0,009	0,102	-0,013	0,103	-0,673 ***	0,116	-0,703 ***	0,117
Detached	-0,279 **	0,139	-0,274 **	0,140	-0,102	0,143	-0,119	0,146	0,170	0,139	0,170	0,140	0,580 ***	0,144	0,563 ***	0,145	0,026	0,164	0,011	0,166
Rental dwelling	0,112 *	0,067	0,096	0,067	0,083	0,075	0,059	0,075	0,173 ***	0,064	0,162 **	0,065	-0,083	0,071	-0,081	0,071	-0,564 ***	0,076	-0,578 ***	0,077
Multiple floors	-0,908 ***	0,062	-1,287 ***	0,127	-0,844 ***	0,066	-0,680 ***	0,120	-0,807 ***	0,069	-0,948 ***	0,127	-0,500 ***	0,066	-0,579 ***	0,171	-0,742 ***	0,071	-0,831 ***	0,153
Multiple floors x low educational level			0,571 ***	0,157			-0,306 **	0,156			0,118	0,180			-0,456	0,417			0,261	0,261
Multiple floors x high educational level			0,334 *	0,182			-0,291	0,180			0,262	0,167			0,164	0,187			0,129	0,176
Elevator	0,382 ***	0,077	0,786 ***	0,145	0,310 ***	0,078	0,311 **	0,130	-0,035	0,076	0,063	0,137	-0,292 ***	0,090	0,292	0,211	0,083	0,084	0,499 ***	0,153
Elevator x low educational level			-0,451 ***	0,173			0,063	0,174			0,114	0,187			-0,881 *	0,527			0,338	0,344
Elevator x high educational level			-0,812 ***	0,204			-0,382 **	0,192			-0,318 *	0,177			-0,544 **	0,230			-0,593 ***	0,181
Staircase	-1,025 ***	0,087	-1,063 ***	0,090	-0,843 ***	0,091	-0,864 ***	0,093	-0,963 ***	0,088	-0,960 ***	0,089	-1,196 ***	0,097	-1,179 ***	0,098	-0,900 ***	0,096	-0,887 ***	0,098
Staircase x low educational level			-0,087	0,057			0,329 ***	0,073			0,051	0,078			0,674 ***	0,237			-0,332 **	0,163
Staircase x high educational level			0,234 **	0,109			-0,119	0,104			-0,091	0,074			-0,247 ***	0,064			-0,054	0,062
Neighbourhood attributes																				
Mainly rental dwellings	-0,063	0,105	-0,073	0,105	0,166	0,110	0,103	0,112	0,031	0,107	0,007	0,107	-0,457 ***	0,120	-0,472 ***	0,121	-0,670 ***	0,121	-0,705 ***	0,122
Mixture of owner-occupied and rental dwellings	0,023	0,098	0,011	0,099	0,228 **	0,099	0,185 *	0,100	0,197 **	0,095	0,180 *	0,095	-0,011	0,111	-0,003	0,111	-0,260 ***	0,119	-0,279 **	0,120
Mixture of single households, families and older	0,410 ***	0,092	0,410 ***	0,092	0,475 ***	0,094	0,507 ***	0,094	0,380 ***	0,090	0,390 ***	0,090	0,631 ***	0,100	0,650 ***	0,101	0,327 ***	0,104	0,352 ***	0,105
Mainly older adults	0,263 **	0,105	0,276 ***	0,105	-0,076	0,105	-0,012	0,106	0,194 *	0,103	0,216 **	0,104	0,056	0,117	0,085	0,118	0,148	0,112	0,185 *	0,112
Around inner city	0,000	0,090	0,001	0,090	0,064	0,097	0,057	0,098	-0,104	0,093	-0,108	0,093	0,146	0,098	0,148	0,098	0,034	0,100	0,032	0,100
Edge of the city	-0,352 ***	0,099	-0,356 ***	0,099	-0,185 *	0,112	-0,193 *	0,113	0,040	0,098	0,042	0,099	-0,203 *	0,120	-0,201 *	0,120	-0,256 *	0,130	-0,249 *	0,132
Daily supplies on walking distance	0,805 ***	0,117	0,952 ***	0,214	0,857 ***	0,116	1,066 ***	0,212	0,612 ***	0,100	0,019	0,180	1,021 ***	0,126	0,937 **	0,397	0,747 ***	0,126	0,341	0,266
Walking distance x low educational level			-0,212	0,271			-0,194	0,273			0,641 **	0,257			0,164	0,595			0,103	0,496
Walking distance x high educational level			-0,134	0,309			-0,361	0,306			1,227 ***	0,242			0,139	0,419			0,616 **	0,304
Daily supplies on cycling distance	0,219 *	0,119	0,205	0,200	0,105	0,117	0,217	0,187	0,223 *	0,116	-0,007	0,216	0,485 ***	0,124	-0,283	0,388	0,091	0,130	-0,375	0,295
Cycling distance x low educational level			-0,104	0,270			-0,377	0,262			-0,121	0,298			1,531 **	0,741			-0,336	0,575
Cycling distance x high educational level			0,298	0,293			0,276	0,301			0,881 ***	0,282			0,877 **	0,409			0,765 **	0,328
Care facilities on walking distance	0,457 ***	0,119	0,436 **	0,208	0,431 ***	0,114	0,676 ***	0,207	0,222 **	0,104	-0,450 **	0,181	0,494 ***	0,119	0,798 **	0,349	0,291 ***	0,123	-0,024	0,259
Walking distance x low educational level			0,302	0,264			-0,325	0,263			1,000 ***	0,268			-0,597	0,564			0,132	0,454
Walking distance x high educational level			-0,557 *	0,320			-0,372	0,303			1,154 ***	0,251			-0,291	0,371			0,481	0,295
Care facilities on cycling distance	0,000	0,112	-0,069	0,195	-0,151	0,110	-0,123	0,172	0,027	0,104	-0,367 *	0,196	0,065	0,116	-0,095	0,313	-0,080	0,116	-0,344	0,248
Cycling distance x low educational level			0,227	0,257			-0,190	0,247			0,289	0,281			0,332	0,831			-0,215	0,518
Cycling distance x high educational level			-0,156	0,290			0,177	0,288			0,954 ***	0,252			0,195	0,334			0,425	0,280
Good access by public transport	1,245 ***	0,106	1,148 ***	0,184	0,929 ***	0,103	1,046 ***	0,170	0,908 ***	0,090	0,828 ***	0,163	1,026 ***	0,103	1,225 ***	0,274	0,965 ***	0,114	0,791 ***	0,249
Good access x low educational level			0,218	0,235			0,059	0,235			0,181	0,228			-0,275	0,560			-0,487	0,443
Good access x high educational level			-0,004	0,272			-0,348	0,267			0,246	0,214			-0,174	0,294			0,364	0,281
Log likelihood	-6027,742		-5988,337		-5410,623		-5334,103		-5900,820		-5846,669		-4836,519		-4797,755		-4596,333		-4555,308	
N	222		222		197		197		192		192		162		162		161		161	

