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# Flexible insurance for informal long-term care: A study of stated preferences

Shang Wu,<sup>\*</sup> Hazel Bateman,<sup>†</sup> Ralph Stevens,<sup>‡</sup> and Susan Thorp<sup>§</sup>

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## ABSTRACT

We collect and analyze stated preferences for long-term care insurance that pays income in poor health states instead of reimbursing formal care costs. Around 75% of the sample of 1008 pre-retirees chose to purchase at least some long-term care income insurance from a menu that also included liquid wealth and a life annuity. Our results show that long term care income insurance is complementary to informal care and is attractive to seniors who plan to rely on family members for extensive care. Those who have access to extensive informal care demand 25-37% *more* health-contingent income per year than those who do not. Females who expect to rely exclusively on extensive care from family members are willing to buy more cover than males. We also find that if long-term care income insurance were available, many healthier seniors would release funds set aside to self-insure long-term care risk and purchase additional longevity insurance.

**Keywords:** Long-term care insurance; longevity insurance; aged care; informal care; retirement incomes; social care.

**JEL Classifications:** G52, I13, J32

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# 1 Introduction

Between 50 and 65 percent of people now aged 65 will need long-term care at some time before they die (Ameriks et al., 2018; Hewitson et al., 2011; Productivity Commission, 2011; Colombo et al., 2011). Moreover, the costs of long-term-care will consume more of elderly households’ financial resources than other health-related expenses (French et al., 2019). Although long-term-care insurance could help people manage the risk of this expense, in many countries it is not sold at all, and even where care insurance is available, few people buy it (Ameriks et al., 2011; Lockwood, 2018). One of the key reasons that markets for long-term care insurance are so limited is that claiming rates can be high. Insured families have incentives to replace the informal (uninsured) care they provide with formal (insured) care (Pauly, 1990; Zweifel and Strüwe, 1998; Mommaerts, 2016; Ko, 2016). Aging societies need more flexible and affordable long-term care insurance products that cover costs of formal care when it is needed while supporting complementary informal care.

Here we study an emerging insurance product that can help the elderly and their families manage long-term-care risk. This long-term care insurance product pays a regular income whenever the insured person needs care, irrespective of the formal care costs they actually incur. We call this “long term care income insurance”. Such a product has been envisaged in social care policy discussions in the UK to complement a proposed lifetime cap on individual contributions to care, thereby eliminating catastrophic care costs (Dilnot, 2011; Care Act, 2014), and is emerging in the US market.<sup>1</sup>

A challenge for research into the viability of new products is the lack of revealed preference data. We measure potential purchasers’ interest in long-term care income insurance by collecting the stated preferences of a representative sample of over 1,000 Australian pre-retirees.<sup>2</sup> We incentivized participants to learn about one new, and two existing, products: a long-term care income insurance product that exchanges a single premium payment for health-contingent income benefits, a life annuity, and a liquid investment account. We then asked participants to divide their hypothetical retirement savings between these products in a structured choice task that identified their preferences for health-contingent and survival-contingent income, and liquid wealth.

We collected the data in Australia, a setting with several advantages. First, the publicly financed long-term care system in Australia shares many features with other developed countries, especially the UK, including the absence of a private market for long-term care insurance, so our results are

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<sup>1</sup>A version of this product has been introduced in the US market as an annuity product with a long-term care rider (LIMRA, 2017) and such hybrid products now comprise around 80 percent of new sales of long-term care insurance in the US (American Association for Long Term Care Insurance, 2019). Brown and Warshawsky (2013) introduced the idea for a long-term-care-contingent annuity and it has since been advocated in French et al. (2019). Demand for similar products has been studied in Ameriks et al. (2018), Society of Actuaries (2018) and Mayhew et al. (2019).

<sup>2</sup>Similar stated preference methods have been used to elicit interest in life annuities (Beshears et al., 2014), valuation of life annuities (Brown et al., 2017; Brown et al., 2020); and interest in and valuation of long-term care insurance in the US (Ameriks et al., 2011; Ameriks et al., 2018; Akaichi et al., 2020) and Canada (Boyer et al., 2020).

informative in many other settings. Second, Australians are very unlikely to have experienced a private market for long-term care insurance and come to the hypothetical choice task with no influences from previous experiences. Third, pre-retirees in Australia participate in the mandatory defined contribution (DC) retirement saving system and have responsibility for managing their own retirement account balances. For these reasons, decisions about retirement wealth are consequential, relevant, and imminent for participants in our study.

Our results show that this flexible care insurance is likely to provide benefits to aging societies through two complementarities: complementarity with informal care and complementarity with longevity insurance. First, we find evidence that this product encourages flexible care arrangements; it attracts people who prefer informal care but want to support or compensate their carers, and thus lowers incentives for carers to substitute formal for informal care (Pauly, 1990; Zweifel and Strüwe, 1998). Second, people who can access long-term care income insurance are more likely to release savings set aside as a precaution against future care costs and use those funds to purchase longevity insurance (Ko, 2016; Mommaerts, 2016). It follows that a bundle of longevity insurance and long-term care income insurance could boost risk pooling by encouraging longevity insurance purchases by unhealthy people and care insurance purchases by healthy people (Brown and Warshawsky, 2013). Overall, around 75% of pre-retirees in our study chose to “spend” at least some of their retirement savings on long-term care income. The median annual long-term-care contingent income they chose, at around A\$45,000, is comparable with estimated costs for high-level care. At the same time, these results put the stated demand for long-term care income well above the actual demand for private expense-reimbursement cover in real markets, possibly because the choice survey setting smooths some important “real-world” purchasing frictions (Ameriks et al., 2018), and the dollar value should be treated with caution.

Our investigation of demand for long-term care income insurance makes contributions to three strands of research. First it speaks to an urgent issue for social and economic policy. Home-based care is increasingly favored by elderly people and governments, especially in countries with a familism culture (Costa-Font et al., 2009; Costa-Font, 2010), but also in countries where formal long-term care arrangements are more common, such as in the US, UK, Europe, and Australia (Barczyk and Kredler, 2019).<sup>3</sup> As the usage rates of home-based care increase, elders and their families are calling for more flexible financial support (Muir, 2017; Commonwealth of Australia, 2019). And while the care provided by family members may be unpaid, it is not costless. Carers bear costs such as lost

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<sup>3</sup>In Australia increased emphasis on home-based care was formalized in the Living Longer Living Better Aged Care Reform Package introduced in 2012 (Department of Health and Ageing, Australian Government, 2012) and was expanded in the 2018 More Choices for Longer Life Package (<https://archive.budget.gov.au/2018-19/factsheets/supporting-choice.pdf>). These issues are also high on the policy agenda in the UK (see Mayhew et al., 2010; Jarrett, 2019).

time, lost earnings, and detriments to physical and mental health (Colombo et al., 2011; Schmitz and Westphal, 2017; Caplin et al., 2018; Do et al., 2015) that are not reimbursed by typical long-term care insurance policies and are only partially offset in public systems that pay carers.

