Preferences for long-term care services: bequests, informal care and health expectations*

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Abstract

This paper studies people's preferences for formal long-term care services provided at home, and examines how long-term care preferences relate to saving motives, such as the relative importance and type of the bequest motive, the availability of informal care, and health expectations. We use a stated choice experiment in which we ask people, who are used to a high level of long term care insurance, to choose between home care insurance plans that differ in generosity. The results show that there is viable demand for insurance that covers long-term care services at home. The willingness to pay for home care insurance is heterogeneous, depending on individual characteristics and expectations about long-term care needs. The presence of a partner, access to informal care, and a strong strategic-bequest motive reduces the willingness to pay for formal long-term care services. These results contribute to the understanding of saving behavior after retirement and design of long-term care insurance policies.

Keywords: long-term care insurance, bequest motives, health expectations, informal care, life cycle

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1 Introduction

Encouraging people to age in their homes rather than in expensive nursing homes is a priority of many OECD countries. This shift from inpatient to outpatient care is a response to rising long-term care (LTC) costs and the belief that many individuals prefer to receive LTC at home (see e.g. Swartz 2013, Costa-Font et al. 2015). At the same time, LTC reforms—especially in countries with large public LTC spending–also tend to shift part of the long-term care responsibilities to individuals and their families. Given that the availability of informal care by family members is declining because of changing family structures (Costa-Font et al. 2017), individuals — who do not meet the criteria for state provision of basic care — become more reliant on private finance to pay for professional formal care provided at home.

People can save money to self-insure against the risk of care that spans the gap between independent life at home and the nursing home. There may also be scope for insurance products, since the onset of care needs is unpredictable and the distribution of costs incurred is skewed. While the benefits of insurance are obvious in countries where private financing of LTC expenditures is important, such as the U.S., the demand for private insurance remains relatively small (see e.g. Brown et al. 2012). Yet demand for products that add supplementary benefits to basic public care at home is growing in countries such as France and Germany (Costa-Font et al. 2015). In this paper we investigate preferences for different attributes of home care insurance in order to understand demand for LTC insurance and aid the design of products that enhance the wellbeing of the elderly.

The aim of this paper is to examine the demand for home care insurance and how this relates to people's preferences and the availability of substitutes for formal care. Furthermore, we examine to which extent adverse selection may play a role in individual choice among LTC insurance policies. By fielding a discrete choice experiment in a large representative household panel, we measure the willingness to pay for different types of long term care services. These include support for home-keeping, personal care, social care, and a budget for home adaptation or supporting devices. See also De Bekker-Grob et al. (2012) on the increasing use of discrete choice experiments to elicit preferences in the field of health economics and the recent survey by Tinelli (2016) about implementing them in the field of social care and support.

The Netherlands provides an interesting setting to examine this question as Dutch people were used to a high amount of insured LTC (by the government). This adds a complementary

view to U.S. studies, where people are used to have a lot of responsibility with regard to long term care. In the Netherlands individual responsibility increases. The government aims to move care out of the nursing home into the patient's home. The rise in home care coincided with the transfer of responsibility for less-catastrophic long-term care from the national government to municipalities as of January 2015. Housekeeping services and personal care, among other things, are no longer financed by a national scheme, and the provision of care may now differ from one municipality to another. The 2015 long-term care reform was accompanied by substantial budget cuts, and thus implied a shift away from public provision to more individual responsibility. These changes to the institutions that govern the provision of LTC make it more important to understand peoples' priorities when it comes to care. Understanding heterogeneity in LTC priorities helps policy makers to make choices about the generosity of long term care insurance by the government.

We fielded the discrete choice experiment in the Longitudinal Internet Studies for the Social Sciences (LISS) in January 2016. The experiment elicits preferences for different in-kind services provided by hypothetical insurance policies. In addition to these vignettes, the survey also included questions on risk en time preferences, expectations regarding LTC needs, and different saving motives such as the relative importance of saving for a bequest or long-term care. Furthermore, the questionnaire covers the availability of informal care, such as that provided by spouses, children or neighbours. Hence, we can relate heterogeneity in preferences for different types of in-home care services to variation in preferences, expectations and other factors in order to understand not only *whether* home care insurance would be viable, but also *which type* would be demanded by different types of customers.

This paper is related to the literature on long-term care financing, particularly the literature that tries to explain the limited purchase of private long-term care insurance in countries that allow those products to be sold. Brown et al. (2012) regress the ownership of long-term care insurance among US survey participants on an extensive list of survey statements about preferences (o.a. leaving a bequest) and beliefs (o.a. the availability of informal care). They conclude that both demand-side factors and market imperfections—such as a high insurance loads or a high perceived probability of bankruptcy—explain the limited purchase of private long-term care insurance. To explain the potential demand for "improved" long-term care insurance products (in a well functioning market), Ameriks et al. (2016) elicit the stated demand for private long-term care insurance. They show that there is a considerable unmet demand for

long-term care insurance. Their results suggest that for middle and high wealth households the demand for private insurance is based on a complex interaction between individual's preferences and circumstances which are difficult to capture in a life-cycle model of saving, consumption and bequests—such as the interaction between the bequest and availability of informal care (see e.g. Pauly 1990).

Therefore, in our paper, we elicit both individual's stated preferences for private long-term care insurance, as well as a rich set of preference parameters, expectations, and substitutes for insurance, such as the availability of informal care and strength of the bequest motive. Moreover, rather than focusing on an insurance product that protects against excessive expenditures in a long-term care facility, we consider a product that covers long-term care needs at home, which might appeal a large group of elderly in several countries.

Our results show a high overall demand for in-home care insurance. Willingness to pay is high relative to an actuarially fair insurance premium for housekeeping support, a monthly supporting budget for devices, and a lump sum for home improvement. Individuals with the highest willingness to pay, ceteris paribus, have a higher income, are more often single and woman, and less often expect to receive help from family members. Individuals who expect to use in-home care for longer, conditional on needing care at all, are willing to pay more. This is consistent with adverse selection into insurance. Individuals with a bequest motive have a lower willingness to pay. The results thus suggest that in-home care services represent a different value for different people depending on individual characteristics. This contributes to the design of long-term care insurance policies to improve the wellbeing of the elderly.

2 Discrete choice experiment

2.1 Home care services

To elicit preferences for different types of home care services we fielded a survey with a discrete choice experiment. The experiment consists of hypothetical home care insurance plans. The questionnaire starts with a brief explanation of the difference between home care and a nursing home. After a major long-term care reform in 2015 the attention shifted from residential care to the provision of home care, with an increased focus on informal care provision. Access to a nursing home is only available for severe care needs.

Changes in the long-term care system for the elderly

Before answering the questions, we would like to draw your attention to the most important changes in the long-term care system for the elderly. Since January 1st 2015 the government distinguishes between two types of care:

1. Care in a nursing home (severe care needs)
   - People who require care and supervision all day are entitled to a place in an institution. This concerns severe care.
2. Home care (light or moderate care needs)
   - People whose needs are light or moderate will receive care at home.
   - Health insurance entitles people to nursing and personal care by healthcare professionals.
   - The municipality is responsible for support and guidance in housekeeping. In the provision of support and guidance in housekeeping, the municipality will decide on what someone can do him- or herself and whether informal arrangements can be made, such as with family, friends or neighbours.

Next, we ask people to imagine that they are responsible for long-term care at home. We emphasize that nursing care is covered by universal health insurance. Furthermore, we assume that the government provides a basic safety-net:

- Imagine that you are yourself responsible for long-term care at home. You can purchase long-term care insurance that entitles you to help by health care professionals (offered by either the government or an insurance company). Nursing care will be provided through your basic health insurance policy.
- There is a safety net for which you are eligible if your gross household income is lower than 16.000 Euro (for singles) or 22.500 (for multi-person households) and informal care is not available. Based on the safety net you will receive approximately 1 hour of support in housekeeping per week and 45 minutes of personal care per day.

Respondents face ten choices between two realistic insurance plans with different care levels along several dimensions. These dimensions are attributes that could improve the wellbeing of elderly with ADL problems. Consistent with the long-term care situation in the Netherlands, we selected the following attributes and corresponding levels:

- Premium, percentage of (equivalized) income (1.5; 3; 4.5; 6)
- Domestic care, hours per week (0; 2; 5)
- Personal care, minutes per day (0; 45; 90)
- Social services, hours per week (0; 5; 10)
- Home adaptations, lump-sum budget in euro (0; 4000; 8000)
- Assisting devices and services, euro per month (0; 50; 100)

A realistic range of premia is computed using an actuarial (gender-specific) pricing model of the duration of home-care use. We instruct respondents to imagine that the premium has to be paid from age 40 onward. The budget for home adaptations is based on quoted amounts on the websites of large municipalities in the Netherlands. In the survey it is mentioned that over time all amounts will be adjusted for price inflation. So, all amounts are in real terms. In line with the actual institutions that govern long-term care in the Netherlands, we used the in-home care criteria for personal care, domestic care and social services as set by the Care Assessment Centre (Centrum Indicatiestelling Zorg, CIZ). The questionnaire was tested among a small group of people to ensure that the wording used in the questionnaire was well understood.