Notes: * p<0.10; ** p< 0.05; ***p< 0.01

Cluster 2: The estimation results of model IV reveal that the older adults without children (living at home) in this cluster show a preference for a bigger dwelling. Considering this cluster has a relatively large share of couples without children (living at home), this is an interesting find. Model IV further demonstrates that the lower educated in this cluster dislike having to pay for "luxuries" such as having a say in this finishing and the presence of home automation designed to increase the comfort and safety of the dwelling. In general, they show a strong disliking towards non-detached houses. Given a choice, they would prefer to live in an apartment. This preference is further illustrated by their desire to live in a dwelling in which the living room, kitchen, bathroom and at least one bedroom are located on the same floor (no education effect in this cluster). The majority of respondents in this cluster are currently living in neighbourhoods with predominantly (other) families, when given a choice they would rather live a neighbourhood with a mixture of single households, families and older adults.

Cluster 3: the estimation results of this cluster reveal that the respondents in this group have strong disliking towards the presence of domotics in their dwelling. The results of model VI illustrates that, when controlled for education, this result is not significant anymore. The (negative) coefficient is, however, very significant for the lower educated in this group. Since the majority of respondents in cluster 3 are lower educated (males), this is an important find. The respondents in this cluster currently tend to live alone in rental apartments accessible by a staircase. When given a choice, the respondents in this cluster would choose to live in a rental apartment again, but they would not choose a dwelling which is accessible by a staircase.