Second, we add to research on the underdeveloped private markets for long-term care insurance. In the US, the coverage rate of private long-term care insurance is around 7% and has been falling (LIMRA, 2017), while, in Europe, a recent study of SHARE data identifies large country variations, but low overall coverage, with the exception of France and Israel (Bucher-Koenen et al., 2017). There is no private market at all for long-term care insurance in the UK or Australia. Explanations for weak markets in long-term care insurance include adverse selection (Sloan and Norton, 1997; Finkelstein and McGarry, 2006; Brown and Finkelstein, 2009; Webb, 2009; Hendren, 2013), poor product design (Brown and Finkelstein, 2007; Ameriks et al., 2018; Akaichi et al., 2020), availability of public care (Sloan and Norton, 1997; Brown and Finkelstein, 2008), means-testing of public benefits (De Nardi et al., 2016; Braun et al., 2016), reliance on unpaid care givers (Pauly, 1990; Zweifel and Strüwe, 1998; Brown et al., 2012), self-insurance using home equity (Davidoff, 2010), (non-strategic) bequest motives (Pauly, 1990; Lockwood, 2018), limited awareness of risk (Zhou-Richter et al., 2010), and state-dependent utility (Brown and Finkelstein, 2009). Our results are consistent with several of these explanations and but also show that long-term care income insurance can potentially encourage stronger demand.

Third, our findings contribute to explanations for the “annuity puzzle” motivated by concerns about future care costs. Previous studies offer mixed evidence of the effects of long-term care risk and health cost risk on the demand for longevity insurance (life annuities). On one hand, people could purchase more longevity insurance and use the increasing-with-age mortality credits to buffer care costs (Davidoff et al., 2005; Davidoff, 2009; Pang and Warshawsky, 2010; Peijnenburg et al., 2017). On the other hand, people might annuitize less wealth and hold more liquid funds to self-insure (Turra and Mitchell, 2008; Reichling and Smetters, 2015; Wu et al., 2016; Ameriks et al., 2011; Ameriks et al., 2020). Our study shows that long-term care income insurance could encourage longevity-risk pooling by alleviating the need for precautionary saving by aging individuals.

In the next section, we describe the sample of participants and incentives. In Section 3, we outline the choice task and preliminary results. Section 4 presents econometric results that test the connection between preferences for, and access to, informal care and the demand for the long-term care income product and selection effects. We then investigate the relation between longevity insurance and long-term care income insurance, and the impact on precautionary savings. Section 5 concludes.

## 2 Sample and incentives

We collected stated preferences from 1,008 pre-retirees aged 55-64 years in October 2015, sampling from a panel of over 180,000 Australians (Lightspeed GMI). We excluded people who said they had dementia, or that they needed help with two or more activities of daily living (ADLs), because these conditions would make them immediately eligible for health-contingent income, and therefore disqualified from purchasing the insurance policy.<sup>4</sup> We also filtered out people whose self-reported net worth was negative or very low because the stated preference task endows participants with at least \$50,000 of retirement wealth. Table 1 compares the demographics of the sample with the Australian population aged 55-64. The sample is similar to the population except that the participants were better educated and had higher personal income, on average, consistent with the filters we applied to health and net worth.

Table 1: Demographics

The table compares demographic characteristics of survey participants with Australian Census population data. The survey samples 1,008 Australians aged 55-64 who do not have dementia or need help with two or more activities of daily living. The population data come from the Australian Bureau of Statistics 2011 Census of Population and Housing.

Variable	Population %	Sample %	Variable	Population %	Sample %
Gender			High school completion		
Male	49.4	51.4	Year 12	40.5	63.2
Female	50.6	48.6	Year 11	9.8	8.6
Age			Year 10	31.1	22.8
55	10.9	9.6	Year 9	9.3	3.8
56	10.6	9.1	Year 8 or less	8.2	1.5
57	10.2	10.1	Did not go to school	1.1	0.1
58	10.2	9.8			
59	9.9	11.4	Tertiary qualification		
60	9.8	9.7	Post graduate	4.1	7.4
61	9.7	10.2	Graduate Diploma/Certificate	2.5	9.3
62	9.4	9.6	Bachelor Degree	12.5	16.0
63	9.4	10.9	Vocational Diploma	9.9	18.0
64	9.9	9.4	Vocational Certificate	20.1	23.7
Marital status			None of the above	50.9	25.6
Never married	8.1	10.9			
Widowed	4.3	3.4	Personal income		
Divorced/Separated	20.7	18.4	Negative or no income	7.6	7.6
Married/De facto	66.9	67.4	A\$1 to A\$20,799	28.8	24.8
Work status			A\$20,800 to A\$41,599	24.3	25.2
Employed (FT)	37.3	27.0	A\$41,600 to A\$64,999	18.4	20.7
Employed (PT)	23.1	20.6	A\$65,000 to A\$103,999	13.4	16.0
Unemployed	2.4	5.8	A\$104,000 or more	7.6	5.7
Not in labor force	37.2	46.6			

<sup>4</sup>Online Appendix B briefly explains long-term care financing in Australia.

The web panel provider recruited participants by email invitation and paid eligible participants A\$4 if they completed the online survey. Participants could earn a bonus of up to A\$3 if they answered a quiz on product features correctly.<sup>5</sup> The median time participants took to complete the choice task and subsequent questions was 30 minutes and we checked participants' inattention using two instructional manipulation checks (IMC)<sup>6</sup> (Oppenheimer et al., 2009). Only 5% of participants rated the survey as confusing.<sup>7</sup>

### 3 Choice task and preliminary results

We designed the choice task, first, to investigate connections between preferences for informal care and for long-term care income insurance, and second, to investigate the connection between long-term care income insurance, longevity risk insurance (life annuities), and liquid precautionary savings. All participants answered all questions, thus avoiding selection effects in the stated preference data.