2.2 Design of the choice situations

Each choice situation in the discrete choice experiment consists of a choice between two insurance plans with different premiums and coverage. Careful design of these situations helps to estimate preference parameters precisely. The trick of optimal design is to simulate decisions from a pre-specified model and choose combinations of attribute levels that minimize the variances of estimates obtained from the simulations. The objective to be minimized is the determinant of the asymptotic covariance matrix of the estimates, resulting in a D-efficient design (Bliemer et al. 2006). Prior information on parameters is required to construct an efficient combination of choices. Though prior estimates did not exist at the time the study was designed, naturally we assumed that respondents prefer lower premiums and higher amounts of care. Moreover, we improved robustness by introducing uncertainty into these prior estimates, generating a so-called Bayesian-efficient design (Bliemer et al. 2006).

We created a Bayesian-efficient design with 36 choice situations, divided into three blocks of twelve. Within each block we dropped two scenarios in which one alternative most clearly dominated the other. In the experiment each respondent was randomly presented one of these three blocks of ten choices. Previous research indicates that answering ten choice sets does not impose excessive burden on respondent (see e.g. Watson et al. 2017 about the quality of the design of discrete choice experiments and response rates).

Two additional randomizations were carried out across respondents. These were (1) the order in which we presented the 10 choice situations, and (2) the order of the attributes, except for the premium. The premium was always presented first, because we want the price of insurance to be equally salient in all decisions. Figure 1 shows an example of a choice set.

Figure 1: Example of a choice set

	Plan A	Plan B
Montly premium per person	90 euro	130 euro
Hours domestic care per week	0 hours	2 hours
Minutes personal care per day	60 minutes	0 minutes
Hours social care per week	5 hours	10 hours
Budget for devices per month	50 euro	100 euro
Budget for home adaptations	8000 euro	4000 euro

Which of these plans would you choose?	
Plan A	
Plan B	

Since we are interested in people's relative preferences for different attributes (rather than the decision whether or not to acquire a product), we did not include an opt-out option in the experiment, as people have the tendency to choose an opt-out when they have to make a complex decision (Veldwijk et al. 2014). Instead, after the discrete choice experiment we asked respondents about their willingness to buy a similar in-home care insurance product to the packages presented in the experiment. As a sensitivity check, we estimated whether results differed between respondents in both groups.

2.3 Model

To approximate preferences for attributes of LTC in a flexible way we use a mixed logit model; detailed descriptions of the mixed logit can be found in Revelt & Train (1998) and in Train (2003). A mixed logit model is appropriate for the setting of a stated preference experiment, because it allows for differences in tastes between individuals. Variation in preferences is a key aspect of modelling repeated choices of the same respondents. Formally, the utility individual i derives from choosing alternative j from choice set t is given by:

$$U_{ijt} = \mathbf{x}'_{ijt}\boldsymbol{\beta}_i + \varepsilon_{ijt}; \quad j = 1, 2; \quad t = 1, 2, ..., 10 \tag{1}$$

Here $\mathbf{x}_{ijt}$ is a vector of attributes, $\boldsymbol{\beta}_i$ is a vector of preference parameters and error ε_{ijt} is assumed to follow a type 1 extreme value distribution. Since the errors ε_{ijt} are independent across the different choice scenarios faced by an individual, the standard logit with fixed $\boldsymbol{\beta}$ restricts all differences in tastes to be independent across the sequence of choices. The mixed logit model allows the preferences for attributes, $\boldsymbol{\beta}_i$, to be random and vary across individuals, inducing correlation between answers (e.g. an individual may show a preference for domestic care in all scenarios, while someone else prefers social services). We specify the mixing distribution of preferences to be multivariate normal and allow for correlations between preference parameters in some specifications. Estimation proceeds by Maximum Simulated Likelihood and 500 Halton draws are used to integrate over the mixing distribution.

The mixing distribution of preferences captures variation in the population and does not condition on observed decisions. The richness of the data, which contain 10 scenarios for each individual, allows this prior distribution to be combined with observed choices to construct a much narrower posterior distribution for the preferences of each individual in the sample. We approximate individual-specific preferences by the means of these posterior distributions and analyze how they vary with observed characteristics of respondents.

3 Data

3.1 LISS panel

We field the discrete choice experiment in the Longitudinal Internet Studies for the Social Sciences (LISS) panel in January 2016. LISS is an internet-based household panel of approximately

4500 households that is representative for the non-institutionalized Dutch population. It is administrated by CentERdata that is affiliated to Tilburg University. CentERdata uses several approaches to safeguard the representativeness of the panel. First, households are recruited through address-based sampling to avoid self-selection into the panel. Second, household members receive an incentive if they complete a questionnaire which keeps attrition to a minimum. Third, households without a computer or internet connection are provided with a computer and internet connection.

We fielded our questionnaire to all panel members aged 40 years and older (i.e. the head of household and spouse) who have non-zero household income. The response rate was 86 percent which provided us with a sample of 2444 respondents of which 2412 respondents complete the questionnaire. In the empirical analysis we exclude 30 persons who reported to receive personal care at home at the time of the questionnaire, leaving us with a final sample of 2382 respondents. Descriptive statistics of sociodemographic variables can be found in Appendix A.

3.2 Survey questions

In addition to the discrete choice experiment we fielded a survey to measure expectations about future home care use, the availability of informal care, non-medical expenditures, and bequest motives.

Expectations about future home care needs.— Adverse selection is a problem in many insurance markets and LTC insurance is likely to be no exception. Purchasers of insurance may have private information on their likely future use of LTC, for instance based on their family history or their current health. We measure respondents' subjective expectations of future home care use to incorporate this into our models of preferences for insurance. The literature on subjective expectations has shown that beliefs can be elicited as probabilities, which helps to make answers comparable across individuals (Manski 2004, Hurd 2009). However, survey respondents may find it hard to report on a probability scale, especially when the subject is abstract or lacks salience. Therefore, we elicited expectations of future care use by means of both qualitative and quantitative questions. The qualitative questions ask respondents whether they expect to receive (formal or informal) care at home for a longer or shorter period in comparison to the average for individuals of the same age and gender. As can be seen in Table 1a, respondents expect not to spend a long time in care relative to their peers: 61 percent expect to be close to the average, while 30 percent expect to receive care for a relatively short period and only

Table 1: Descriptive statistics home care use expectations

a. Qualitative expectations

Expected home care use relative to average for gender/cohort

	Own		Partner's[a]	
	Mean	SD	Mean	SD
(1) Much shorter	0.06	0.24	0.05	0.23
(2) Shorter	0.24	0.43	0.22	0.41
(3) Average	0.61	0.49	0.62	0.48
(4) Longer	0.08	0.27	0.11	0.31
(5) Much longer	0.00	0.00	0.00	0.00
N	1901		1393	

b. Quantitative expectations

Expected home care use (years)

	Mean	SD	p25	p50	p75
Median – own care [b]	2.6	2.7	0.6	1.0	5.0
IQR – own care [b]	3.3	3.1	0.6	2.2	5.2
N	1513				
Median – both care [c]	1.5	1.5	0.5	0.7	2.0
IQR – both care [c]	1.9	1.8	0.5	0.7	3.3
N	1155				

[a] Based on 1393 observations for individuals who live with a partner.
[b] Based on 1513 observations who report subjective probabilities that are internally consistent.
[c] Expected number of years that the respondent expects to need care for his/her own and for his/her partner (simultaneously). Based on 1155 observations for individuals who live with a partner and report subjective probabilities that are internally consistent.

8 percent expect to receive care longer than average. This tendency to expect a below rather than above-average care duration extends to one's partner, for which qualitative expectations are similar in the aggregate.

The quantitative questions ask respondents to indicate the probability that they will need home care for more than 1, 3, 5, 7 and 9 years. By linear interpolation between these five probabilities we construct a distribution that characterizes beliefs for each respondent. Next, for each subjective distribution we compute summary statistics such as the median and Inter-Quartile Range (IQR). Table 1b shows that the average respondent reports a median expected duration of 2.6 years and that 75% of respondents report medians below 5 years (that was the average actual lifetime use of home care in 2006). Moreover, the reported uncertainty is substantial with an average IQR of 3.3 years. Both uncertainty and the median duration vary widely across the sample, with standard deviations of 3.1 and 2.7 years respectively. We also ask respondents with a partner to indicate the probability that they will need home care simultaneously for more

Table 2: Descriptive statistics informal care

Availability of informal care by someone else than partner	Overall		Children	No children
	Mean	(SD)	Mean	Mean
Definitely	0.06	(0.24)	0.06	0.03
Probably	0.17	(0.38)	0.19	0.11
Maybe	0.32	(0.47)	0.34	0.25
Probably not	0.30	(0.46)	0.29	0.36
Definitely not	0.15	(0.35)	0.13	0.26
N	1901		1604	297

than 1, 3, and 5 years. On average, respondents with partners expect the median period during which both partners require care to be 1.5 years.

The literature has shown that people who do not have experience with LTC have difficulties to form expectations. For instance Coe et al. (2015) show that long-term care use of parents increases the purchase of LTC insurance. This result suggests that providing information about home care use might result in more realistic expectation. To test this hypothesis we provided a random two-thirds of the sample with information on average home care use among the Dutch population. We included the following information intervention in the questionnaire before measuring respondents' subjective expectations of future home care use:

To give an idea about home care use:

- About 7 percent of persons aged 65 to 80 received formal home care, and 32 percent of persons above age 80 received formal home care in 2014.
- The average lifetime use of home care was 5 years (3.1 years for men en 6.5 years for women) in 2006.