Cluster 4: The estimation results of model XV and XVI show that, in contrast to the other clusters, the respondents in this cluster prefer to live in a detached dwelling. The estimation results further reveal that they have a preference for dwellings in which the living room, kitchen, bathroom and at least one bedroom located on the same floor, with an access on street level. Based on these findings, it is conceivable that the respondents in cluster 4 show a preference for dwellings which are considered to be more accessible than their current type of dwelling (i.e. single family homes are overrepresented in this cluster), such as a bungalow. This does, however, not necessarily imply that they prefer a smaller dwelling.

Cluster 5: The estimation results for this cluster demonstrates that the respondents in cluster 5 are willing to pay the most for having a say in the finishing of their dwelling. Based on the ratio of the coefficients of finishing and disposable income, the willingness to pay equals (0.175/0.233)= 0.7510. This implies that a having a say in the finishing would be worth 75 euro per month. This is in accordance to the fact that this is the most affluent cluster, in terms of their average net monthly income. The estimate results of model XVII and XVIII further show a strong preference for owner-occupied dwellings. When given a choice, the respondent in this cluster would choose an apartment instead of a detached dwelling. In contrast to the other clusters, the estimation results for cluster 5 reveal a strong preference for neighbourhods with predominantly (other) owner-occupied dwellings.

Even though the estimation results for the different motivational clusters reveal heterogeneous preference patters, we do find some strong similarities. Again, all clusters show a strong preference for their current dwelling. In addition, all clusters dislike non-detached dwellings (either with or without a

garden) and dwellings in which the living room, kitchen, bathroom, and at least one bedroom are located on multiple floors. With regard to their living environment, all clusters show a strong preference for neighbourhoods with a mixture of single households, families and older adults. This neighbourhood should not be located at the edge of the city. All clusters prefer to have amenities (i.e. daily supplies, care facilities and public transport) in the vicinity (i.e. walking distance) of their home. Apparently, the preference for these particular housing attributes is generic among the older adults in our sample and not dependent on values and/or age (as demonstrated by table 6 and 4).

Discussion

This study analysed evidence from a self-designed questionnaire to examine the issue of housing preferences of Dutch older adults. Distinguishing between different age groups made it possible to scrutinise whether age affected preferences for further strengthening the status quo ('staying put') or for changing dwelling. When given a choice (albeit a hypothetical one) a vast majority of the respondents prefer to stay put. The preference for the current dwelling becomes stronger by age. We therefore conclude that the tendency of Dutch older people to 'stay put' is mainly caused by choice rather than by constraint. We can, however, not fully confirm that older adults 'stay put' due to a strong sense of residential satisfaction (as suggested by Reschovsky in 1990). In fact the estimation results demonstrate that certain desired housing characteristics do not necessarily correspond with the current housing situation (on average). The location of the neighbourhood and the access (internal and/or external) to the dwelling are good examples of characteristics that in reality do not meet the desired standards as indicated in the survey.

Since people's homes represent "a combination of personal and financial security, family memories and a sense of place and well-being" (Stimson et al., 2002, p. 16), older adults might prefer to cope with the costs of a mismatch between their dwelling and their needs rather than move elsewhere (Costa-Font et al., 2009). This attachment to place has often been cited as an important factor in explaining the low mobility of older adults (see among others Birch, 1973; Butler, 1975; Ferraro, 1981; Golant, 1972; Lawton, 1978, 1986; Newman, 1976). Based on the estimation results of this study we were unable to reflect on the extent to which the preference to stay put might be affected by factors such as place attachment.

The estimation results do reveal that older adults do not necessarily want to live smaller as they age. In general, they have a preference for apartments, which is also illustrated by the fact that they prefer houses accessible by an elevator in which the living room, kitchen, bathroom, and at least on bedroom is located on the same floor. With regard the living environment, the results indicate that older adults do not want to live in a neighbourhood which is located at the edge of the city. This is re-emphasized by their desire to have amenities, such as to have daily supplies, care facilities and public transport, in the vicinity of their homes. They would also like to be surrounded by mixture of single households, families and older adults.