We asked participants to compare three financial products in a three-stage task that found their most preferred mix of health- and survival-contingent income and liquid wealth. The first product was long-term care insurance that pays a fixed, regular income for the period of time the insured needs care. When the insured person has either dementia and/or needs help with at least two Activities of Daily Living (ADLs) out of (i) eating, (ii) bathing, (iii) dressing, (iv) toileting, and (v) getting into or out of bed, the insurer pays the agreed income.<sup>8</sup> The insurer stops the income payments if the insured dies or recovers from these conditions. The product does not guarantee to cover total formal care expenditure and the costs of care can exceed the income benefits. The regular income can be used at the discretion of the insured to pay for professional care, for care provided by family members, or to cover other expenses. The second product was an immediate life annuity that provides fixed, inflation-indexed, lifetime income. The third product was a liquid investment account where withdrawals can be made at any time. We priced the life annuity and the long-term care income product at actuarially fair value based on gender and the risk-free, real interest rate of 3% that prevailed at the time of the survey. We took the mortality probabilities and health transition probabilities for pricing the life annuity and the long-term care income product from estimates by Brown and Warshawsky (2013).

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<sup>5</sup>Ideally, we would offer an incentive payment to participants that was compatible with the hypothetical allocations of their retirement savings made in the choice tasks. However, an incentive payment that is compatible with the trade-off between long-term care insurance coverage and liquidity is a complicated multi-period payment that continues over the whole of retirement and is thus infeasible in this experiment.

<sup>6</sup>9% of participants failed the IMCs.

<sup>7</sup>The dynamic version of the survey is available at: <https://survey.confirmit.com/wix3/p3074038853.aspx>. A full set of screenshots from the survey that include the wording of all questions and instructions is available in Online Appendix A at <http://www.cepar.edu.au/publications/working-papers/online-appendices-flexible-insurance-for-informal-long-term-care-2021.pdf>.

<sup>8</sup>In reality, these limitations in ADLs are usually determined by a physician to reduce moral hazard.

(See Online Appendix D for details on mortality and health probabilities.)<sup>9</sup>

We allocated participants into eight (2×4) treatment groups by gender (2 groups) and by net wealth excluding the family home (4 groups), making a roughly even number in each wealth group. In the task, we matched hypothetical endowments of retirement savings close to participants’ actual net wealth at \$50,000, \$175,000, \$375,000 or \$1,000,000.<sup>10</sup>

The choice task started by participants reading information about retirement expenses, such as the estimated average chance of needing, and costs of, long-term care (Productivity Commission, 2011). We then asked participants to rate their chances of needing in-home care and residential care against an average person of their gender. After that, we described the three retirement income products and their prices, and offered a bonus for correct answers in a recall quiz about the products. (We summarized the important features of the products in a table that also pops up during the task if participants put their cursor on the product names.) Next, we described the setting for their decision: a simple situation where everyone was paid a flat-rate public pension, was not subject to taxation, and could be confident that the insurers would not default.<sup>11</sup> After reading an instruction, “We are now going to present you with a series of hypothetical scenarios and ask you to make decisions about the allocation of your retirement savings to the various retirement income product options we have shown you. Ignoring your own financial circumstances for the moment, we want you to imagine you are 65 years old, about to retire, and own your own home.”, participants answered nine questions in a sequence that simplified the problem of comparing three products simultaneously (Besedeš et al., 2015).

### 3.1 Long-term-care income insurance choices

Questions one to four (Q1 - Q4) measured participants’ stated demand for long-term care income at incrementally increasing levels of lifetime annual (public pension and annuity) income. For example, Q1 asked participants how much long-term care income they would like to buy using their retirement savings of \$375,000 if they also received a lifetime real income of A\$22,000 p.a. from the public pension (basic retirement income). Any retirement savings they did not allocate to long-term care insurance stayed in a liquid investment account (account-based pension). The participants made their choices by moving a slider, and, as they did so, they could see changes in their health-contingent (long-term or “aged” care) income and related changes in their liquid wealth (i.e., the account-based pension

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<sup>9</sup>Labels for products in the survey match Australian usage, as tested in preliminary focus groups.

<sup>10</sup>Online Appendix C shows details of the wealth groups.

<sup>11</sup>The public pension in Australia is the Age Pension that is means-tested and covers more than 70% of Australians over the eligibility age of 65 (Department of Social Services, Australian Government, 2018). We labeled the public pension in the task as “Age Pension” but also told participants explicitly both in the instructions and in the task questions that the amount of income from the public pension was constant and would not change with the choices they made.



balance), always constrained by their total retirement savings. Figure 1 shows an example of the first question of the choice task. In Q1, we allocated 0% of retirement savings to the life annuity; Q2-Q4 repeated the same decision but with the share of retirement wealth paid for a life annuity rising from 25%, to 50%, to 75%.

**Scenario 1: How much Aged Care Income would you prefer?**

Hover your mouse over the blue text for more information on these products.

In this first scenario, you have:


- **Basic retirement income of \$22,000 per annum (CPI-indexed).** This is from the Age Pension.
- **Retirement savings of \$375,000**

The decision you have to make is as follows:

- **How much Aged Care Income (if any) do you want to buy?**

The balance of your retirement savings after buying the **Aged Care Income** will go into an **Account-Based Pension Product**. Your basic retirement income (of \$22,000 per annum CPI-indexed) is **not** affected by your choice.


Using the slider below, show how much **Aged Care Income** you would like to **receive each year in the future**, in the event that you qualify.



*You can position the slider anywhere on the line, but you need to move it at least once before you can continue.*

The outcomes of your choice are summarised as follows:

1. Basic retirement income: **\$22,000**
2. **Aged Care Income** paid only if you suffer from either (or both) of the health conditions **1**) or **2**): **\$0**
3. **Account-Based Pension** balance: **\$375,000**






Figure 1: Allocation question for a male in wealth group 3

In these tasks, around 85% of participants chose to purchase at least some of the long-term care income product at all pre-determined levels of annuitization. Participants generally increased the percentage of remaining liquid retirement savings they allocated to the long-term care income product as pre-set annuitization rose, consistent with maintaining a nominal amount of long-term care income. The amount chosen by the median participant decreased from A\$50,700 (A\$35,300) at a 0% pre-set level of annuitization to A\$18,800 (A\$11,800) at a 75% level of annuitization for males (females). Females are objectively more likely to need long-term care (Brown and Finkelstein, 2007), but the dollar amounts chosen by males were higher, probably in response to fair pricing that made the long-term care income product 33% less expensive for males than females. The majority of participants maintained some liquid retirement savings at the expense of long-term care insurance coverage as annuitization increased. However, around 17% of participants chose a fixed nominal long-term-care-contingent income, even at the expense of exhausting their liquid savings, while around 14% purchased almost none.

