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ARTICLE

Beyond demographics: human value orientation as a predictor of heterogeneity in student housing preferences

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Abstract In the Netherlands, there is currently both a quantitative and a qualitative shortage in student housing. New housing units need to be built to accommodate the growing population of students, and existing ones need to be adapted to better fit the students' needs. However, whilst housing preferences are studied extensively in the literature, less research has focused on the housing needs of students. In the current study, students' housing preferences, and individual differences within these preferences, were studied with the use of a conjoint choice experiment. Within this experiment, hypothetical student houses were defined by systematically varying nine housing characteristics: price, size, kitchen sharing, bathroom sharing, cycling time to city centre, cycling time to campus, outdoor space, walking time to supermarket, and walking time to park. The participants were asked to select the most preferred housing from multiple sets of two student houses. A total of 589 completed online questionnaires were analysed. With the use of a mixed logit model, the importance and influence of the housing characteristics and taste heterogeneity was measured. Individual differences were explained with the use of socio-demographics and human values. The results show that heterogeneity is present in the housing preferences of students. These differences can be explained partly by socio-demographics and human values. Human values are thought to give additional understanding of differences in students' housing preferences on top of socio-demographics.

Keywords Conjoint choice experiment · Housing preferences · Human values · Mixed logit model · Student housing

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1 Introduction

Housing preferences are not the same for everyone. There are substantial individual differences in housing choice behaviour (i.e. taste heterogeneity), which are commonly explained by socio-demographic variables such as age, education, and income (e.g. Jansen 2011). However, demographic background cannot fully explain heterogeneity in housing preferences and choice behaviour. Due to socio-demographic shifts, and a greater variety of lifestyle cultures in Western countries, housing preferences have become more divers (Jansen 2011). As a result, the relationship between demographics and housing preferences is now more complex, diminishing its predictive power in turn (Hessing and Reuling 2003; Jansen 2011; Oppenhuisen 2000).

In the present paper, we investigate an alternative to the use of demographics to predict choice heterogeneity in housing preferences and choice behaviour: human values. Human values express what people find important in their lives. They represent standards held by a person, culture, or religion, which are responsible for the selection and maintenance of goals and regulating the way in which these goals are attained (Bell et al. 2001; Vinson et al. 1977). The most prominent definition of values is provided by Schwartz and Bilsky (as cited in Schwartz 1992, p. 4): 'Values are (1) concepts or beliefs, (2) about desirable end-states or behaviours, (3) that transcend specific situations, (4) guide selection or evaluation of behaviour and events, and (5) are ordered by relative importance'. Schwartz' value theory states that, across people and across cultures, a universal set of ten value types (guiding principles) can be identified, including, for example, power, security, and hedonism (Schwartz 1992). Research has demonstrated that the ten value types are not independent of each other. According to Schwartz, the interrelationships amongst the ten value types are best described in a so-called quasi-circumplex value structure (Fig. 1). In this structure, the positions of value types show their compatibility and connectedness with each other. In addition to the ten value types, four higher-order value domains are identified in the structure: openness to change, self-transcendence, conservation, and self-enhancement (see Fig. 1). Value domains positioned opposite to each other in Schwarz' value structure are mentally and physically incompatible. Research has demonstrated that a person's value orientation can predict his or her consumer behaviour (Brangule-Vlagsma et al. 2002; Hessing and Reuling 2003; Jansen 2011).

However, the magnitude and form of influence of human values on housing choice behaviour are highly debated (Jansen 2012). Only few researchers have studied this phenomenon, with most of these studies being qualitative in nature (Coolen et al. 2002; Coolen and Hoekstra 2001; Jansen 2011, 2012; Lindberg et al. 1989). Jansen (2011) found, after correction for the influence of socio-demographic variables, that high importance of hedonism (pleasure, sensuous gratification) and low importance of universalism (in specific unity with nature) were linked to the preference of living in a lively neighbourhood. This may be explained by the presence of more facilities in lively neighbourhoods. Additionally, people living in cities were found to give lower importance to universalism and higher importance to power/achievement than people living outside the city (Jansen 2011). Similarly, Lindberg et al. (1989) found that the value type leisure (hedonism) was linked to distance to recreation (e.g. a city centre). Although these studies are promising with respect to the possible role of human values in explaining choice heterogeneity, Jansen (2012) found people's values to be only weakly related to housing preferences after correcting for socio-demographical differences. Jansen (2012) based this conclusion on straightforward questioning interviews. In this paper, the influence of human values on housing preferences will be investigated by means of conjoint analysis.