We find that providing information significantly increases expected home care use (see Appendix D). For the qualitative measures the intervention raised both own expected home care use and that of the partner relative to the gender/cohort average. The sizes of these effects are 0.14 and 0.09 respectively on the 5-point scale that was shown in Table 1a. The quantitative measures show that the information increased the average subjective median by 0.3 years, but it did not affect uncertainty or the expected length of the period during which both partners require care. Given that respondents tend to expect to use home care for a relatively short period, such upward revisions probably lead to more realistic expectations in the aggregate.

Availability of informal care.— The availability of informal care may lower the demand for

Table 3: Descriptive statistics medical and non-medical expenditures

When I am in need of home care, expenditures will...		
	Mean	(SD)
...strongly decrease	0.09	(0.29)
...decrease	0.07	(0.26)
...stay constant	0.08	(0.27)
...increase	0.31	(0.46)
...strongly increase	0.45	(0.50)
N	1901	

home care insurance. We asked respondents whether they expect their family or relatives to provide informal care. Table 2 shows that respondents are not very hopeful that they can rely on other informal care-givers than their partner. 45% of the respondents indicate that such care will "definitely" of "probably" not be available. Only 23% expect to receive informal care and the remaining third of the sample expresses substantial uncertainty. This outlook is different for individuals with and without children: 25% of those with children and 14% without children expect that informal care will be available, while 42% and 62%, respectively, expect this will not be the case.

Expenditures. — The demand for home care insurance may also be driven by the effect of long-term care on overall, medical plus non-medical, expenditures. This effect may vary across individuals, since some people might cut back expenditures on hobbies that are no longer feasible while being sick, whereas others did not have expensive hobbies and suddenly incur out-of-pocket medical costs. Table 3 shows that three quarters of respondents expect that total expenditures will *increase* when they need care. Only 16% expect that expenditures will decline.

Relative importance of the bequest motive.— The demand for home care insurance may depend on bequest motives. Lockwood (2018) shows that when bequests are luxury goods, bequest motives decrease the demand for long-term care insurance. That is because bequest motives reduce the opportunity cost of precautionary saving. On the other hand, uncertainty about long term care costs exposes bequest to a considerable risk. When people are risk averse over bequest, bequest motives increase the demand for long term care insurance. Following Ameriks et al. (2011) we measure the relative importance of bequest and precautionary motives to save through a vignette question. Respondents are placed in a hypothetical situation in which they divide 100 thousand euro over two lock boxes that represent bequests and long-term care.

Table 4: Descriptive statistics bequest motive

a. Strength of bequest motive[a]

	Mean	SD
Fraction of windfall in bequest box (%)	48	27
Fraction = 0%	0.10	0.30
1-20%	0.09	0.29
21-49%	0.15	0.36
50%	0.33	0.47
51-80%	0.24	0.43
81-99%	0.03	0.16
100%	0.05	0.23
N	1901	

b. Intended recipient(s) (if bequest>0)[b]

	Mean	SD
Partner	0.76	0.43
Children	0.73	0.44
Other family	0.15	0.36
Friends	0.07	0.25
Charity	0.15	0.35
Other	0.03	0.17
N	1693	

c. Conditionality[c]

	Mean	SD
Strategic	0.15	0.35
Most needy	0.27	0.44
No conditions	0.61	0.49
Other	0.05	0.21
N	1374	

[a] Respondents are asked to divide 100 thousand euro over two lock boxes that represent bequests and long-term care. [b] Based on 1693 observations that allocate a positive share of the windfall to the bequest box. [c] Based on 1374 observations who intend to leave a positive bequest to someone else than partner or charity.

The money in the bequest box will be left to the respondent's relatives after their death. The long-term care box can only be used to buy supplementary private care for the respondents or their partners. The money in this box will not be part of a bequest.

Panel a. of Table 4 shows how respondents divide their budget over the two boxes. Respondents mostly split the budget over both: only 15% allocate all money to either bequests or care. One third divide the money evenly over the boxes and another 39% are between a 50/50 and 20/80 split, suggesting that most people care about saving for both bequests and long-term care. Moreover, the data reveal substantial heterogeneity in preferences. The distribution of the relative importance of preferences is comparable to that of Ameriks et al. (2011) who conducted the survey on single elderly in the US. Separating the sample into those with and without children shows that respondents who have children tend to allocate a larger share of the windfall in the bequest box.

After dividing 100 thousand euro between bequests and LTC, respondents were also asked to divide the money in the bequest box among family, friends, charity and other recipients. Table 4b shows how respondents divided their bequest over these groups. For each type of recipient we define a dummy equal to one if an individual intends to leave a positive amount to that type (so, the categories are not mutually exclusive). Members of the nuclear family are by far the most likely to receive a positive inheritance: 76% of the respondents want to leave money to their partner and 73% to their children. 15% intend to leave a bequest to other family or charity and only 7% intend to give to friends. Furthermore, respondents without children more often include charity and friends among recipients.

Panel c. of Table 4 divides respondents into groups according to the type of bequest motive. These motives were only elicited if the respondent allocated a positive bequest to recipients other than the partner or charity. Moreover, respondents could choose multiple motives, so categories are not mutually exclusive. Panel c. shows that 15% of the respondents who have a bequest motive indicate that they consider to give a larger bequest to individuals who provide them informal care (strategic bequest motive). Interestingly, this proportion is somewhat larger for people without children who depend on others in the provision of informal care. Though some people do indicate strategic considerations, most either divide according to the needs of the recipients (27%) or do not formulate conditions and divide the money equally (61%).

4 Results

4.1 Mixed logit estimates

Table 5 shows the estimation results of the mixed logit models that we use to map sets of ten choices between two insurance products into preferences for different types of care and support for each individual. We consider three different specifications for the mixing distribution. Models (1) is our preferred model (as from now the baseline model). It has a fixed coefficient on price, which means that all respondents dislike paying higher premiums equally. The other coefficients are random and multivariate normal, allowing for correlations between tastes. For comparison, model (2) and (3) restrict the coefficients to be uncorrelated, and model (3) includes a random coefficient for the premium.

The parameters of the multivariate normal mixing distributions are estimated extremely precisely: all paramaters are significant at 1%. The means of all coefficients have the expected sign. Individuals dislike paying high premiums and on average they put positive value on domestic, personal and social care as well as on a monthly budget for devices and a lump-sum for adaptation of one's house. The standard deviations show that there is considerable variation among respondents in their preferences for the attributes.

While estimates are very similar for all three models, we prefer model (1) and will focus on those estimates in the remainder of the paper. We prefer model (1) over (2), because panel b. of Table 5 shows that tastes for different dimensions of care are positively correlated. Hence, independent mixing distributions are not appropriate. Model (1) also has an edge over model (3), because the random coefficient on price in model (3) yields unrealistically high Willingness To Pay (WTP) for some part of the distribution. These considerations matter only for quantities that are derived directly from the mixing (prior) distribution, without any additional information. The posterior means used to analyze preference heterogeneity conditional on the ten observed choices for an individual, which contain a lot of information about that person's preferences.Table B1 in Appendix B shows that correlations between posterior means computed from these three sets of estimates are strongly correlated (correlation coefficients are between 0.5 and 0.99). Hence, once choices are taken into account the exact specification for the prior distribution of preferences becomes less important and results are robust across the three specifications in Table 5.

Table 5: Estimated parameters of the mixed logit models

a. Estimates of normal mixing distribution for preferences						
	(1)		(2)		(3)	
	Corr. preferences		Uncorr. preferences		Random coefficient on price[b]	
Mean						
Price (Euro)	-0.0157***	(0.000657)	-0.0146***	(0.000629)	-0.0175***	(0.000818)
Domestic care (hrs/wk)	0.281***	(0.0105)	0.266***	(0.00949)	0.282***	(0.0101)
Personal care (hrs/wk)	0.162***	(0.00630)	0.144***	(0.00550)	0.153***	(0.00582)
Social care (hrs/wk)	0.0398***	(0.00443)	0.0302***	(0.00397)	0.0264***	(0.00431)
Devices (Euro/month)	0.00400***	(0.000318)	0.00390***	(0.000291)	0.00435***	(0.000318)
Housing (Euro)	8.89e-05***	(4.82e-06)	8.27e-05***	(4.63e-06)	8.88e-05***	(5.05e-06)
Standard deviation						
Price	–	–	–	–	0.0230***	(0.00109)
Domestic care	0.315***	(0.0115)	0.243***	(0.00902)	0.224***	(0.0104)
Personal care	0.191***	(0.00695)	0.149***	(0.00566)	0.127***	(0.00678)
Social care	0.138***	(0.00580)	0.0845***	(0.00508)	0.0897***	(0.00546)
Devices	0.00680***	(0.000561)	0.00458***	(0.000647)	0.00544***	(0.000621)
Housing	_[a]	_[a]	0.000153***	(6.11e-06)	0.000173***	(6.85e-06)
Individuals	2412		2412		2412	
Log-likelihood	-14,364.72		-14,567.78		-14,259.74	

b. Correlation matrix model (1)				
	Domestic care	Personal care	Social care	Devices
Domestic care	1			
Personal care	0.527***	1		
Social care	0.620***	0.646****	1	
Devices	0.530***	0.408***	0.697***	1

Robust standard errors in parentheses; *** p<0.01

[a] In model (2) with correlated random coefficients the Cholesky factors for housing are so small that numerical issues prevent us from calculating the standard deviation and its standard error. For this reason we cannot calculate the correlations that involve housing in panel b.