### 3.2 Preferred allocations of retirement savings

Responses to Q5 and Q6 together then gave us participants' most preferred ratios of health-contingent to survival-contingent income, along with their preferred allocation to liquid wealth. We achieved this by asking participants to make two sets of rankings. Q5 asked participants which of the three allocations they had made at 25% to 75% annuitization (Q2-Q4) they *most* and *least* preferred (Q5). Then, to discover their most preferred allocation from 0% to 100% annuitization, we showed participants their highest ranked alternative from Q5, together with participants' choice from Q1 (zero annuitization) and a third alternative that assumed 100% annuitization (i.e., no long-term care income or savings in the investment account). We then asked participants to rank these three allocations (Q6) which left us with the most preferred combination of the three products.

After these additional tasks, we found that around 75% of participants chose to "spend" at least some of their liquid retirement savings on long-term care income, as just over 10% of participants chose full annuitization as their most preferred allocation in Q6. The median annual health-contingent income chosen was around A\$45,000. These results put the stated demand for long-term care income insurance well above the actual demand for the expense-reimbursement variant in real markets – in line with Ameriks et al. (2018). This apparently high demand for long-term care income insurance is partly explained by the fact that the choice setting removes some real world barriers to purchase in that we explain all three financial products and incentivize participants to learn about them. We also side-step dealings with intermediaries by asking participants directly about their preferences. Stated preference studies for similar insurance products show similar high potential demand (see Brown et al., 2008; Beshears et al., 2014; Brown et al., 2017; Brown et al., 2020).

From this point we can also infer participants' most preferred ratios of health-contingent income (from long-term care insurance) to survival-contingent income (from the life annuity and public pension). Over three quarters of participants chose a ratio below three. The mean ratio for males was 3.4 and for females was 2.1. The health- to survival-contingent income ratio generally increased with wealth, partly because the fixed (and pre-set) public pension is a large component of the allocations of participants with low wealth, but a declining share of the allocations of wealthier participants, giving the latter's ratios a higher upper bound. The mean ratio for the lowest wealth group was 0.8 (0.7) for males (females), rising to 6.8 (4.0) for males (females) in the highest wealth group. We elaborate on the mechanism underlying choices of this ratio in the multivariate analysis that follows.

### **3.3 Long-term care, annuitization and precautionary savings**

The next part of the task (Q7) measured how access to long-term care income insurance affected participants' demand for life annuities and precautionary saving. In this question, we told participants to now imagine that the long-term care income product was no longer available. Then we asked them to rank three options: 1) their preferred allocation (from Q6), but where the money they spent on long-term care income was refunded to their liquid saving account with the level of lifetime income remaining the same; 2) option 1 with 25 percentage points higher annuitization; and 3) option 1 with 25 percentage points lower annuitization. Questions 8 and 9 collected complementary information: how participants would finance any purchases of long-term care insurance they might make in the future (Q8); and whether they preferred long-term care insurance benefits paid as income (labeled as fixed payments) or expense-reimbursement (labeled as reimbursement) (Q9). The choice task concluded with a recall quiz on the key features of the three financial products.

### **3.4 Participant characteristics**

We also collected personal information about participants including: i) risk attitudes (Dohmen et al., 2011), patience, and preferences for spending in different health conditions; ii) measures of exposure to long-term care risk, including health, subjective longevity, smoking status, bequests, experience of receiving or providing care, purchase of private health insurance, availability of informal care, and planning for financing care; and iii) personal demographic characteristics and financial capability measures, including past experiences with insurance products. Table 2 displays the summary statistics for the participants' characteristics.

Participants may have additional private information about their longevity and long-term care risk (Hendren, 2013) and we asked them about their subjective life expectancy and the self-assessed need for home care or residential care, respectively. Participants, on average, were subjectively pessimistic about their survival prospects, consistent with other studies (e.g., Wu et al., 2015) but were more likely to be optimistic about needing in-home or residential care. Around 40% rated their chances of needing care as below average, compared with fewer than 8% who rated their chances as above average. The small number of participants who reported a higher-than-average chance of needing residential care is consistent with unrealistic optimism about health problems found in other studies (Weinstein, 1982, 1987).

Table 2: Participants' Characteristics: Summary statistics

The table displays the definitions and summary statistics for participants' characteristic variables from survey responses.