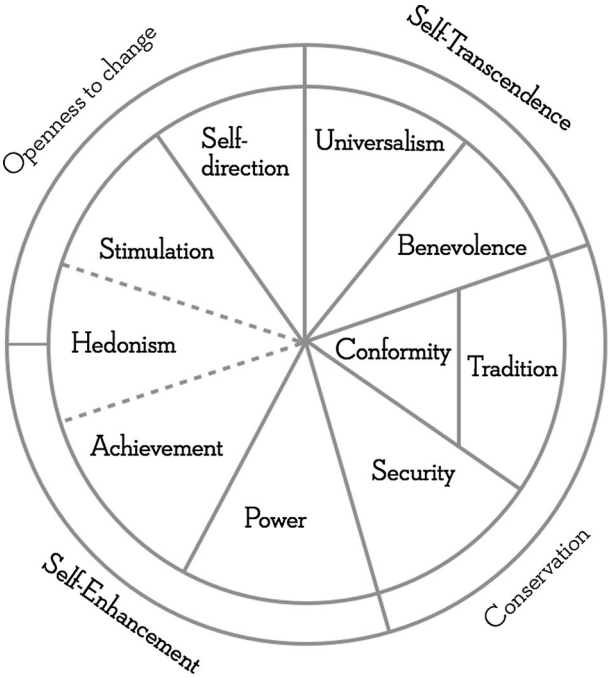

Fig. 1 Schwartz' (1992) value system structure

Conjoint analysis is a popular method of measuring consumer choices and preferences because it elicits which characteristics of the product are most important in the decision-making process (Louviere et al. 2000). It is thought that households consider and evaluate multiple characteristics of the house, neighbourhood, and location to come to a housing choice decision (e.g. Jansen et al. 2011; Louviere and Timmermans 1990; Molin et al. 1996, 2001; Thomsen and Eikemo 2010; Timmermans et al. 1992). Because conjoint analysis takes into account trade-offs and estimates the relative importance and influence of each housing characteristic in housing choice decisions, the conjoint analysis method is considered better in estimating housing preferences than straightforward questioning (Molin et al. 1996; Train 2009). More specific, a conjoint choice experiment was used to elicit housing preferences as choices reflect consumer preferences and the essentials of real decision-making behaviour better than ranking or rating (Molin 2011).

The present paper will focus on students. Currently, a tremendous shortage of student housing is present in the Netherlands. The shortage of student housing is estimated at 30,000 units in 2011 (LSVb 2011), and this number is still rising due to an increasing number of students (ANP 2010). In addition to the quantitative shortage, also a qualitative shortage is present in many Dutch student cities. In these cities, students have to wait a long time before they find housing that meets their preferences (Kences 2010). To meet students' needs and avoid qualitative shortages, new buildings should become available according to the housing preferences of the students. Therefore, we will address these students' housing preferences.

At the moment, few studies investigating student housing preferences are available. In the Netherlands, most studies on student housing are conducted by commercial companies,

which are not published in scientific journals and are mainly based on simple multiple-choice questions (Molin et al. 1996; Kences 2010). The studies found in the literature are often aged or conducted in countries with different student housing systems (e.g. Amole 2009; Louviere and Henley 1977; Steenkamp 1985). In the Netherlands, it is most common for students to live in a student house or complex in which they have their own private bedroom (student room). This housing situation of students is different than, for example, in the USA, where it is more common to share a bedroom, and where additional facilities such as reading rooms, catering, and organised activities are often offered (Amole 2009; Nuffic 2012). Therefore, the studies investigating student halls and residences (Amole 2009; Kaya and Erkip 2001; Wilcox and Holahan 1976) are not applicable to the Dutch student housing situation. The Norwegian student housing situation studies by Thomsen and Eikemo (2010) is more similar to the Dutch situation. However, Norwegian students may differ in many respects, both demographically and in value orientation, from their Dutch colleagues. The aim of the current paper is twofold. First, we investigate choice heterogeneity in students' housing preferences in the Netherlands using conjoint analysis and a mixed multinomial logit model. Second, we investigate the extent in which human values, in addition to demographics, can explain the choice heterogeneity in students.

2 Methods

2.1 Fieldwork

In October 2011, the empirical study was conducted in Tilburg and Breda, two medium-sized cities in the south of the Netherlands. All students registered at housing provider WonenBreburg were invited to participate in the current study by filling in a Web-based questionnaire. WonenBreburg provides student rooms in various locations in Tilburg and Breda. Both Dutch and international students were contacted. A total of 2,427 students (1,867 Tilburg and 560 Breda) currently renting student housing with WonenBreburg, and 342 students searching for housing received an invitation to participate. It was made clear that students could win an IPad when participating.

2.2 Demographics and human values

A conjoint choice experiment was combined in a Web-based questionnaire with additional questions about students' socio-demographics and human value patterns. These additional questions were asked in the questionnaire after the conjoint choice experiment. With respect to socio-demographics, we asked participants to answer questions about their age, gender, nationality, income, and education.

Participants' value orientation was assessed with a short version of the Schwartz' Value Survey (SVS, Schwartz 1992, 2009a). The original SVS uses 56 items to measure the importance of each of the ten value types defined in Schwartz' value theory (Table 1). The instrument is applicable to everyday life decisions, directed towards individual value research, and usable in many contexts and countries, including the Netherlands (Schwartz 1992, 2009a). The SVS is regarded to be the most comprehensive and theoretically sound instrument for assessing people's value orientation (Watkins 2010) and has proven to be stable, effective, reliable, and valid (Bardi and Schwartz 2003; Spini 2003).