[b] In model (3) random parameters are assumed to be uncorrelated. The fraction with negative preference for higher prices (premiums) is estimated to be $\Phi\left(\frac{-0.0175}{0.0230}\right) = 0.78$ (SE = 0.011).

Table 6: Average willingness-to-pay for attributes

a. Willingness-to-pay (WTP) derived from the baseline model (normal mixing distribution

	Actuarial premium[a]	Mean[b]	(SE)	WTP ≥ premium (%)	(SE)
Domestic care (1 hr/wk)	8.43	17.93	(0.79)	68	(1.1)
Personal care (1 hr/wk)	11.39	10.30	(0.44)	46	(1.5)
Social services (1 hr/wk)	5.23	2.54	(0.27)	38	(1.4)
Devices (100 Euro/month)	9.73	25.48	(2.02)	64	(1.8)
Housing (1000 Euro once)	1.25	5.66	(0.34)	67	(1.2)
In-kind: at least one WTP ≥ premium				89	(0.9)
Financial: at least one WTP ≥ premium				90	(1.1)
At least one WTP ≥ premium				99	(0.2)

b. Estimates for subsamples that WOULD and WOULD NOT consider buying home care insurance

		WOULD				WOULD NOT			
	Actuarial premium[a]	Mean[b]	(SE)	WTP ≥ premium (%)	(SE)	Mean[b]	(SE)	WTP ≥ premium (%)	(SE)
Domestic care (1 hr/wk)	8.43	23.76	(1.44)	76	(1.5)	12.96	(0.87)	60	(1.6)
Personal care (1 hr/wk)	11.39	14.15	(0.81)	58	(2.0)	6.89	(0.48)	33	(2.3)
Social services (1 hr/wk)	5.23	3.60	(0.42)	43	(1.9)	1.55	(0.34)	32	(2.0)
Devices (100 Euro/month)	9.73	28.37	(3.22)	66	(2.7)	22.74	(2.55)	62	(2.4)
Housing (1000 Euro)	1.25	7.84	(0.58)	75	(1.7)	3.81	(0.41)	60	(1.7)
In-kind: at least one WTP ≥ premium				88	(1.1)			75	(1.6)
Financial: at least one WTP ≥ premium				86	(2.3)			83	(2.8)
At least one WTP ≥ premium				100	(0.0)			100	(0.0)

[a] Actuarially fair monthly premium based on premium payment from age 40 up to first claiming (or death) with waiting period of 1 year during which the contract is cancelled if the need for care would arise. Price of domestic care is 20 Euro/hr; price of personal care is 27.02 Euro/hr; price of social services is 12.41 Euro/hr. Prices for personal care and social services are taken from "personal budget" (PGB) for 2014, see https://www.nationalehulpgids.nl/forms/PGBWeektarieven2011-2015.pdf. Actuarially fair premiums are calculated using tools provided by a large insurance company.

[b] Mean willingness to pay as a monthly premium for the various services listed in the table. E.g. on average respondents would be willing to pay a monthly premium of €18.25 from age 40 onward in order to receive 1 hour of domestic care per week. Loading factor: 18%, discount rate 2%.

4.2 Willingness to pay

Table 6 shows Willingness-To-Pay (WTP) estimates, computed from the estimated mixing distribution for the baseline model (model (1)).[1] Given that the price coefficient is not random in the baseline model, the normal marginal distributions for the attributes yield straightforward normal marginal distributions for WTP. Table 6 summarizes the distribution of WTP by means of its expected value. The table also lists the actuarially fair insurance premiums that would be charged for annuities that cover the price of each attribute in order to aid interpretation of the magnitudes of the estimates. An hour of domestic care, for instance, costed about 14 euros in 2015 according to the government website "National Care Guide". Using a calculation tool provided by a large insurance company, we calculate that the corresponding premium as from the age of 40 year is 8.43 euros per month (which would cover one hour per week at a price of $14 \times 52/12 = 60.67$ Euros per month). The average WTP is 18 euros per month, so according to our estimates the average individual would buy a realistically priced insurance that covers domestic care. Indeed, 68% of the population is simulated to have a WTP at or above the market price. Similarly, 64% would be interested in buying an insurance that provides

[1] The WTP of attribute k is minus one time the ratio of the coefficient of the attribute and that on price $WTP^k = -\beta^k/\beta^{Price}$

a monthly budget of 100 Euros when one is need of home care, to buy support equipment. A lump-sum of 1000 Euros to improve the comfort and suitability of one's house would be attractive for 67% of the respondents. For personal care and social support the average WTP is only 10.30 Euros and 2.54 per month, respectively. These averages are lower than the actuarial premiums and, as expected, the share of respondents with a WTP larger than the actuarial fair premiums is relatively low (46% for personal care and 38% for social support). The low WTP for social support may be due to the fact that social support can be substituted with informal care fairly easily (if informal care is available[2]). Informal care substitution is much more difficult for personal care so, surprisingly, personal care is valued relatively low. Taken together, the estimates show that 100% of the respondents have a WTP that exceeds the market premium for at least one dimension of coverage.

After the discrete choice experiment we asked respondents whether they would be interested to buy any in-home care insurance product similar to the packages presented in the experiment, or whether they would take the risk that they have to buy home care themselves and/or to use informal care. 52% of the sample reports being interested in buying insurance. If the discrete choice experiment measures meaningful preferences for the different dimensions of care, we would expect them to have substantially higher WTP's. Table 6b shows that this is indeed the case. The average WTP's of the sample that is interested in insurance are about twice as high as the WTP's for the subsample that is not interested in insurance. Interestingly, the gap is much smaller for the monthly annuity. This result is in line with the fact that a large majority of respondents expect expenditures to increase once they need care (Table 3).

The mixed logit models in Table 5 and the corresponding WTP estimates in Table 6 capture preference heterogeneity by means of continuous (multivariate normal) distributions. In order to assess the robustness of the results, we also modeled the population as consisting of a finite set of discrete types or latent classes. Each such type has different preferences, which are estimated jointly with the fraction of the population that belongs to that class. These latent class models allow us to relax the parametric restrictions of a pre-specified mixing distribution, at the cost of many additional parameters to be estimated. Appendix C presents the WTP's of these models. While the estimates from latent class models are considerably less precise, they reveal similar qualitative patterns as the mixed logit model.

[2]In section 4.4 we will relate the WTP for social support to the availability of informal care on the individual level

4.3 Decreasing returns to scale

In sections 4.1 and 4.2 we assumed a linear relationship between the number of hours of care (or the euros received for devices and housing) and the utility derived from this care (or euros). However, we expect that there are decreasing returns to scale. Therefore, we estimate an extended model, with the several levels of care that were used in the discrete choice experiment. The estimation results in table 7 show indeed decreasing returns to scale. For example, the coefficient for five hours of domestic care per week is higher than the coefficient for two hours, but the first two hours give substantial more utility than the additional three hours of domestic care. The same holds for personal care, devices and housing. Only, for social care we see a relatively low coefficient, which does not increase with the number of hours. In line with table 6 the WTP for social care is low, and apparently it does not increase with the number of hours.

In line with table 5, the standard deviations in table 7 show that there is considerable variation among respondents in preferences for the attributes. Interestingly, the standard deviations increase with the number of hours of care, indicating that the variation in preferences increases with the number of hours of care. So, people agree more about basic levels of care than about higher amounts of care. Only, the variation in preferences stays about the same for an annuity of 50 or 100 euro per month when in need of home care. Figure 2 shows the corresponding WTP's and the fraction of respondents with a WTP above the actuarial fair premium. Again, as in table 6, we distinguish between respondents who would and would not consider buying home care insurance, and find that those who are interested in home care insurance have substantial higher WTP's than those who are not interested (figure 3).

4.4 Heterogeneity in preferences

To better understand preferences for home care insurance, we relate individual specific WTP estimates on demographics, and other variables such as risk aversion, care expectations and the bequest motive. Table 8 shows the results for domestic care, personal care and social services. We find that females have a higher WTP for domestic care insurance than man (+1.28 euros, compared to the actuarial fair premium of 8.43 euros), but there are no significant gender differences for the other types of care. Respondents who live with a partner have a substantial lower WTP for domestic care insurance (-4.18 euros), probably because they expect informal care from their partners that can substitute for domestic care (but not for the other types of care). Age is not significantly related to the WTP for domestic and personal care. However,