Variable:	Mean	Standard deviation	Variable type
Panel A: Key variables of interest			
<i>Objective measures of exposure to long-term care risk</i>			
Female	0.486	0.500	Binary
Age	59.539	2.838	Continuous in years
Health state			Categorical
1	0.597		Proportion in this group
2	0.090		Proportion in this group
3	0.196		Proportion in this group
4	0.116		Proportion in this group
Current smoker	0.157	0.364	Binary
Received care	0.062	0.240	Binary
<i>Subjective indicators of exposure to long-term care risk</i>			
Subjective life expectancy	-3.186	8.946	Continuous in years
Chance of needing homecare			Categorical
Lower than the average	0.365		Proportion in this group
Equal to the average	0.559		Proportion in this group
Higher than the average	0.076		Proportion in this group
Chance of needing residential care			Categorical
Lower than the average	0.410		Proportion in this group
Equal to the average	0.530		Proportion in this group
Higher than the average	0.061		Proportion in this group
<i>Availability of informal care</i>			
Source of some (low) care			Categorical
Informal care only	0.376		Proportion in this group
Informal care and other sources	0.328		Proportion in this group
No informal care	0.296		Proportion in this group
Source of extensive (high) care			Categorical
Informal care only	0.219		Proportion in this group
Informal care and other sources	0.282		Proportion in this group
No informal care	0.499		Proportion in this group
Panel B: Other control variables			
<i>Awareness of long-term care risk</i>			
Financial planning for LTC			Categorical
Have set aside money but may need help	0.508		Proportion in this group
Expect to rely on government	0.083		Proportion in this group
Do not know needs and costs	0.409		Proportion in this group
Care provider	0.262	0.440	Binary
<i>Measures of utility parameters</i>			
Willingness to take risk (WTR)	3.975	2.594	Continuous on a 0-10 scale
Patience	6.360	2.427	Continuous on a 0-10 scale
Utility in bad health	4.253	2.181	Continuous on a 0-10 scale
Chance of A\$100K bequest	52.589	42.451	Percentage points
Prefer reimbursement	0.421	0.494	Binary
<i>Individual capability and knowledge about retirement financial products</i>			
No. of mistakes in Financial literacy	0.648	0.836	Continuous on a 0-3 scale
No. of mistakes in Numeracy	1.298	1.091	Continuous on a 0-3 scale
No. of correct answers in recall quiz	3.119	1.705	Continuous on a 0-6 scale
General product knowledge	8.495	1.870	Continuous on a 0-10 scale
Knowledge on life annuity	2.167	1.576	Continuous on a 0-5 scale
Knowledge on LTCI	1.217	1.587	Continuous on a 0-5 scale
No private health insurance	0.382	0.486	Binary
<i>Retirement planning</i>			
Intend to retire before 65	0.493	0.500	Binary
Financial planning for retirement	0.782	0.413	Binary
Retirement spending change	-17.005	24.292	Percentage points
<i>Demographics</i>			
Not born in Australia	0.243	0.429	Binary
Bachelor degree or above	0.327	0.469	Binary
Work status			Categorical
Full time	0.270		Proportion in this group
Part time	0.206		Proportion in this group
Unemployed/not in labor force	0.384		Proportion in this group
Retired	0.140		Proportion in this group

continued on next page

**Table 2 – continued**

Variable:	Mean	Standard deviation	Variable type
Household gross income	73.672	55.188	Continuous in thousand dollars/Year
Wealth group			Categorical
1	0.275		Proportion in this group
2	0.252		Proportion in this group
3	0.209		Proportion in this group
4	0.264		Proportion in this group
Non-partnered	0.326	0.469	Binary
Number of children	1.961	1.465	Continuous
Non-homeowner	0.191	0.394	Binary

To help answer questions about the relation between the demand for the long-term care income product and informal care we collected data on the availability of informal care for both low-level and extensive care, as well as whether participants had partners or children. Around 70% of participants said they had access to low-level informal care, and 50%, to high level care. In terms of awareness of long-term care risk, around 50% of participants reported that they had “set aside money”, while just over 40% responded that they “do not know needs and costs” with the remaining 8% reporting that they expected to rely on government support. Just over one quarter of participants reported that they themselves had provided care in the past five years.

Table 2 (Panel B) reports other control variables - including variables measuring awareness of long-term care risk, utility parameters and covariates such as financial capabilities, product and system knowledge, retirement planning and demographics - and discussed in detail in Online Appendix E. Responses to questions on financial capability indicated modest levels of financial literacy and numeracy in accordance with previous studies (Bateman et al., 2018) and good general product knowledge. Two thirds of the participants answered at least 3 out of the 6 questions about the financial products in the experiment correctly.

## 4 Results and Discussion

In this section, we first investigate whether people expect to use long-term care income insurance to fund informal as well as formal care, and then we review the impact of the long-term care income product on the demand for life annuities.

Using data from Q1-Q4, we estimate 1) a random-effects probit model of the binary decision to purchase the long-term care income product or not, and 2) a random effects OLS model of the demand for dollar-amounts of health-contingent income, for participants who chose to purchase a non-zero amount of the long-term care income product. In both the probit and OLS specifications, we include explanatory variables relating to objective and subjective indicators of long-term care risk and the availability of informal care, and a set of controls. To avoid difficulties with multiple hypothesis testing, we select controls from the long list of possibilities shown in Table 2 using the Least

Absolute Shrinkage and Selection Operator (LASSO) based on the extended Bayesian information criterion (EBIC, Chen and Chen, 2008).<sup>12</sup> The LASSO method selected *No. of correct answers in recall quiz* - a measure of knowledge of the three financial products introduced to participants, two variables measuring financial planning for long-term care, *Have set aside money* and *Expect to reply on government*, as well as *Wealth group* and *Level of annuitization*. Table 3 reports the estimation results from the random effects probit model for the purchase decision (columns 1-3) and OLS models for the dollar amount of health-contingent income conditional on purchase (columns 4-6).

#### 4.1 Effects of access to informal care

Participants who expect to receive extensive, high-level informal care have a stronger demand for long-term care income insurance than participants who do not expect to receive any care informally. The estimated coefficient on the indicator for informal-only, extensive care is significant and positive (Table 3, column 1). While the sign on the estimated coefficient on the indicator for having access to some (low-level) informal care is negative, consistent with the results of Pauly (1990) and Zweifel and Strüwe (1998) for expense-reimbursement long-term care insurance, the coefficient is insignificant. For high-level (extensive) care, results in column (2) of Table 3 show that males who plan to rely exclusively on family members for care have a significantly higher probability of purchasing the long-term care income product than males who do not plan to rely on informal care.

Notably, the results of column (4-6) confirm complementarity. Males and females who have access to extensive informal care demand 25-37% *more* health-contingent income per year than those who do not. We conclude that the long-term care income product complements the availability of extensive informal care.

Some differences between males and females are worth highlighting. The point estimates in columns (5) and (6) in Table 3 suggest that females who expect to rely exclusively on extensive care from family members are willing to buy more income cover than males. Further estimation supports this view.<sup>13</sup> First, females with more children demand significantly more long-term care income insurance, but males do not. More children implies a better chance of, and/or more access to, informal care, which then justifies more transfers to be financed by the long-term care income product while the elderly female is alive. Second, we also find that for females, but not for males, an intention to bequeath wealth to children lowers demand for long-term care income insurance. Transfers while the elderly parent is alive are probably a substitute for (strategic) *post-mortem* bequests. It makes sense

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<sup>12</sup>We also estimate models that include the key variables of interest and *all* other control variables listed in Panel B of Table 2. Online Appendix F reports the estimation results for the full models, which are consistent with the results reported below using the reduced models.

<sup>13</sup>See the full model results in Online Appendix F.

that if women choose the long-term care income to reward their children for informal care, then those mothers who prefer a conventional *post-mortem* bequest will have lower demand for the product, as our results confirm.