Since the SVS is time-consuming for respondents to complete (see also Watkins 2010), we used the shortened version of the SVS as proposed by Schultz and Zelezny (1999). This

Table 1 Schwartz' value types and value items

Value types	Representative value items
Power	Social power*, authority*, wealth*, preserving my public image*, social recognition
Achievement	Successful*, capable*, ambitious*, influential*, intelligent, self-respect
Hedonism	Pleasure*, enjoying life*
Stimulation	Daring*, a varied life*, an exciting life*
Self-direction	Creativity*, freedom*, curious*, choosing own goals*, independent, self-respect
Universalism	Broadminded*, a world of beauty*, unity with nature*, protecting the environment*, wisdom, social justice, equality, a world at peace,
Benevolence	Helpful*, honest*, forgiving*, loyal*, responsible, mature love, true friendship
Tradition	Humble*, devout*, respect for tradition*, moderate*, accepting my portion in life
Conformity	Politeness*, obedient*, self-discipline*, honouring of parents and elders*
Security	Family security*, national security*, social order*, clean*, reciprocation of favours, sense of belonging, healthy

* Included in the abbreviated value list of Schultz and Zelezny (1999)

instrument consists of 37 items, which were found to represent best the ten value types in Schwartz theory (see Table 1). Schultz and Zelezny based their selection on smallest space analyses of the data in Schwartz (1994) containing 97 independent samples from 44 countries.

The 37 items were presented to the participants in accordance with Schwartz (1992). With each item, for example 'wealth', an additional explanation was presented in brackets: '(material possessions, money)'. Respondents were asked to indicate how important each value was 'as a guiding principle in their lives' using a nine-point scale ranging from 'opposed to my values' (−1) through 'not important' (0) to 'supremely important' (7). Before the analysis, we corrected for individual scale differences as proposed by Schwartz (2009b). For this purpose, we calculated, for each participant, the mean score across the set of items. Subsequently, this mean score was used to centre all individual responses around. The items belonging to the same value type (Table 1) were averaged to get Schwartz' ten value type scores.

Principal component analysis (PCA) was used to confirm the positioning of the ten value types in Schwartz' (1992) circumplex model for our student sample. To reduce the number of variables in our analyses, we subsequently reduced the ten value types into the four higher-order value domains: openness to change, conservation, self-enhancement, and self-transcendence (see Fig. 1). Conservation (encompassing the value types tradition, conformity, and security) is aimed at preserving the status quo, which provides certainty in relationships. Openness to change (self-direction, stimulation, hedonism) deals with going one's own way. Self-enhancement (power, achievement, hedonism) emphasises enhancing own personal interests, and self-transcendence (universalism, benevolence) emphasises transcending selfish concerns and promoting welfare of others. The location of hedonism regarding these higher-order value domains is dependent on context and culture, and thus must be empirically determined for our population of students (Schwartz and Boehnke 2004).

2.3 Conjoint choice experiment

We use a conjoint choice experiment to trace quantitatively students' housing preferences based on the relative importance of multiple characteristics (Louviere et al. 2000). Respondents were asked to choose multiple times between imaginary housing alternatives,

each described by nine characteristics (attributes) with varying attribute levels; see Table 2. These attributes and levels were selected based on (1) previous studies about students' housing preferences (e.g. Kences 2010), (2) the input of experts (interviews with student housing provider and research company), and (3) a qualitative pretest. In the pretest, 20 students were asked to write down all student housing characteristics that were important to them when making a housing choice decision. Furthermore, they were asked to rate the importance of each mentioned characteristic on a 10-point scale. The attributes mentioned most often and rated most important were included in the experiment.

The attributes were varied systematically and independently to be able to estimate the importance of all attributes and their levels separately (Train 2009). In such an orthogonal design, no correlations exist amongst attributes across all alternatives making it possible to obtain unbiased estimates. Because a full factorial design was too large with its $4^9 = 262{,}144$ different housing alternatives, we used a fractional factorial design in the present study. Moreover, a main effects only design was chosen because of the amount of profiles and because previous studies have found that including first-order interactions do not statistically improve the prediction of students' housing preferences compared to main effects only designs (Steenkamp 1985). Main effects typically account for 70–90 % of explained variance in linear models. First-order interactions typically account for only 5–15 %, with higher-order interactions accounting for the remaining explained variance (Louviere et al. 2000).

The smallest orthogonal experimental design for nine attributes at four levels was chosen and consisted of 32 alternatives (Addelman and Kempthorne 1961), which had to be evaluated by respondents. Each respondent was presented 16 randomly composed sets of two alternatives, comprising the complete set of 32 alternatives. The alternatives were presented by text only to avoid measurement errors produced by irrelevant and disturbing details in pictures and graphics (Singelenberg et al. 2011). For each of the presented pairs, participants had to pick the most preferred alternative. To reflect the real-life option of not choosing a house, a 'no preference' response option was included. See Fig. 2 for an example of a choice set as presented to the respondents.

2.4 Mixed logit model

The mixed logit model used in this study can be described as follows. An individual n chooses amongst J possible housing alternatives. The utility that individual n derives from housing alternative i ($i = 1, \ldots, J$) is (Louviere et al. 2000):

$$U_{ni} = V_{ni} + \varepsilon_{ni} = \sum_{k=1}^{K} \beta_k x_{nik} + \varepsilon_{ni}$$

U_{ni} = overall utility that consumer n obtains from alternative i; V_{ni} = structural utility of alternative i for individual n; ε_{ni} = error term (random utility component); β_k = utility weight for attribute k; x_{nik} = score of alternative i on attribute k.

With the assumption of utility-maximising behaviour, the probability that a consumer n chooses alternative i over other alternatives j can be written as the preference for the greatest utility (Train 2009):

$$P_{ni} = \text{prob}(U_{ni} > U_{nj} \quad \forall j \neq i)$$

P_{ni} = probability of consumer n choosing alternative i out of the set of J available alternatives.