In addition, the estimation results by age demonstrate the presence of heterogeneity among Dutch older adults. The next generation of older adults (the pre-elderly) is different from today's older adults. They have different expectations and abilities, due to having experienced expanded education opportunities, emancipation and participation (Kramer and Pfaffenbach, 2009).Therefore, future older adults can be expected to develop different lifestyles, which will likely lead them to favour different (residential) locations (Kramer and Pfaffenbach, 2007). The estimation results by motivational cluster (i.e. lifestyle) indeed confirm that not all older adults want the same. Older adults differentiate themselves by age as well as by motivational cluster. Obviously income, age and education are related to these differences, but they do not explain all the variance. Therefore, the heterogeneity in wishes and demand in housing attributes needs to be assigned to other differences as well, such as underlined by the motivational clusters.

In general, the housing choices of future older adults are likely to have an impact on spatial structures, simply due to the large numbers this generation represents (e.g. Andersson and Abramsson, 2011; Kramer and Pfaffenbach,2009). This illustrates that the housing of an ageing society requires timely and adequate reactions in (housing) policy, in particular with respect to the growing diversity within the older population.

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Appendix I: BSR questionnaire

Question 1: Which character traits fit you best?
(Max. 7 picks)

- ❑ A little bit shy
- ❑ Adventurous
- ❑ Capable
- ❑ Cosy
- ❑ Energetic
- ❑ A little bit imprudent
- ❑ Honest
- ❑ Jovial
- ❑ Opinionated
- ❑ Self-assured
- ❑ Serious
- ❑ Spontaneous
- ❑ A Little impatient
- ❑ Assertive
- ❑ Cheerful
- ❑ Critical
- ❑ Enthusiastic
- ❑ Gentle
- ❑ Intelligent
- ❑ Sympathetic
- ❑ Ordinary
- ❑ Self-confident
- ❑ Down-to-earth
- ❑ Strong character
- ❑ Easy going
- ❑ Balanced
- ❑ Classy
- ❑ Deliberate
- ❑ Leader
- ❑ Helpful
- ❑ Interested in others
- ❑ Neat
- ❑ Passionate
- ❑ Serene
- ❑ Commercial

Question 2: Which family or household types fit you best?
(Max. 3 picks)

- ❑ A family where everyone goes their own way
- ❑ Bachelor
- ❑ Busy, dynamic family
- ❑ Happy family
- ❑ Ideal family
- ❑ Not suited for family life
- ❑ Peaceful family
- ❑ Single
- ❑ Stable family
- ❑ Striving for a family
- ❑ Artistic household
- ❑ Broad-minded family
- ❑ Cosy old-fashioned family
- ❑ Harmonious family
- ❑ Isolated family
- ❑ Perfect family
- ❑ Rigid family
- ❑ Sportive family
- ❑ Dignified household
- ❑ Warm family

Question 3: Which occupations appeal to you most? Mind: you do not have to practice the occupation(s) that you pick (anymore).
(Max. 7 picks)

- ❑ Account manager
- ❑ Member of the board
- ❑ Commercial assistant
- ❑ E-Business
- ❑ Freelancer
- ❑ Journalist
- ❑ No occupation
- ❑ Photographer
- ❑ Programmer
- ❑ Secretary
- ❑ Shop assistant
- ❑ Sports teacher
- ❑ Temporary employee
- ❑ Activity guide
- ❑ Businessman/-woman
- ❑ Commissioner
- ❑ Entrepreneur
- ❑ Fulltime housewife
- ❑ Male nurse
- ❑ Nurse
- ❑ Artist
- ❑ Project manager
- ❑ Scientist
- ❑ Shopkeeper
- ❑ Student
- ❑ Truck driver
- ❑ Volunteer
- ❑ Beautician
- ❑ Social worker
- ❑ Designer
- ❑ Financial planner
- ❑ Househusband
- ❑ Manager
- ❑ Part-time housewife/-husband
- ❑ Anchor man
- ❑ Public servant
- ❑ Vets assistant
- ❑ Relief worker
- ❑ Stylist
- ❑ Unemployed