In contrast to the typical expense-reimbursement insurance, long-term care income cover compensates people who rely on either informal care or professional care. In our sample, 22% of participants say that they would prefer to receive extensive (high-level) care only from informal sources. Another 28% of participants say that they prefer to use both informal and other sources for extensive care. Hence, the potential market for the long-term care income product covers a much larger proportion of the population than expense-reimbursement long-term care insurance by potentially covering people who prefer at least some informal care. More importantly, the finding that the long-term care income product complements the need and desire to rely on family members for extensive care indicates a stronger demand among these people.

Table 3: Determinants of demand for the long-term care income product

The table reports the estimated coefficients for random effects probit models in columns (1), (2), and (3) and for random effects OLS models in columns (4), (5), and (6). The dependent variable for columns (1), (2), and (3) is a binary variable that equals one if a participant chose to purchase the long-term care income product in Q1-Q4 and zero otherwise. The dependent variable for columns (4), (5), and (6) is the natural logarithm of the amount of annual health-contingent income chosen by participants who chose to purchase the long-term care income product in Q1-Q4. Here we report reduced models with selected independent variables and additional control variables selected by LASSO based on EBIC. Online Appendix F reports the results of estimations with all covariates.  $+\infty$  indicates that the associated independent variables perfectly predict the purchase of the long-term care income product. Robust standard errors (Huber-White) are shown in parentheses. Asterisks for  $\sigma_\nu$  indicate significance of the random effects that are derived from likelihood ratio tests (for columns (1), (2), and (3)) and Breusch and Pagan Lagrange multiplier tests (for columns (4), (5), and (6)). The \*, \*\*, and \*\*\* indicate significance at the 10, 5, and 1% levels, respectively.

Dependent variable:	Purchase long-term care income product			Log (annual health-contingent income)		
	Sample (1)	Male (2)	Female (3)	Sample (4)	Male (5)	Female (6)
<i>Objective measures of exposure to long-term care risk</i>						
Female	0.216 (0.202)			-0.448*** (0.073)		
Age	-0.013 (0.035)	-0.026 (0.052)	-0.009 (0.050)	-0.013 (0.013)	-0.031* (0.017)	0.003 (0.018)
Health state: base case = 1						
2	-0.109 (0.386)	-0.957* (0.567)	0.635 (0.585)	0.082 (0.134)	0.132 (0.159)	-0.028 (0.213)
3	0.327 (0.270)	0.163 (0.355)	0.469 (0.447)	0.010 (0.096)	0.014 (0.121)	-0.028 (0.151)
4	0.201 (0.331)	0.283 (0.452)	0.085 (0.516)	0.145 (0.112)	0.024 (0.155)	0.337** (0.157)
Current smoker	-0.120 (0.279)	0.134 (0.409)	-0.205 (0.405)	-0.315*** (0.108)	-0.210 (0.131)	-0.494*** (0.173)
Received care	0.146 (0.448)	-0.292 (0.632)	0.993 (0.791)	0.187 (0.138)	0.007 (0.188)	0.420** (0.185)
<i>Subjective indicators of exposure to long-term care risk</i>						
Subjective life expectancy	-0.017 (0.012)	-0.035** (0.017)	0.004 (0.020)	0.003 (0.004)	0.011** (0.005)	-0.007 (0.007)
Chance of needing homecare: base case = average						
Lower than the average	0.512* (0.308)	0.256 (0.395)	0.840 (0.533)	-0.016 (0.104)	-0.019 (0.127)	-0.032 (0.182)
Higher than the average	-0.657 (0.612)	-1.392 (0.935)	-0.117 (0.894)	-0.339** (0.171)	-0.266 (0.205)	-0.323 (0.288)
Chance of needing residential care: base case = average						
Lower than the average	-0.875*** (0.299)	-1.048*** (0.388)	-0.851* (0.516)	-0.038 (0.102)	-0.147 (0.126)	0.099 (0.178)
Higher than the average	5.527*** (1.154)	$+\infty$ *** (n.a)	3.691** (1.655)	0.591*** (0.165)	0.712*** (0.176)	0.326 (0.311)
<i>Availability of informal care</i>						
Source of some (low) care: base case = no informal care						
Informal care only	-0.385 (0.316)	-0.492 (0.461)	-0.392 (0.464)	-0.126 (0.107)	-0.302** (0.133)	0.017 (0.170)
Informal care and other sources	-0.177 (0.306)	0.530 (0.450)	-0.847* (0.447)	-0.188* (0.111)	-0.225 (0.143)	-0.174 (0.165)
Source of extensive (high) care: base case = no informal care						
Informal care only	0.887*** (0.331)	1.331*** (0.478)	0.497 (0.485)	0.284*** (0.110)	0.252* (0.142)	0.373** (0.169)
Informal care and other sources	0.217 (0.282)	0.350 (0.435)	0.266 (0.392)	0.227** (0.099)	0.080 (0.132)	0.364** (0.145)
<i>Additional control variables</i>						
No. of correct answers in recall quiz				-0.129*** (0.024)	-0.113*** (0.032)	-0.149*** (0.034)
Financial planning for LTC: base case = do not know needs and costs						
Have set aside money				0.327*** (0.077)	0.452*** (0.103)	0.282** (0.114)
Expect to rely on government				-0.007 (0.145)	0.104 (0.175)	-0.151 (0.239)
Wealth group: base case = 1						
2				1.106*** (0.100)	1.068*** (0.130)	1.181*** (0.151)
3				1.786*** (0.106)	1.702*** (0.148)	1.873*** (0.150)
4				2.331*** (0.110)	2.237*** (0.147)	2.482*** (0.163)
Level of Annuitization: base case = 0%						
25%	0.055 (0.132)	-0.053 (0.185)	0.167 (0.189)	-0.127*** (0.021)	-0.080*** (0.030)	-0.176*** (0.028)
50%	-0.187	-0.227	-0.147	-0.425***	-0.358***	-0.496***

continued on next page



**Table 3 – continued**

Dependent variable:	Purchase long-term care income product			Log(annual health-contingent income)		
	Sample (1)	Male (2)	Female (3)	Sample (4)	Male (5)	Female (6)
75%	(0.129) -0.441*** (0.126)	(0.182) -0.580*** (0.178)	(0.184) -0.295 (0.180)	(0.028) -1.002*** (0.034)	(0.041) -0.858*** (0.046)	(0.037) -1.151*** (0.049)
Constant	4.561** (2.101)	5.347* (3.107)	4.642 (2.964)	10.853*** (0.767)	11.928*** (1.047)	9.338*** (1.096)
$N$	4032	1932	1960	3443	1753	1690
Log likelihood	-1030.131	-525.518	-494.979			
$R^2$ (overall)				0.479	0.468	0.480
$\sigma_v$	3.423***	3.342***	3.336***	1.077***	1.030***	1.109***