Table 2 Selected attributes and attribute levels

Attributes	Levels
Price (incl.)	225, 275, 325, 375 euro
Size	12, 17, 22, 27 square meters
Cycling time to campus	1, 6, 12, 18 min *by bike*
Cycling time to city centre	1, 6, 12, 18 min *by bike*
Bathroom	Own bathroom, shared with 1 housemate, shared with 2 housemates, shared with 3 or 4 housemates
Kitchen	Own kitchen, shared with 1 or 2 housemates, shared with 3–5 housemates, shared with 6–9 housemates
Walking time to supermarket	1-, 4-, 7-, 10-min *walking*
Walking time to park	1-, 4-, 7-, 10-min *walking*
Outdoor space	No balcony or garden, own balcony, shared balcony, shared garden

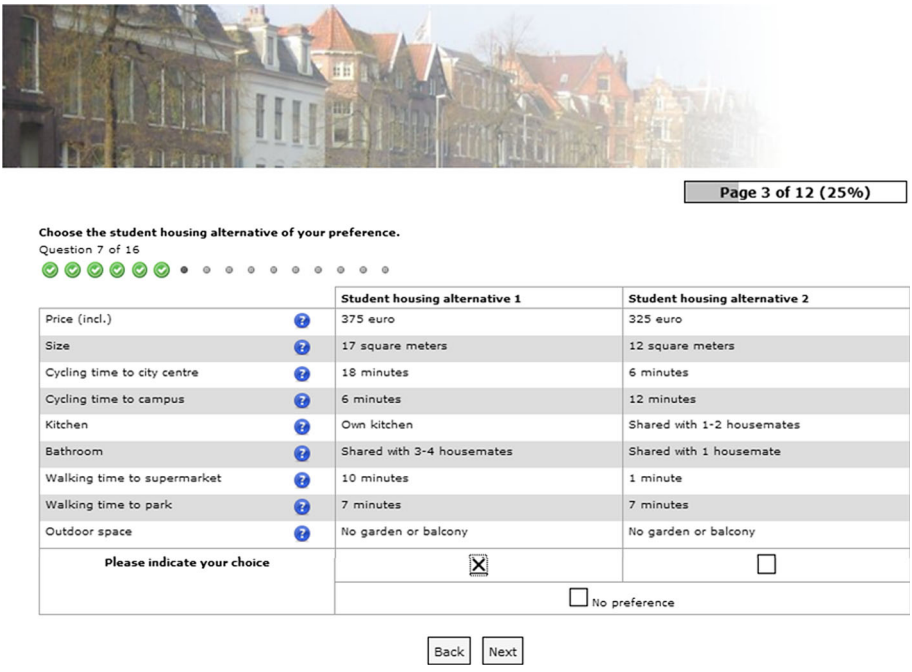

Fig. 2 Conjoint choice experiment, choice set example

Parameters (β_1, …, β_k, …, β_K) are estimated to express the main effects of each attribute level, representing the preferences for the attribute levels. However, preferences may vary across individuals. The presence and magnitude of these differences can be accounted for by the mixed logit model assuming β_k follows a normal distribution with mean parameter α_k and standard deviation parameter σ_k: $\beta_k \sim N(\alpha_k, \sigma_k)$.

When the standard deviation parameter of an attribute level is large compared to the mean parameter of that attribute level, severe heterogeneity is present in the utility awarded by the population to this attribute level. Based on the correlations, regressions, and findings

of previous studies, socio-demographic and human value variables will be selected to be entered into the mixed logit model analyses. These individual characteristics (e.g. gender, nationality, and value importance) will be included in the model as interaction terms. In this way, it can be seen whether the mean preferences vary across individuals' characteristics (Greene 2007):

$$\alpha_k = \rho_k + \sum_m \delta_{km} Z_{nm}$$

ρ_k = the basic value for attribute k; Z_{nm} = the score for individual n on individual characteristic m; δ_{km} = the effect of individual characteristic m on α_k.

Before the mixed logit model is estimated, all attribute levels will be effect coded to estimate the utility weights for each attribute level. For each attribute, the L levels are described by $L - 1$ coded variables. An attribute level l ($l = 1, \ldots, L - 1$) is coded 1 if this level is present in the housing alternative and 0 otherwise. When the Lth level is present, all $L - 1$ variables are coded -1 (Louviere et al. 2000). The mixed logit model will be estimated by means of simulated maximum likelihood estimation, using Halton draws (see Train 2009).

3 Results

With 667 students participating, response rate was 24 %. Of the total sample, 78 respondents had to be removed from the dataset for several reasons, including, for example, completion times shorter than could reasonably expected for quick but proper answering of all questions, or an abundance of missing answers. The dataset of 589 cleaned from these cases was used for further analyses.

3.1 The socio-demographics characteristics

Of the 589 students included in the analyses, 60.1 % was female and average age was 21.9. About three quarter of the students studied in Tilburg and more than half of all students studied at the university in this city (Table 3). About 17.7 % had a nationality different than Dutch. Those foreign students came from all over the world, but most came from Europe (74.0 %). Based on the educational institutions students were studying at, educational level of the students was indicated MBO/HBO or WO (university). About 61.5 % of all students were studying at a university, whereas 38.4 % studied at a higher (HBO) or mid-level (MBO) educational institution.