Table 7: Estimated parameters of the mixed logit models

a. Estimates of normal mixing distribution for preferences				
	(1) Uncorr. preferences		(2) Corr. preferences	
Mean				
Price (Euro)	-.0135352***	(0.000629)	-.0190261***	(.0008754)
Domestic care (2 hrs/wk)	.7608019***	(0.00949)	1.15894***	(0.0105)
Domestic care (5 hrs/wk)	1.048277***	(0.00949)	1.577855***	(0.0105)
Personal care (45 hrs/day)	.9715438***	(0.00550)	1.569113***	(0.00630)
Personal care (60 hrs/day)	1.045177***	(0.00550)	1.751126***	(0.00630)
Personal care (90 hrs/day)	1.116957***	(0.00550)	1.842448***	(0.00630)
Social care (5 hrs/wk)	.2621277***	(0.00397)	.3770999***	(0.00443)
Social care (10 hrs/wk)	.1885024***	(0.00397)	.364563***	(0.00443)
Devices (50 Euro/month)	.224811***	(0.000291)	.3124309***	(0.000318)
Devices (100 Euro/month)	.3240995***	(0.000291)	.5173506***	(0.000318)
Housing (4000 Euro)	.4526736***	(4.63e-06)	.7254515***	(4.82e-06)
Housing (8000 Euro)	.4904957***	(4.63e-06)	.7678658***	(4.82e-06)
Standard deviation				
Price	–	–	–	–
Domestic care (2 hrs/wk)	-.0008572***	(0.00949)	1.026315***	(0.0105)
Domestic care (5 hrs/wk)	.6895641***	(0.00949)	1.878685***	(0.0105)
Personal care (45 hrs/day)	.0117067***	(0.00550)	1.845312***	(0.00630)
Personal care (60 hrs/day)	.0013605***	(0.00550)	1.995087***	(0.00630)
Personal care (90 hrs/day)	.9272401***	(0.00550)	2.229025***	(0.00630)
Social care (5 hrs/wk)	-.000566***	(0.00397)	.9089466***	(0.00443)
Social care (10 hrs/wk)	-.3258932***	(0.00397)	1.500562***	(0.00443)
Devices (50 Euro/month)	.0076383***	(0.000291)	.5941668***	(0.000318)
Devices (100 Euro/month)	.091602***	(0.000291)	.5762374***	(0.000318)
Housing (4000 Euro)	-.1754053***	(4.63e-06)	1.065022***	(4.82e-06)
Housing (8000 Euro)	.7153044***	(4.63e-06)	1.593672***	(4.82e-06)
Individuals	2412		2412	
Log-likelihood				

b. Correlation matrix model (2)					
	Domestic care (5 hrs/wk)	Personal care (90 hrs/day)	Social care (10 hrs/wk)	Devices (100 Euro/month)	Housing (8000 Euro)
Domestic care (5 hrs/wk)	1				
Personal care (90 hrs/day)	.116**	1			
Social care (10 hrs/wk)	.472***		1		
Devices (100 Euro/month)	.378***			1	
Housing (8000 Euro)	.163***				1

Robust standard errors in parentheses; *** p<0.01

[a] In model (2) with correlated random coefficients the Cholesky factors for housing are so small that numerical issues prevent us from calculating the standard deviation and its standard error. For this reason we cannot calculate the correlations that involve housing in panel b.

[b] In model (3) random parameters are assumed to be uncorrelated. The fraction with negative preference for higher prices (premiums) is estimated to be $\Phi\left(\frac{-0.0175}{0.0230}\right) = 0.78$ (SE = 0.011).

Figure 2: Willingness to pay for LTC services

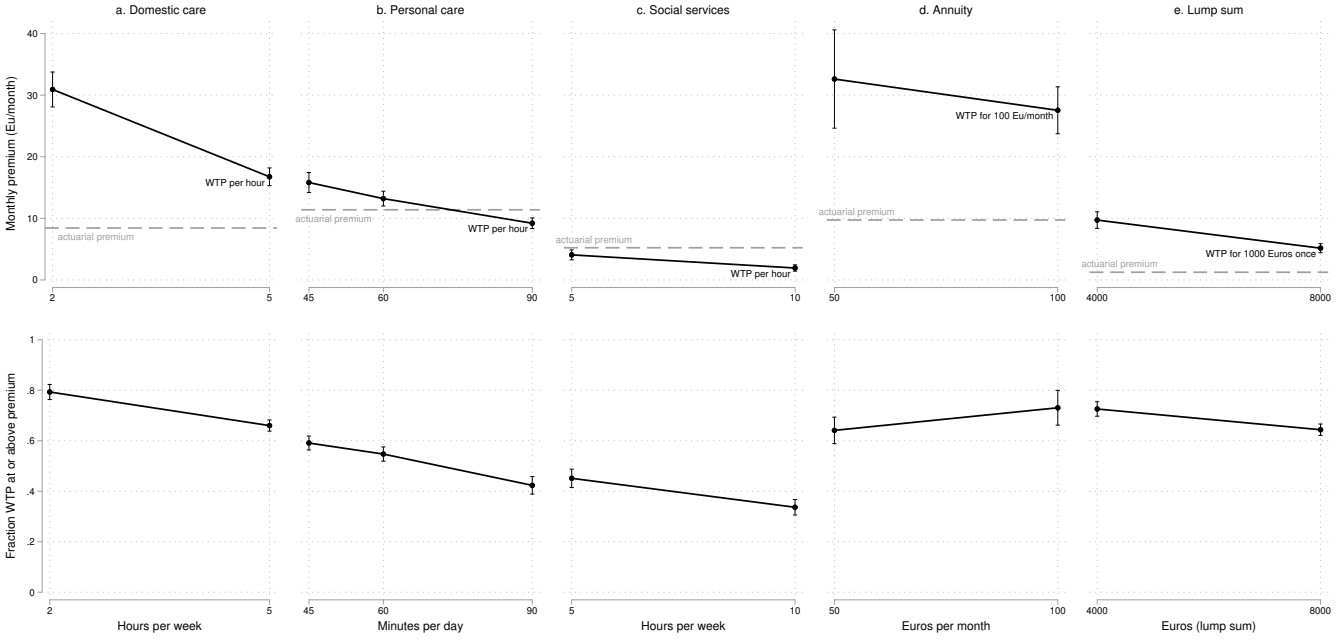
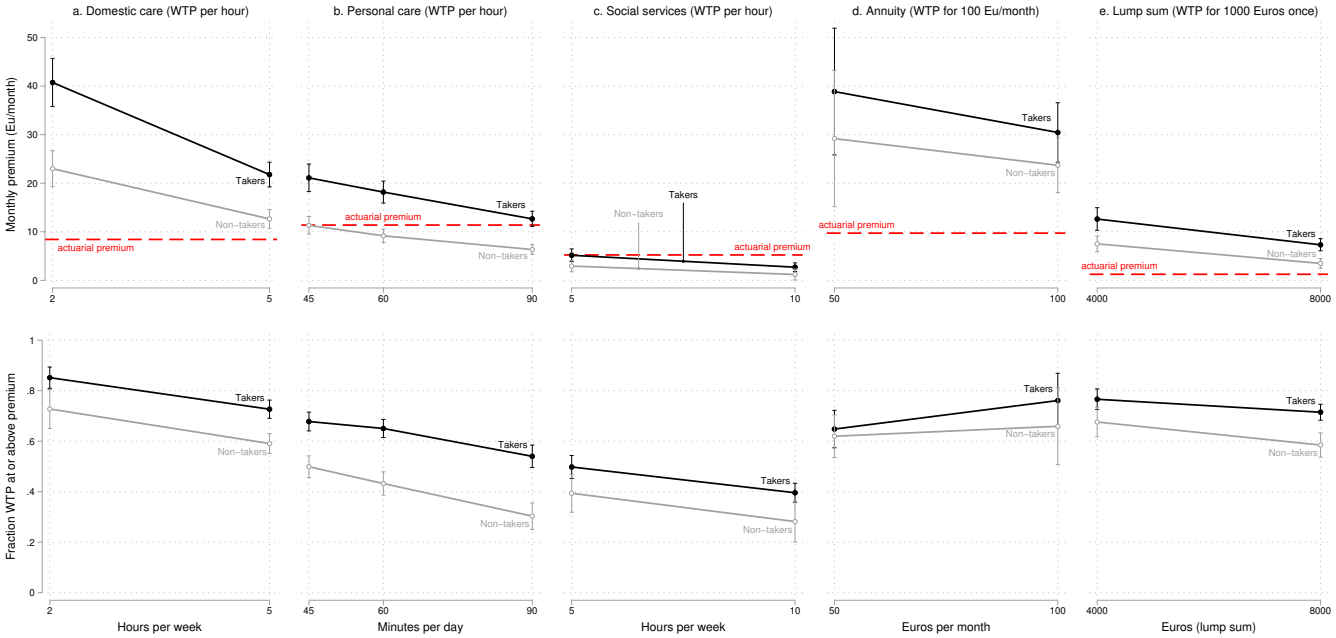


Figure 3: Willingness to pay for LTC services, takers and nontakers



for social services we find an U-shape, with the minimum WTP at the age of 64. Respondent with children have no significantly different WTP's compared to respondents without children, but those who feel sure about the availability of informal care (often from children) have on average a 3.07 euros lower WTP for domestic care insurance than those who do not expect any informal care. Homeowners have a significantly higher WTP for personal care, maybe because this may give them the opportunity to stay at home longer. Log net household income has significantly positive coefficients, indicating that income-rich households have stronger preferences for insurance covering all three types of care. On the one hand they can afford more care, but also the fact that they are further away from the safety net may induce demand for home care insurance. Regarding preferences, we find that more risk averse people have higher WTP's for all types of care. Respondents with a high bequest motive (relative to putting money away in a long term care box), have a significantly lower WTP for all three types of care insurance. This may indicate that a bequest is considered a luxury good (in line with Lockwood (2018)), but it may also be that those who put a lot of money in the bequest box just do not find long term care very important.[3]. The type of bequest motive (warm glow, strategic, altruistic, or other) is not significantly related to the demand for home care insurance. Surprisingly, those with average expectations about home care use have the highest WTP's for domestic and personal

[3]When we use a more general variable for bequests, which is available for halfof the observations, we do not find a significant relationship between bequests and home care insurance

care. Respondents who choose the average may be those who are most uncertain about home care use and therefore insurance may be interesting for them. Informal care givers have a higher WTP for domestic, personal and social care. They are probably more aware of the importance of home care and the burden associated with informal caregiving.