## 4.2 Demand for health- and survival-contingent income

Next we examine the demand for health-contingent income in participants' optimal allocation of total retirement savings. To do so, we consider the situation where participants can choose their allocations to longevity insurance (life annuities) as well as long-term care income insurance. This expansion of the choice set is important because of the possible interaction between the demand for long-term care and longevity insurance (e.g., Davidoff, 2009). We examine this relationship by using the data from Q6 that reflects participants' optimal mix of health-contingent income (long-term care income insurance), survival-contingent income (life annuities), and liquid wealth.

We regress participants' preferred ratio of health-contingent income to survival-contingent income on objective and subjective long-term care risk factors, informal care indicators and other controls. Table 4 presents the regression results. A positive and significant coefficient indicates that, cross-sectionally, the variable signifies a stronger preference for health-contingent income over survival-contingent income.

Estimates confirm that the distinction between low-level (some) care and extensive care is important to demand for long-term care income insurance. For example, participants who would rely exclusively on informal sources for low-level care chose a lower ratio of health-contingent to survival-contingent income than participants who did not expect to use informal care (significant at the 10% level in column (1)). However, participants who would exclusively rely on informal sources for extensive care showed a stronger preference for health-contingent income than those who did not expect to use informal sources for extensive care. These results are mostly driven by females. An exception is that males have a significant and positive coefficient for *Informal care only* in column (2) of Table 4. Thus, our findings about the influence of long-term care risk factors and the availability of informal care on the demand for health-contingent income hold, both when the amount of survival-contingent income is exogenously given to participants, and when it is endogenously chosen by participants.

Table 4: Determinants of the optimal mix of income streams

The table displays the estimates of the coefficients from an OLS regression of a participant’s preferred ratio of health-contingent to survival-contingent income on indicators of risk and available care. The data for the estimation come from Q6 of the choice task. Only key variables of interest in relating to “Objective measures of exposure to long-term care risk”, “Subjective measures of exposure to long-term care risk” and “Availability of informal care” are shown. Online Appendix F sets out the full results. Robust standard errors (Huber-White) are shown in parentheses. The \*, \*\*, and \*\*\* indicate significance at 10, 5, and 1% levels, respectively.

Dependent variable:	health-contingent income/survival-contingent income		
	Sample (1)	Male (2)	Female (3)
<i>Objective measures of exposure to long-term care risk</i>			
Female	-1.392*** (0.432)		
Age	-0.086 (0.057)	-0.121 (0.100)	-0.037 (0.064)
Health state: base case = 1			
2	0.091 (0.584)	0.042 (0.999)	0.461 (0.511)
3	-0.212 (0.509)	0.115 (0.738)	-0.377 (0.604)
4	0.701 (0.667)	0.564 (1.082)	0.819 (0.596)
Current smoker	-0.505 (0.408)	-1.498** (0.631)	0.359 (0.535)
Received care	-0.449 (0.760)	-0.699 (1.141)	-0.283 (0.544)
<i>Subjective indicators of exposure to long-term care risk</i>			
Subjective life expectancy	0.007 (0.018)	0.029 (0.026)	-0.012 (0.027)
Chance of needing homecare: base case = average			
Lower than the average	0.251 (0.468)	0.381 (0.748)	-0.299 (0.457)
Higher than the average	-0.499 (0.676)	0.921 (1.180)	-1.946** (0.908)
Chance of needing residential care: base case = average			
Lower than the average	-0.647 (0.413)	-1.374** (0.669)	0.301 (0.395)
Higher than the average	2.264** (1.054)	3.188** (1.529)	0.507 (1.000)
<i>Availability of informal care</i>			
Source of some (low) care: base case = no informal care			
Informal care only	-0.883* (0.496)	-0.397 (0.912)	-1.385*** (0.483)
Informal care and other sources	-0.299 (0.571)	0.503 (1.061)	-1.099** (0.474)
Source of extensive (high) care: base case = no informal care			
Informal care only	2.120*** (0.595)	2.312** (0.982)	1.841*** (0.711)
Informal care and other sources	0.607 (0.513)	-0.437 (0.959)	0.876* (0.465)
Other control variables			
<i>Awareness of long-term care risk</i>	Yes	Yes	Yes
<i>Measures of utility parameters</i>	Yes	Yes	Yes
<i>Individual capability and knowledge about retirement financial products</i>	Yes	Yes	Yes
<i>Retirement planning</i>	Yes	Yes	Yes
<i>Demographics</i>	Yes	Yes	Yes
<i>N</i>	1008	518	490
<i>R<sup>2</sup></i>	0.183	0.226	0.206

### 4.3 Precautionary savings and demand for long-term care income insurance

We now examine the impact of having access to the long-term care income product on the demand for longevity insurance (life annuities). We use the data obtained from Q7 of the choice task, that asked participants how they would like to re-allocate their retirement savings when the long-term care income product was no longer offered. In the experiment, we reset participants' allocations so that the amount of retirement wealth they had previously allocated to the long-term care income product (in Q6) was "deposited" back into their investment account. Participants could then increase or decrease their annuitization level by 25%, or keep the new allocation we gave them unchanged.<sup>14</sup> The answers to Q7 measure the within-participant effect of having access to the long-term care income product on their demand for life annuities. In this way, we are able to minimize, if not eliminate, the effects of other participant-specific factors.

We first carry out a univariate test on whether the proportion of participants who chose to increase their level of annuitization in the absence of long-term care insurance was equal to the proportion of participants who chose to decrease it. To explain the heterogeneity in participants' reactions, we then report results from a multinomial logit model with three states: 1) the participant prefers a decrease in annuitization when long-term care income insurance is not available; 2) a base case of no change in annuitization when long-term care income insurance is not available; and 3) the participant prefers an increase in annuitization when long-term care income insurance is not available.