Students were found to differ little in age and income. Therefore, these socio-demographic variables were not included in further analyses. City of study (Tilburg or Breda) was found to be correlated to educational level ($r = 0.65$) and was consequently not admitted in further analyses. The socio-demographic variables nationality, gender, and educational level were only weakly correlated ($|r| < 0.2$) and were thus used in further analyses.

3.2 The human value patterns

On average, satisfaction of sensual desires (hedonism) was most important for students from Tilburg and Breda (Table 4). Also, the welfare of close others (benevolence, second most important value domain) and autonomy in thinking and acting (self-direction, third)

were important for them. On the other hand, students were not interested in maintaining tradition (tradition, 10th) and did not accept the use of others to pursue selfish interests (power, ninth).

We used principal component analysis (PCA) on the 10 derived value types to confirm the clustering of value types in the four higher-order value domains as proposed by Schwartz (1992), and to determine the position of hedonism in Schwartz' value structure for our population of students. The PCA showed that the ten value types clustered according to the value domains as expected (Fig. 3). Hedonism was clearly located closer to stimulation than to achievement, suggesting that students place hedonism values more towards experiencing pleasure freely and less towards pursuing pleasure competitively. Subsequently, students' scores on each higher-order value domain were calculated by aggregating the respective value types (Table 5).

Each pair of opposite value domains—self-transcendence versus self-enhancement, and conservation versus openness to change—was strongly correlated to each other in the expected manner (respectively $r = -0.652$ and $r = -0.738$). Scores on the non-opposing domains gave considerable smaller associations ($|r| < 0.3$). Because of these correlations, only one of each pair of opposing domains was used in further analyses. Openness to change and self-enhancement were chosen because most variation was present in these value domains (Table 5).

3.3 The relationship between socio-demographics and human values

Because people's value orientation is affected by life experiences, and differences in life circumstances are largely determined by demographical characteristics, the students' socio-demographics might be linked to their value orientation (Schwartz 2009a). Therefore, we correlated a student's socio-demographics with his or her value domains. With Pearson's correlations, no correlations were found beyond $|r| = > 0.3$ between socio-demographics and the value domains openness to change and self-enhancement. Furthermore, linear regression analyses showed that the value domains could be explained only little by the demographic variables. The R^2 scores showed that the value domain of self-enhancement could be explained for only 9.2 % by age, gender, and educational level, and the value domain of openness to change could be explained for only 3.2 % by nationality and educational level. These linear regressions, and the lack of strong correlations, indicated that value domains and demographics are more or less distinct in our student population. This could mean that human values have added value on top of demographics in predicting choice behaviour. The final set of personal variables included in the analyses is presented in Table 6. The value variables are standardised ($\mu = 0$; $\sigma = 1$) to make sure these variables contribute evenly and to simplify the interpretation of the results.

3.4 Students' housing preferences

To evaluate students' housing preferences, a mixed logit model including human values and socio-demographics was estimated with Nlogit 4.0 (Greene 2007). The number of Halton draws was set to 100; this number produced stable parameter estimates. The results of the mixed logit model are presented in Table 7. Model fit of this model was LL (β) = $-5{,}653.7$ and $\rho^2_{\text{adj}} = 0.438$, which can be considered good.

From the parameters (β-estimates) in Table 7, it can be concluded that price is a very important attribute; the difference in utility between the lowest (€225) and highest (€375)

Table 3 Socio-demographics

Variables	Foreign ($N = 104$)	Total ($N = 589$)
Age		
Mean	22.4	21.9
SD	2.7	2.4
	%	%
Gender		
Male	30.8	39.9
Female	69.2	60.1
Income		
<€200	8.7	3.6
€200–€399	7.7	10.4
€400–€599	19.2	20.2
€600–€799	24.0	27.2
€800–€999	18.3	18.2
>€999	4.8	10.4
Not provided	17.3	10.2
Educational institution		
University of Tilburg	61.5	57.2
Fontys Tilburg	1.9	13.9
Avans Tilburg	0	3.1
NHTV Breda	31.7	14.1
Avans Breda	4.8	7.5
Other	0	4.3

Table 4 Corrected value type scores

Value type	M ($N = 589$)	SD	Minimum	Maximum
Hedonism	1.489	1.127	−2.42	4.51
Benevolence	0.830	0.754	−2.17	3.24
Self-direction	0.819	0.807	−2.09	3.54
Security	0.506	0.893	−2.60	3.41
Achievement	0.456	0.745	−2.11	2.86
Conformity	0.349	0.792	−2.72	2.70
Stimulation	0.050	1.238	−3.69	3.08
Universalism	−0.403	1.175	−4.08	2.73
Power	−1.453	1.131	−4.78	1.87
Tradition	−1.887	1.110	−5.15	1.20

price level is approximately 2.2 units. In comparison, this difference ranges between 1.2 and 1.5 for the attributes size, kitchen, bathroom, and cycling time to city centre and campus. The remaining attributes (outdoor space and walking time to supermarket and park) seem to be less important to students with a difference range less than 0.5 units. In