In table 9 we relate WTP's for financial transfers and the overall willingness to buy home care insurance to demographics, preferences and expectations. We do not find significant coefficients for gender and having a partner. The demand for a monthly annuity in case of home care needs follows a U-shape over age, with a minimum at the age of 64 (the same as for the insurance for social services). Older respondents are less interested in financial support to make their home care-proof. Maybe these older people have already made the required adjustments or chosen to move to an appropriate dwelling. Income and education are not significantly related to WTP's for financial transfers, but income-rich and higher educated respondents do more often consider buying home care insurance (they are relatively more interested in an insurance for domestic, personal and social care). Risk averse respondents have a higher WTP for the monthly annuity (+0.97 euro, compared to an actuarial fair premium of 9.73 euro), and consider buying home care insurance more often. Impulsive respondents are less interested in buying home care insurance products. In line with the results for care, a high bequest motive relative to long term care reduces the WTP's for insurance and the overall willingness to buy home care insurance. Expectations about home care use show no clear relation with the demand for home care insurance, but those who expect expenditures to increase in bad health have a higher demand for the housing lumpsum. Informal care givers have a substantial higher WTP for the monthly annuity in bad health. Informal care givers maybe better in imagining themselves in the situation of bad health, as they are more confronted with people in bad health.

Table 8: Preferences for domestic care, personal care and social services

	Dependent variable: WTP for home care					
	Domestic care		Personal care		Social services	
	(1)		(2)		(3)	
Demographics						
Female	1.283*	0.66	0.514	0.405	0.134	0.275
Partner	-4.183*	2.144	-1.819	1.33	-0.895	0.893
Age/100	-40.09	27.35	-16.74	15.61	-26.25**	10.86
Age squared/100	0.321	0.224	0.116	0.127	0.205**	0.0882
Children	-0.978	0.95	-0.711	0.572	-0.465	0.395
Homeowner	0.346	0.823	1.163**	0.501	0.413	0.344
Log net HH income	2.743***	1.001	1.865***	0.625	1.003**	0.419
Low gross HH income	1.078	1.339	0.684	0.818	0.807	0.541
Education – vocational	-2.007**	0.791	0.548	0.484	0.0424	0.335
35						
Education – university	-1.345	0.869	0.189	0.534	-0.111	0.364
Health – no problems	0.353	0.953	0.898	0.577	0.491	0.389
Preferences						
Risk aversion (scale 1-7)	0.852***	0.231	0.296**	0.146	0.254***	0.0979
Patience (scale 1-7)	0.225	0.241	0.0474	0.146	-0.00931	0.1
Impulsiveness (scale 1-7)	-0.0328	0.271	-0.0603	0.17	-0.0725	0.115
Strength bequest motive (percent of windfall allocated to bequest; baseline: 0%)						
Bequest motive – no	-2.306	1.551	0.725	1.004	-0.202	0.662
Bequest motive – 21-49%	0.901	1.325	1.744**	0.812	0.681	0.562
Bequest motive – 50%	-1.151	1.201	-0.18	0.749	-0.126	0.513
Bequest motive – 51-80%	-0.12	1.282	0.07	0.785	0.153	0.538
Bequest motive – 81-99%	-4.679*	2.616	-4.064**	1.618	-0.967	1.143
Bequest motive – 100%	-5.250***	1.808	-3.009**	1.206	-2.062***	0.786
Expectations						
Availability informal care by someone else than partner (baseline: definitely not)						
Definitly	-3.074**	1.451	-0.502	0.941	-0.306	0.646
Probably	-0.493	1.136	-0.779	0.686	0.378	0.477
Maybe	-0.621	0.976	-0.424	0.598	0.19	0.413
Probably not	-0.226	0.979	-0.022	0.603	0.392	0.412
Expected care use relative to average for gender and age (baseline: much shorter)						
Shorter than average	0.0685	1.644	0.897	1.092	0.19	0.739
Average	2.655*	1.598	1.823*	1.064	1.171	0.716
Larger than average	1.596	1.911	1.701	1.237	1.247	0.822
Expected *partner's* care use relative to average for gender and age (baseline: much shorter)						
Shorter than average	1.988	2.192	0.00733	1.353	-0.431	0.927
Average	1.505	2.135	0.59	1.318	-0.0819	0.884
Larger than average	2.226	2.338	-0.289	1.473	0.051	0.983
Expectation that expenditures increase in sickness						
	0.172	-0.712	0.928**	0.446	0.15	0.305
Constant	4.791	11.42	-2.687	6.818	0.885	4.576
Observations	2,174		2,174		2,174	
R-squared	0.048		0.058		0.036	

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1
Sample excludes individuals who currently receive or need long-term care.

Table 9: Preferences for a monthly budget, a lump sum for home improvements, and general interest in home care insurance [CIJFERS NOG VERVANGEN]

	Dependent variable: WTP for home care					
	Monthly budget		Lumpsum home improvements		General interest	
	(1)		(2)		(3)	
Demographics						
Female	0.825	1.123	0.314	0.313	-0.0071	0.0223
Partner	-5.783	3.568	-0.494	0.971	0.00231	0.0686
Age/100	-78.53*	44.63	20.17	12.5	0.467	0.879
Age squared/100	0.617*	0.361	-0.226**	0.102	-0.00729	0.00715
Children	-2.073	1.621	-0.734	0.447	-0.0386	0.0318
Homeowner	0.274	1.414	-0.0904	0.389	-0.0655**	0.0271
Log net HH income	2.755	1.699	0.00277	0.43	0.0659**	0.0328
Low gross HH income	1.495	2.201	-0.845	0.621	0.103**	0.0446
Education – vocational	0.27	1.391	0.118	0.388	0.0363	0.0273
Education – university	-0.392	1.485	0.0232	0.406	0.0946***	0.0292
Health – no problems	1.293	1.617	-0.738*	0.431	-0.0262	0.0324
Preferences						
Risk aversion (scale 1-7)	0.966**	0.398	-0.037	0.108	0.0209***	0.00772
Patience (scale 1-7)	0.056	0.425	-0.06	0.11	0.00283	0.00827
Impulsiveness (scale 1-7)	-0.0663	0.479	-0.0394	0.123	-0.0172*	0.00929
Strength bequest motive (percent of windfall allocated to bequest; baseline: 0%)						
Bequest motive – no	-0.0877	2.656	-0.85	0.729	-0.00268	0.0538
Bequest motive – 21-49%	2.133	2.311	-0.459	0.625	0.0614	0.0453
Bequest motive – 50%	0.155	2.117	-1.030*	0.532	0.00664	0.0408
Bequest motive – 51-80%	1.435	2.225	-1.073*	0.55	-0.0193	0.043
Bequest motive – 81-99%	-2.178	4.648	-2.576**	1.119	-0.246***	0.0714
Bequest motive – 100%	-6.015*	3.164	-1.865**	0.809	-0.260***	0.0573
Expectations						
Availability informal care by someone else than partner (baseline: definitely not)						
Definitly	-1.861	2.609	1.096	0.761	-0.132***	0.0508
Probably	0.209	1.931	0.535	0.542	-0.113***	0.0383
Maybe	0.0457	1.679	0.712	0.489	-0.0545*	0.033
Probably not	0.498	1.676	0.364	0.474	-0.0151	0.0332
Expected care use relative to average for gender and age (baseline: much shorter)						
Shorter than average	0.168***	0.0556	-2.118	3.025	-0.811	0.741
Average	0.130**	0.0543	2.368	2.986	-0.865	0.752
Larger than average	0.140**	0.0658	2.515	3.445	-1.933**	0.918
Expected *partner's* care use relative to average for gender and age (baseline: much shorter)						
Shorter than average	-0.0884	0.0706	2.4	3.674	1.237	0.974
Average	-0.046	0.0685	2.366	3.527	1.024	0.968
Larger than average	0.00728	0.0765	3.761	3.969	1.206	1.038
Expenditures increase in sickness	-0.00161	0.0245	-0.0971	1.252	0.773**	0.353
Constant	21.880	18.890	3.236	5.087	0.0137	0.370
Observations	2,174		2,174		2,174	
R-squared	0.030		0.045		0.067	

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1
Sample excludes individuals who currently receive or need long-term care.

5 Conclusions and discussion

In countries where private financing of LTC expenditures is important (such as the U.S.), the demand for private insurance is in general relatively small. This paper investigates the willingness to pay for home care insurance, in a country (the Netherlands) where people are used to a high level of long term care insurance. The results show a high overall demand for in-home care insurance. Willingness to pay is high relative to an actuarially fair insurance premium for housekeeping support, a monthly supporting budget for devices, and a lump sum for home improvement. Individuals with the highest willingness to pay, ceteris paribus, have a higher income, are more often single and woman, and less often expect to receive help from family members. Individuals who expect to use in-home care for longer, conditional on needing care at all, are willing to pay more. This is consistent with adverse selection into insurance. Individuals with a strong bequest motive have a lower willingness to pay (they have a stronger incentive to self-insure). These results contributes to the design of long-term care insurance policies to improve the wellbeing of the elderly.