We find that when long-term care income insurance was removed, more participants decreased their level of annuitization (31.9%) and boosted their liquid wealth than increased annuitization (19.8%), with 48.3% leaving annuitization unchanged. These differences are significant at a 5% level. Thus we infer that for most participants whose portfolio choices were materially affected by whether they had access to the long-term care income product, the product allowed them to release precautionary savings that would otherwise be needed to self-insure against long-term care risk, and therefore to purchase additional longevity insurance.

Table 5 presents estimated coefficients from the multinomial logit model. We find that participants with low long-term care risk were more likely to decrease their level of annuitization when the long-term care income product was no longer offered on the market than an average or high-long-term-care-risk participant. In the absence of long-term care insurance coverage, the demand for life annuities for the low long-term care risk participants was substantially reduced, because they chose liquid wealth to self-insure. Participants with higher perceived long-term care risk are more likely to purchase the long-term care income product, and they purchase more, while participants with lower long-term care

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<sup>14</sup>A magnitude of change as much as 25% (the same as the increment in Q1-Q4) is required because otherwise we would not be able to identify whether the change is due to the treatment or rounding behaviors.

risk are more likely to purchase more life annuities after they obtain coverage for long-term care. This means that the availability of separate long-term care income insurance may strengthen the demand for life annuities for healthy (low risk) participants but not for the unhealthy participants, highlighting the potential value of bundling longevity insurance and long-term care insurance, to improve risk pooling.

Table 5: Regression of participants' responses to the withdrawal of the long-term care income product

This table reports estimation of the multinomial logit model of the probability that participants decrease (case 1), do not change (base case), or increase (case 3) annuitization when the long-term care income insurance product is withdrawn. The data for the estimation come from Q7 of the choice task. The sample includes participants who chose partial annuitization in the presence of the long-term care income product in Q7 of the choice task. Online Appendix F reports estimates from models with a full set of control variables. Robust standard errors (Huber-White) are shown in parentheses. The \*, \*\*, and \*\*\* indicate significance at the 10, 5, and 1% levels, respectively.

Base outcome: No change in annuitization	Decrease by 25%	Increase by 25%
	(1)	(2)
<i>Objective measures of exposure to long-term care risk</i>		
Health state: base case = 1		
2	0.621 (0.513)	0.413 (0.543)
3	-0.006 (0.359)	-0.034 (0.402)
4	-1.072** (0.478)	0.030 (0.443)
<i>Subjective indicators of exposure to long-term care risk</i>		
Chance of needing residential care: base case = average		
Lower than the average	1.074*** (0.405)	0.687 (0.442)
Higher than the average	-0.590 (0.881)	0.523 (0.849)
<i>Awareness of long-term care risk</i>		
Financial planning for LTC: base case = do not know needs and costs		
Have set aside money	-0.195 (0.284)	-0.683** (0.317)
Expect to rely on government	-0.794 (0.580)	-0.023 (0.642)
<i>Retirement planning</i>		
Financial planning for retirement	0.598 (0.406)	1.016** (0.516)
<i>Demographics</i>		
Wealth group: base case = 1		
2	-1.154*** (0.435)	0.317 (0.570)
3	-2.818*** (0.486)	-0.092 (0.585)
4	-2.533*** (0.474)	-0.065 (0.595)
<i>N</i>		-389.964
Log likelihood		445.000

## 5 Conclusions

Our analysis of stated preferences for long-term care insurance shows that a more flexible product that pays a regular income when the insured person needs care, instead of reimbursing expenses, has a large potential demand, in particular from those expecting to rely on informal care. With declining utilization of residential care facilities and many people relying on unpaid long-term care from close family members, a flexible long-term care insurance policy that offers health-contingent income may

better suit the needs of this large and increasing proportion of seniors.

We find that the demand for long-term care income insurance is stronger for people (especially females) who plan to rely on informally-provided but, extensive, care. To put it differently, the product complements the availability of extensive, informal care, rather than substitutes for it, as is the case for expense-reimbursement long-term care insurance (Pauly, 1990; Zweifel and Strüwe, 1998). This result has practical implications: not only can flexible long-term care income insurance cover a larger proportion of the population by including those who prefer to use informal care, it would also be more attractive to this group of people than expense-reimbursement policies.

We also investigate the demand for longevity insurance when people can simultaneously insure long-term care risk. Having access to long-term care income insurance changes the annuitization decisions of around half of participants. A proportion of participants see longevity insurance as a means to cover long-term care costs in the absence of long-term care insurance. However, there is a larger proportion who would purchase long-term care insurance and release precautionary savings in order to purchase more longevity insurance, particularly those with lower long-term care risk. This finding means that for healthy (low risk) participants, the availability of the long-term care income product offers a partial solution to the annuity puzzle.

Our results can inform product innovation in long-term care public policy. Policy responses to long-term care needs range from tax financing (Nordic countries), social insurance (Germany, Japan, and the Netherlands), means-tested support (Australia, the UK, and the US), and cash payments (Austria, the Czech Republic, and Italy) (Colombo et al., 2011; CEPAR, 2019; Norton, 2016). However, irrespective of the financing format, public long-term care costs are high and rapidly increasing<sup>15</sup>, and in OECD countries are expected to at least double over the next 40 years (de la Maisonneuve and Martins, 2015). Only a few countries have private markets for long-term care insurance that can complement or supplement public support. The long-term care insurance product we propose and analyze does not cover catastrophic risk but could effectively supplement public systems which do provide such cover, such as in Australia or as proposed for the UK.

While our research findings support a market for an long-term care income product, there remain key policy design, and supply-side and demand-side issues to be addressed such as integration with publicly-funded support to deal with potential crowding-out (Norton, 2016), consumer awareness and understanding of health-contingent products (Boyer et al., 2019) and strategies for risk management (Eling and Ghavibazoo, 2019). There are, in addition, a number of practical implementation matters, including the efficacy of providing cash payments to the elderly and cognitively impaired (Norton,

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<sup>15</sup>The consensus of international studies puts the annual cost of home or institutional long-term care as at least as high as the average disposable income for the over 65 year-old population (Muir, 2017; Boyer et al., 2019; Ameriks et al., 2018).

2016), the attractiveness (or not) of a single premium at retirement in terms of affordability and present bias, effective assessment and monitoring of disability status to address moral hazard issues, and the challenges associated with the communication of a complex product to potential purchasers. These are issues for future research.

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