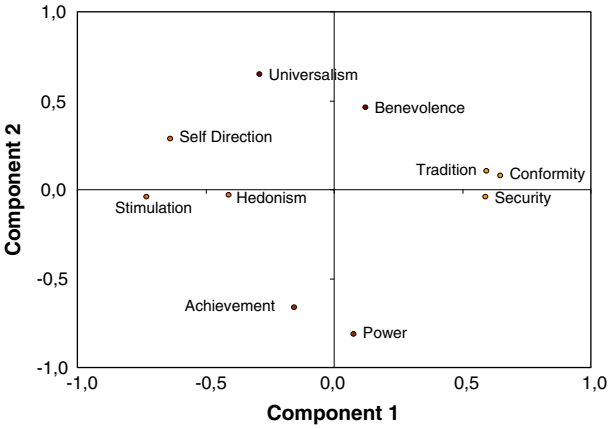

Fig. 3 Principal component plot corresponding with Schwartz' value structure

Table 5 Higher-order value domains

Higher-order value domains	Underlying value types	M ($N = 589$)	SD	Minimum	Maximum
Openness to change	Self-direction, stimulation, hedonism	0.786	0.719	−1.43	3.26
Self-transcendence	Universalism, benevolence	0.214	0.668	−2.04	2.12
Conservation	Tradition, conformity, security	−0.344	0.599	−2.47	1.78
Self-enhancement	Achievement, power	−0.498	0.746	−2.93	2.12

Table 6 Personal variables included in further analyses

Variable name	Variable scores
Nationality	1 = Dutch, −1 = foreign
Educational level	1 = University, −1 = HBO/MBO
Gender	1 = Female, −1 = male
Self-enhancement	Scores (−2.93, 2.12) Standardised (−4, 4)
Openness to change	Scores (−1.42, 3.26) Standardised (−4, 4)

general, parameter values are as expected (except for the two least important attributes: walking time to supermarket and park): overall preferences increase with decreasing price, increasing floor space, kitchen, and bathroom sharing with fewer housemates (preferably none), decreasing cycle times, increasing (private) outdoor space, and (although not consistently) decreasing walking times. The utility of choosing the 'no preference' option is set to 0.0; the 'constant' in Table 7 can be considered as the base utility of each of the other two choice options. This means that students rather choose a housing alternative than the 'no preference' option from the choice sets.

All personal variables, including the demographics and the two value domains, gave significant parameters, indicating that all explained at least some of the observed

Table 7 Estimated parameters

Variable	β-estimate (significance)	SD (significance)	Nationality	Gender	Educational level	Openness to change	Self-enhancement
Constant	3.453 (0.00)	2.013 (0.00)			0.335 (0.00)		
Price							
€225	1.015 (0.00)	0.583 (0.00)	−0.154 (0.01)	−0.104 (0.03)	0.116 (0.01)	0.199 (0.00)	−0.101 (0.03)
€275	0.504 (0.00)	0.314 (0.00)			0.095 (0.02)		−0.104 (0.01)
€325	−0.307 (0.00)		0.097 (0.05)				
€375	−1.212		0.057	0.104	−0.211	−0.199	0.205
Size (m^2)							
27	0.577 (0.00)	0.453 (0.00)	0.135 (0.00)				
22	0.400 (0.00)		0.273 (0.00)			0.104 (0.01)	
17	−0.060 (0.23)				0.101 (0.01)		
12	−0.917		−0.408		−0.101	−0.104	
Kitchen							
Private	0.626 (0.00)	0.687 (0.00)		0.111 (0.03)		−0.169 (0.00)	
Shared with 1–2	0.299 (0.00)					−0.097 (0.01)	
Shared with 3–5	−0.110 (0.03)						
Shared with 6–9	−0.815			−0.111		0.266	
Bathroom							
Private	0.628 (0.00)	0.527 (0.00)		0.142 (0.00)		−0.128 (0.00)	
Shared with 1	0.124 (0.01)						
Shared with 2	−0.165 (0.00)						
Shared with 3–4	−0.587			−0.142		0.128	
Cycling time to city centre (min)							
1	0.514 (0.00)	0.333 (0.00)				0.189 (0.00)	0.146 (0.00)
6	0.340 (0.00)					0.083 (0.03)	
12	−0.140 (0.00)					−0.082 (0.03)	
18	−0.714					−0.190	−0.146

Table 7 continued

Variable	β-estimate (significance)	SD (significance)	Nationality	Gender	Educational level	Openness to change	Self-enhancement
Cycling time to campus (min)							
1	0.746 (0.00)	0.410 (0.00)	−0.280 (0.00)				
6	0.267 (0.00)					−0.085 (0.04)	
12	−0.237 (0.00)		0.126 (0.00)				
18	−0.776		0.154			0.085	
Outdoor space							
Own balcony	0.176 (0.00)						
Shared garden	0.079 (0.03)						
Shared balcony	0.036 (0.32)						
No balcony or garden	−0.291						
Walking time to supermarket (min)							
1	0.123 (0.00)						
4	0.103 (0.01)						
7	−0.118 (0.00)						
10	−0.108						
Walking time to park (min)							
1	0.124 (0.00)						
4	−0.029 (0.44)						
7	−0.055 (0.13)						
10	−0.040						

The β-estimates represent the overall part worth utilities of the attribute levels. The personal effects represent deviations from the overall part worth utilities, representing heterogeneity in housing preferences attributable to the personal variables (Table 6). Note that the value domain variables included in the model ranged from −4 (least important) to +4 (most important) in contrast to the demographics, which vary from −1 to +1. The standard deviations represent the remaining heterogeneity in preferences after taking into account the effects of the personal variables. Fourth levels (e.g. €375, 12 m^2) are calculated by summing the estimates for the first three levels and multiplying by −1

heterogeneity. Only the price attribute is affected by all personal variables; the other attributes are affected by a subset or no personal variables at all.