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A Descriptive statistics of background variables

Table A1: Descriptive statistics of demographic variables

	Choices		Choices + preferences + expectations	
	Mean	(SD)	Mean	(SD)
Female	0.51	(0.50)	0.51	(0.50)
Partner	0.72	(0.45)	0.73	(0.44)
Age	60.1	(11.3)	59.6	(11.2)
Has children	0.84	(0.37)	0.84	(0.36)
Number of children living in HH	0.58	(0.95)	0.60	(0.97)
Homeowner	0.76	(0.43)	0.76	(0.43)
Net HH income (monthly)	2961	(1491)	3004	(1504)
Low gross HH income[a]	0.09	(0.28)	0.08	(0.28)
Education – lower secondary	0.32	(0.47)	0.31	(0.46)
Education – vocational	0.34	(0.48)	0.35	(0.48)
Education – university	0.33	(0.47)	0.34	(0.48)
Health – has problems	0.14	(0.34)	0.13	(0.34)
Health – no problems	0.86	(0.34)	0.87	(0.34)
Primary activity – salaried work	0.40	(0.49)	0.41	(0.49)
Primary activity – self employed	0.05	(0.23)	0.06	(0.23)
Primary activity – unemployed	0.04	(0.21)	0.05	(0.21)
Primary activity – homemaker	0.08	(0.28)	0.08	(0.28)
Primary activity – retired	0.34	(0.47)	0.33	(0.47)
Primary activity – disabled	0.04	(0.19)	0.04	(0.19)
Primary activity – other	0.04	(0.21)	0.04	(0.20)
N	2111		1901	

Samples exclude individuals who currently receive or need long-term care.
[a] Gross HH income below 16,000 Euro per year for single and 22,500 Euro per year for couple.

Table A2: Descriptive statistics preferences

	Mean	SD	Min	p25	p50	p75	Max
Risk aversion (scale 1-7)	4.8	1.4	1	4	5	6	7
Patience (scale 1-7)	4.7	1.5	1	4	5	6	7
Impulsiveness (scale 1-7)	4.9	1.3	1	4	5	6	7
N	1901						

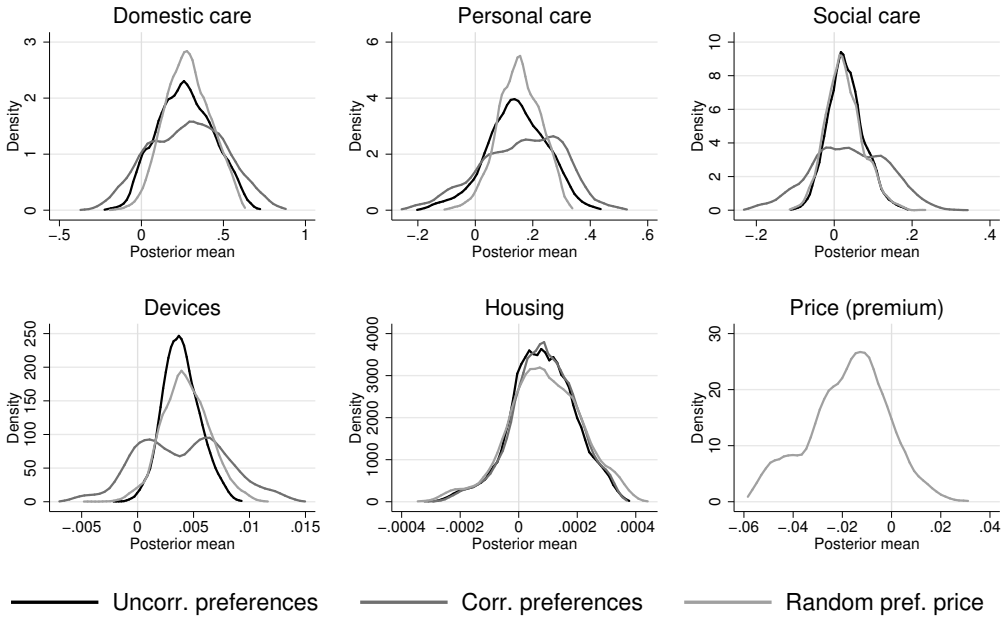
B Correlations between posterior means obtained from different models

Table B1: Correlations between posterior means from different mixed logit models

	Domestic care			Personal care		
	(1)	(2)	(3)	(1)	(2)	(3)
(1) uncorr. preferences	1			1		
(2) corr. preferences	0.89***	1		0.88***	1	
(3) random pref. price	0.96***	0.82***	1	0.96***	0.85***	1
	Social care			Devices		
	(1)	(2)	(3)	(1)	(2)	(3)
(1) uncorr. preferences	1			1		
(2) corr. preferences	0.77***	1		0.62***	1	
(3) random pref. price	0.97***	0.65***	1	0.97***	0.52***	1
	Housing					
	(1)	(2)	(3)			
(1) uncorr. preferences	1					
(2) corr. preferences	0.99***	1				
(3) random pref. price	0.99***	0.98***	1			

*** p<0.01

Figure B1: Marginal distributions of posterior means



C Latent class models

This appendix presents estimates of the latent class models and WTP's, in which heterogeneity is captured by a finite set of discrete types (or latent classes). Table 10 presents information for the selection of the number of latent classes. While information criteria suggest 11 classes, a simpler model with 7 classes already yields imprecise estimates of preferences for some groups, resulting in broad interval estimates of the WTP's. Table 11 shows the average willingness-to-pay for attributes, derived from latent class models with 7 and 9 classes. Figures 4 to 6 show more details about the separate classes.

Comparing the average WTPs with those reported in table 6, we note that while all averages are substantially higher for the latent class models the same is true for the accompanying standard errors. In light of this difficulty of estimating preferences for some latent classes, we distinguish between types for which the entire confidence interval of WTP lies either above or below the actuarial premium and types for which the premium falls within the interval for WTP. Summing the population shares across types for which WTP exceeds the premium, both latent class models confirm that large fractions of the Dutch population would be willing to pay realistic insurance premiums for domestic care, a monthly annuity that is contingent on long term care and a one-off payment at the onset of care needs. While the mixed logit models indicate that roughly two third of the population has a WTP that is higher than the actuarial fair premium, the fraction for which we can confidently conclude the same is around one third in the latent class models. Furthermore, there is not a single latent class for which the entire interval for WTP exceeds the actuarial premium for personal care or social support. Hence, we conclude that while estimates from latent class models are considerably less precise, they reveal similar qualitative patterns as do mixed logit models.

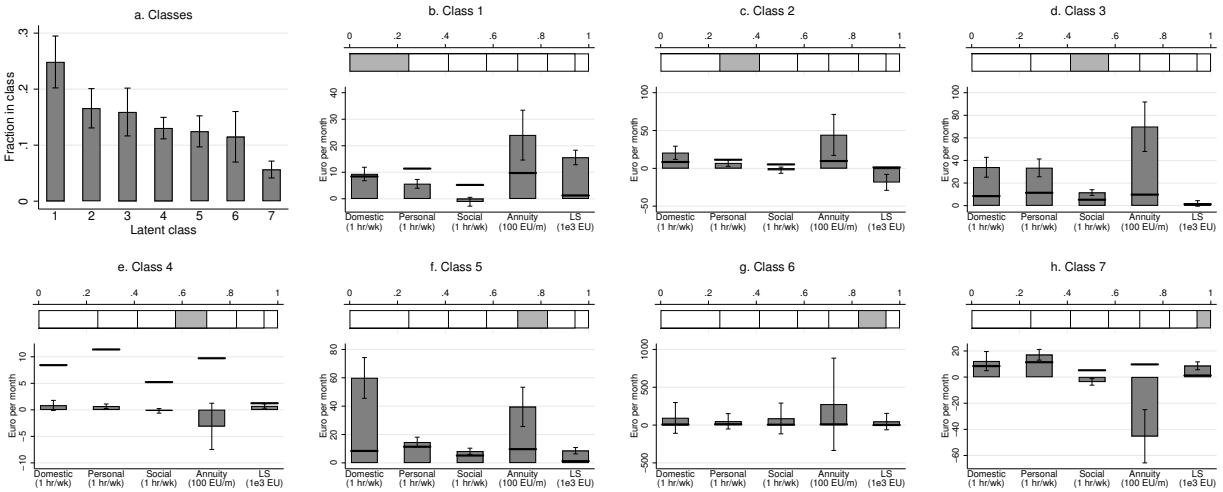


Figure 4: **Figure F1:** Distribution of willingness-to-pay for attributes derived from latent class model with 7 classes (LLH = -13,973.11)