Question 4: Which hobbies, interests and/or leisure activities fit you best?
(Max 5 picks)

- ❑ A sociable evening with friends
- ❑ Turning in a top-notch achievement
- ❑ Build a successful career
- ❑ Classy parties
- ❑ Doing odd jobs around the house
- ❑ Going to a discothèque
- ❑ Making dreams come true
- ❑ Playing chess
- ❑ Visiting friends and relatives
- ❑ Watching TV
- ❑ Active sports
- ❑ Astrology
- ❑ Camping
- ❑ Going on an outing
- ❑ Gardening
- ❑ Golf
- ❑ Religious matters
- ❑ Reading (magazines)
- ❑ Squashing
- ❑ Team sports
- ❑ Adventurous holidays
- ❑ Being at home quietly
- ❑ Cars/ motorbikes
- ❑ Dining out together
- ❑ Going out together
- ❑ Investing in stocks
- ❑ Swimming
- ❑ Shopping
- ❑ Surfing the internet
- ❑ Visiting a pub
- ❑ Snowboarding

Question 5: Which values fit you best?
(Max. 6 picks)

- ❑ Anonymity
- ❑ Enthusiasm
- ❑ Heroism, glory
- ❑ Passion
- ❑ Recognition of performances
- ❑ Self-belief
- ❑ Social harmony
- ❑ Success in life
- ❑ Challenge, stimulation
- ❑ Expression, uniqueness
- ❑ Independence
- ❑ Privacy, tranquillity
- ❑ Respect
- ❑ Self-fulfilment, growth
- ❑ Solidarity
- ❑ Enjoyable life
- ❑ Friendship
- ❑ Intimacy
- ❑ Rationality
- ❑ Security
- ❑ Social alliance
- ❑ Status

Appendix II: Log likelihood ratio test

	Loglikelihood null model	Loglikelihood alternative model	D	df	p value
Whole sample	-27705,621	-27552,089	307,064	21	0,00000
Pre-elderly	-19037,934	-18930,508	214,852	21	0,00000
Young-elderly	-6040,068	-5991,334	97,468	21	0,00000
Old-elderly	-2117,376	-2085,350	64,052	21	0,00000
Cluster 1	-6027,742	-5988,337	78,808	21	0,00000
Cluster 2	-5410,623	-5334,103	153,039	21	0,00000
Cluster 3	-5900,820	-5846,669	108,302	21	0,00000
Cluster 4	-4836,519	-4797,755	77,528	21	0,00000
Cluster 5	-4596,333	-4555,308	82,048	21	0,00000

The test statistic is 32,671. In all cases the associated p-value is very low (less than 0.00001). The results show that adding interaction effects results in a statistically significant improvement in model fit.

Appendix III: the EM logarithm

The EM algorithm is an iterative algorithm that contains the following steps: In the very first iteration of the EM-algorithm the respondents are randomly divided into *Q* clusters.

E-step

1. $\omega_{q|i} = \frac{\omega_q P(x_i|\tau_i=q)}{\sum_{q'=1}^{Q} \omega_{q'} P(x_i|\tau_i=q')}$, for *q*=1, ..., *Q* and *i*=1, ...*N*

M-step

1. $N_q = \sum_{i=1}^{N} \omega_{q|i}$, for *q*=1, ..., *Q*
2. $\omega_q = \frac{N_q}{N}$, for *q*=1, ..., *Q*
3. $\pi_{j|q} = \frac{\sum_{i=1}^{N} \omega_{q|i} x_{ij}}{\sum_{i=1}^{N} x_{ij}}$, for *j*=1, ...*J* and *q*=1, ..., *Q*

A problem with the EM algorithm is when to stop. The EM algorithm stops when the likelihood or, in the case of LatentGold, the parameters hardly change from one iteration to the next. However, Wedel and Kamakura (2000) describe that this is a lack of progress, rather than a measure of convergence and that there is evidence that the EM-algorithm is often stopped too early. In order to avoid this problem, LatentGold uses the speed of Newton-Raphson when close to the optimal solution.