The mean score (part worth utility) for the lowest price level (€225) is (1.015 − 0.154=) 0.861 for Dutch students and (1.015 + 0.154=) 1.169 for foreign students. For the highest price level (€375), these values are, respectively, −1.155 and −1.269. Thus, it can be concluded that foreign students are more concerned about the price than Dutch students. Similarly, foreign students are more concerned with living close to the campus than Dutch students. On the other hand, Dutch students are more concerned with room size, showing greater preference for a room of 27 or 22 m^2 and greater aversion towards a room of 12 m^2.

Gender differences were found in the attributes price, kitchen, and bathroom. Male students were more interested in the lowest rental price, whilst female students showed substantially higher preference for having their own facilities, making the kitchen and bathroom attributes more important in their housing choices. Students studying at universities (WO) were more often found to choose an alternative over the 'no preference' option, gave somewhat more attention to low rental prices, and showed greater aversion against rooms of 12 m^2 than students of HBO or MBO institutions.

The openness to change value domain explained a relatively large amount of heterogeneity in the six most important housing attributes. Students with a relative high openness to change value orientation, compared to the average student, were found to attach relatively more utility to low price (€225), large size (22 m^2), and short cycling time to city centre (1 and 6 min). They showed greater aversion against price level of €375, rooms of 12 m^2, and cycling 12 or 18 min to the city centre. Additionally, they were less demanding regarding the kitchen and bathroom attributes. In contrast, students with a below average openness to change value orientation showed greater preference for private kitchen and bathroom facilities. Also, sharing the kitchen with only one or two housemates was slightly preferred more by those students. Furthermore, a below average openness to change value orientation was associated with greater aversion against sharing the kitchen with more than five housemates, and sharing the bathroom with three or four housemates. In contrast, these students were less bothered with cycling 6 min to campus. The other attributes (price, size, and cycling time to city centre) were considered less important by students who valued openness to change relatively low.

The value domain self-enhancement explained heterogeneity in two housing attributes: price and cycling time to city centre. Students who considered self-enhancement to be relatively important in their lives were more concerned with living close to the city centre (1-min cycling) than their counterparts. Correspondingly, they showed increased aversion against cycling 18 min to the city centre. In contrast, students with a below average self-enhancement value orientation focussed more on low prices (€225 and €275).

Although the included demographics and value domains reduce the heterogeneity in the preferences for housing attributes, still a significant portion of heterogeneity remains. Standard deviations appear to be significant for price, size, kitchen, bathroom, and cycling times. Outdoor space and walking times to supermarket and park did not show significant taste variations. Greatest random heterogeneity is found for the private kitchen. This indicates that some students rather share the kitchen with housemates than having their own kitchen.

Apart from the model with both socio-demographics (nationality, gender, and educational level) and the two human values domains presented in this article, a model including only socio-demographics and a model containing only human values were estimated. The model including solely socio-demographics gave model fit of LL (β) = −5,742.7 and

$\rho^2_{adj} = 0.434$ and the model including solely human values gave model fit of LL (β) = −5,788.0 and $\rho^2_{adj} = 0.431$. Both models performed well, but less than the full model. Most interaction effects found in the full model were approximately the same as in the models including demographics and value domains separately. Also, the mean effects were relatively similar in all models.

4 Conclusion and discussion

Students' housing preferences and individual differences within these preferences were studied using a conjoint choice experiment and a mixed logit model. Specifically, the extent in which human values, in addition to demographics, can explain the choice heterogeneity was investigated. Based on the results of the mixed logit model, it can be concluded that, generally, students consider price the most important housing attribute in housing choice decisions, followed by cycling time to the campus, room size, and kitchen sharing. These findings seem consistent with the expectations of the local student housing provider (interview with WonenBreburg). In contrast to Thomsen and Eikemo (2010), having private or shared facilities was important for students in Tilburg and Breda.

4.1 Heterogeneity in student housing preferences

The standard deviations included in the mixed logit model showed that the rank order of influential housing characteristics was not the same for everyone. To our knowledge, this is the first research indicating that heterogeneity is present in students' housing choice behaviour. This suggests that variation should be taken into account when new student housing is designed. Especially, the housing characteristics such as kitchen, bathroom, and price gave much preference heterogeneity, indicating that student housing should vary in these characteristics. In contrast, the attributes outdoor space and walking times showed little heterogeneity, indicating the relative unimportance of these attributes is applicable to all students. As a result, these housing characteristics may be of secondary interest in the development of new student housing projects. We found that both socio-demographics and human value orientation could explain at least part of the choice heterogeneity. Because most interaction effects in the full model were approximately the same as in the models including demographics and value domains separately, socio-demographics and human values appear to explain different types of heterogeneity. This indicates that socio-demographic variables cannot be replaced by human values and vice versa.

4.2 The role of socio-demographics

Based on the model results, preferences of different kinds of students in the Netherlands can be isolated. Assuming that most student cities in the Netherlands have the same kinds of students, but in varying shares, these results can help housing providers in Dutch cities to meet their students' housing preferences. With the models found, various kinds of student housing can be compared to each other to choose the one that meet student housing preferences best given the composition of the student population.