F1

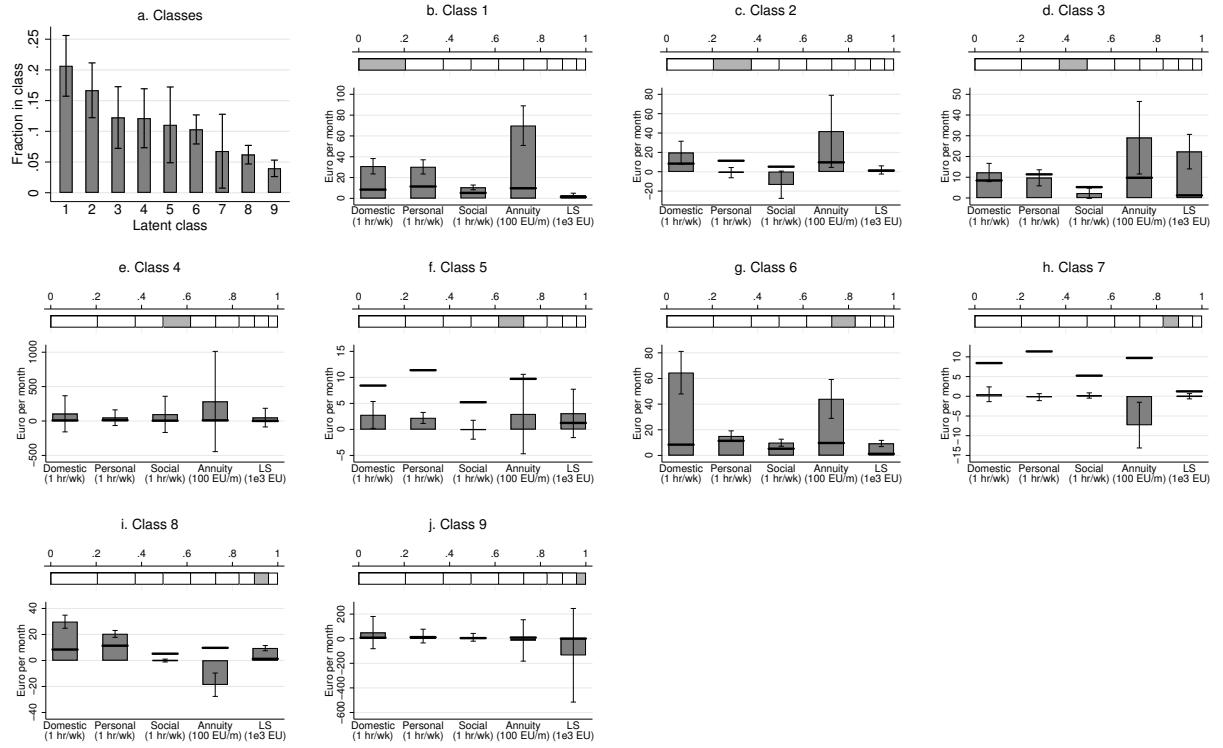


Figure 5: **Figure F2:** Distribution of willingness-to-pay for attributes derived from latent class model with 9 classes (LLH = -13,862.99)

F2

Table 10: **Table F1:** Selection of number of latent classes

Classes	LLF	Parameters	AIC	CAIC	BIC
2	-14823.33	13	29672.67	29760.91	29747.91
3	-14527.96	20	29095.93	29231.69	29211.69
4	-14288.76	27	28631.51	28814.80	28787.80
5	-14206.67	34	28481.34	28712.14	28678.14
6	-14083.56	41	28249.12	28527.44	28486.44
7	-13973.15	48	28042.3	28368.14	28320.14
8	-13955.42	55	28020.83	28394.18	28339.18
9	-13864.51	62	27853.01	28273.88	28211.88
10	-13838.82	69	27815.64	28284.02	28215.02
11	-13789.08	76	27730.16	28246.07	28170.07
12	-13786.30	83	27738.61	28302.03	28219.03
13	-13754.64	90	27689.28	28300.22	28210.22
14	-13753.40	97	27700.8	28359.25	28262.25
15	-13710.49	104	27628.98	28334.95	28230.95
16	-13697.55	111	27617.11	28370.60	28259.60
17	-13708.28	118	27652.56	28453.57	28335.57
18	-13682.75	125	27615.5	28464.03	28339.03
19	-13678.35	132	27620.69	28516.74	28384.74
20	-13673.78	139	27625.57	28569.13	28430.13

Estimation by Expectation Maximization algorithm. The maximum number of iterations was capped at 150 to limit runtime. Subsequent estimation of the models with 5, 7, 9 or 11 classes proceeds without binding cap on the number of iterations.

Table 11: Average willingness-to-pay for attributes, derived from latent class models

		7 latent classes					9 latent classes				
	Actuarial premium[a]	Mean[b]	(SE)	WTP > premium (%)	Premium in 95% CI (%)	WTP < premium (%)	Mean[b]	(SE)	WTP > premium (%)	Premium in 95% CI (%)	WTP < premium (%)
Domestic care (1 hr/wk)	8.43	30.29	(10.97)	45	42	13	34.63	(15.39)	37	45	18
Personal care (1 hr/wk)	11.39	16.47	(5.55)	22	24	54	16.99	(6.73)	27	39	34
Social services (1 hr/wk)	5.23	11.97	(11.04)	28	11	60	13.43	(15.17)	31	16	53
Devices (100 Euro/month)	9.73	57.96	(33.08)	70	11	19	61.95	(42.49)	43	44	13
Housing (1000 Euro once)	1.25	8.08	(6.11)	43	27	30	6.15	(10.96)	29	64	7
In-kind: at least one				51					37		
Financial: at least one				75					49		
At least one				75					49		

[a] Actuarially fair monthly premium based on premium payment from age 40 up to first claiming (or death) with waiting period of 1 year during which the contract is cancelled if the need for care would arise. Price of domestic care is 20 Euro/hr; price of personal care is 27.02 Euro/hr; price of social services is 12.41 Euro/hr. Prices for personal care and social services are taken from "personal budget" (PGB) for 2014, see https://www.nationalehulpgids.nl/forms/PGBWeektarieven2011-2015.pdf. Actuarially fair premiums are calculated using tools provided by a large insurance company.
[b] Mean willingness to pay as a monthly premium for the various services listed in the table. E.g. on average respondents would be willing to pay a monthly premium of €18.25 from age 40 onward in order to receive 1 hour of domestic care per week. Loading factor: 18%, discount rate 2%.

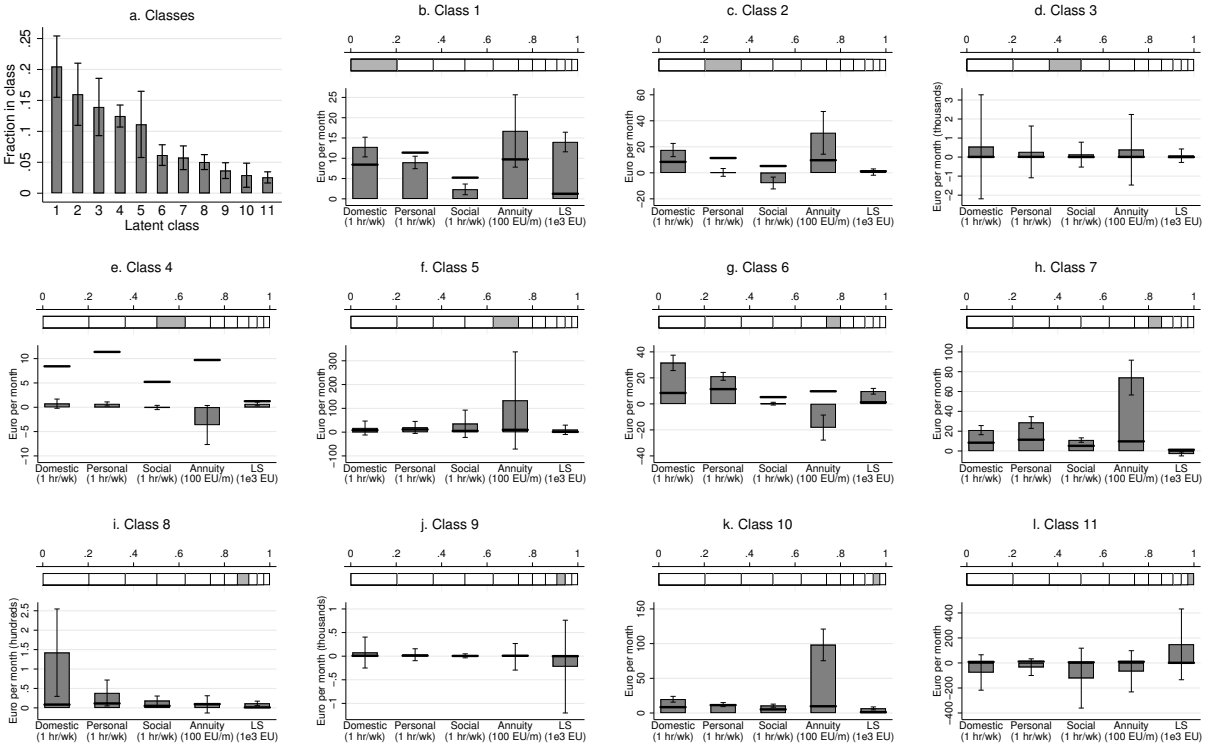


Figure 6: **Figure F3:** Distribution of willingness-to-pay for attributes derived from latent class model with 11 classes (LLH = -13,786.89)

F3

D Information experiment

Table D1: Information provision, expectations and preferences for LTC insurance

a. First stage: $\textbf{exp.}_i = \beta_0 + \beta_1 \mathbb{I}\{\textbf{any info}\}_i + \varepsilon_i$

	Qualitative expectations		Quantitative expectations			
	Own care	Partner's care	p50 Own care	IQR Own care	p50 both both care	IQR both both care
Any info	0.144***	0.0918**	0.344**	0.222	0.0689	0.0247
	(0.0347)	(0.0416)	(0.145)	(0.171)	(0.0913)	(0.111)
Constant	2.623***	2.736***	2.362***	3.160***	1.411	1.907
	(0.0281)	(0.0336)	(0.114)	(0.140)	(0.0730)	(0.0905)
F(1, N-3)	17.33***	4.87**	5.64**	1.69	0.57	0.05
N	1901	1393	1513	1513	1155	1155

Robust standard errors in parentheses; * p<0.10, ** p<0.05, *** p<0.01