Housing for foreign students should be low priced and on or close to the campus, whilst for Dutch students' housing size is more important. If the share of female students is relatively high, more housing with private kitchen and bathrooms should be built to meet preferences. In the case of relative high numbers of male students, this is less important;

then, it is more important to build housing with low prices. Educational level explained only small differences. University students worried more about low prices and were less in favour of rooms of 12 m^2 than MBO or HBO students.

4.3 The role of human value orientation

Openness to change, which encompasses the value types stimulation, self-direction, and hedonism, was found to be most influential of all included individual characteristics. Students who indicated that openness to change was important in their lives showed a more than average concern for room size, possibly because a large room might help them to attain self-direction values such as freedom and creativity. These students also cared more about living near or in the city centre, perhaps because the many facilities and activities in a city centre support their need for stimulation (a varied life, an exciting life) and hedonism (pleasure, enjoying life). Finally, their above average preference for lower prices might be linked to all three value types in this domain (self-direction, stimulation, and hedonism) as more money will be left to do other things, which could fulfil such types of value.

On the other hand, students with a below average openness to change value orientation were, for example, found to attach considerably more value to having private kitchen and bathroom facilities. This preference for privacy may be explained by the relative unimportance that these students attach to the value type stimulation (as part of the openness to change value domain): The higher the number of housemates with whom to share facilities, the more stimulation is expected to be present.

The value domain self-enhancement, which encompasses the value types power and achievement, was found to have only moderate influence on housing choice behaviour of students. Nevertheless, students with an above average self-enhancement value orientation were, for example, found to care more about living in or near the city centre, indicating that own success was thought to be attained there. This corresponds with the finding of Jansen (2011) that people living in cities gave higher importance to power and achievement.

4.4 Socio-demographics versus human value orientation

Whilst it is argued that values are derived from demographics (Schwartz 2009a), our results seem to reflect that demographics and value domains are two distinct personal variables, at least amongst our student population. The presented full model showed only few differences in explaining preference heterogeneity compared to the models in which the socio-demographics and human values were added separately. This indicates that socio-demographics and human values explain different kinds of heterogeneity in housing preferences. Therefore, human values are thought to give additional understanding of differences in students' housing preferences on top of socio-demographics.

Additionally, the mixed logit models in which demographics and value domains were included separately indicated that values are about as sufficient as demographics in explaining individual differences: both ρ^2_{adj} values are greater than 0.4, indicating that the amount of variance explained is high. The value domain model used one variable less than the socio-demographic model, which made it somewhat easier to interpret. This is in line with Hessing and Reuling (2003) and Oppenhuisen (2000). Moreover, it was found that the model with both demographics and human values included performed best despite

correction for the number of variables. Although Jansen (2012) found some significant effects of values on residential preferences and choices after correcting for socio-demographics, she concluded that the impact of values is quite small. In contrast to Jansen (2012), we found that human values have significant impact on residential preferences in addition to socio-demographics. Individual differences in students' housing choice behaviour can be explained best with the inclusion of both variable types. Of course, it should be noted that our findings cannot be compared with Jansen's (2012) findings directly. We included only three socio-demographic variables and two value domains whilst Jansen (2012) used six socio-demographic variables and almost thirty value items. Furthermore, our study investigated students' choices.

4.5 Limitations and further research

The results are based on a population of students with relatively homogeneous socio-demographics, such as age and income. It should be addressed that other variables can come up in the explanatory model when investigating other kinds of populations. Additionally, we focussed on student housing preferences of students studying in two cities in the Netherlands. Although these students come from different areas in the Netherlands and from abroad, the findings need not hold for students in other cities. Whether our findings are also applicable to other types of housing remains speculative.

Another limitation of the study is that only a limited number of attributes can be taken into account within a conjoint choice experiment. As a result, there may be more housing attributes that influence student housing choice behaviour, than the nine attributes included in our experiment. Despite the literature review and pretest, a number of participants mentioned after the experiment that they missed more subjective characteristics such as the condition of the house, housemate's sociability, and neighbourhood safety. Additionally, the presence of a living room and distance to public transportation could influence student housing choice decisions. Third limitation is that our participants were contacted via student housing provider WonenBreburg. Therefore, our sample included only students in the cities of Tilburg and Breda that either already rented a room or were actively searching. Other students, for example students more directed towards private housing opportunities, may not have been addressed. As a result, our results may not generalise to the whole population of students. It would be interesting to study whether and how preferences differ across cities and student groups.

It should be taken into consideration that only three socio-demographic variables (nationality, gender, and educational level) were included in this study. Other socio-demographics like age, income, household type, and so on show only limited variation in a sample consisting of students. This may have affected our conclusion that value domains add predictive power to socio-demographic variables.

Despite these limitations, our experiment contributes to the understanding of students' housing preferences and corresponding choice heterogeneity in the Netherlands. Moreover, our study has demonstrated the importance of looking beyond socio-demographics when explaining or predicting choice heterogeneity, by demonstrating the potential role of human values in explaining the individual differences in people's preferences for housing characteristics. As such, our results are of potential interest to housing providers and municipalities. Student housing can be assigned to and built for particular groups of students according to their demographics and value patterns. In this way, quantitative and qualitative shortages in student housing can be reduced.

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