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ABSTRACT

This paper explores new mechanisms to fund long-term care using housing wealth. Using data from an online experimental survey fielded to a sample of 1,200 Chinese homeowners aged 45-64, we assess the potential demand for new financial products that allow individuals to access their housing wealth to buy long-term care insurance. We find that access to housing wealth increases the stated demand for long-term care insurance. When they could only use savings, participants used on average 5% of their total (hypothetical) wealth to purchase long-term care insurance. When they could use savings and a reverse mortgage, participants used 15% of their total wealth to buy long-term care insurance. With savings and home reversion, they used 12%. Reverse mortgages do not require regular payments until the home is sold, while home reversion involves a partial sale and leaseback. Our results inform the design of new public or private sector programs that allow individuals to access their housing wealth while still living in their homes.

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A data appendix is available at http://www.nber.org/data-appendix/w29689

1. Introduction

We explore new mechanisms to fund long-term care using housing wealth. Our research in this area is motivated by the following trends and policy challenges. In both developed and developing countries worldwide, there is a growing demand for long-term care services that exceed available funding. Health insurance programs often cover only basic long-term care costs (if at all) and few countries have public long-term care insurance programs, while private long-term care insurance markets are very small. As a result, individuals can face high out-of-pocket costs for long-term care. Simultaneously, many older individuals own their homes, with their housing wealth often forming the largest part of their household wealth and retirement savings. However, housing wealth is a lumpy and illiquid asset. Furthermore, individuals often have a strong emotional attachment to their home, and many prefer to 'age in place,' and remain and receive care in their own home as they age. This 'ageing in place trend' has been reinforced by the negative effects of the COVID-19 pandemic on older people in nursing homes.

These trends suggest potential for new public and/or private sector programs that allow individuals to access their housing wealth while still living in their homes. This paper uses survey methods to investigate the stated demand for new financial arrangements that allow individuals to access their housing wealth to purchase long-term care insurance. We compare the stated demand for long-term care insurance when individuals can (i) only use their savings, (ii) use their savings and a reverse mortgage loan, or (iii) use their savings and home reversion, to fund a single upfront premium for long-term care insurance. We focus on reverse mortgages and home reversion as the two most common types of home equity release arrangements internationally. With a reverse mortgage loan, a homeowner borrows against their home and is not required to make any interest and capital repayments until the home is sold. With home reversion, the homeowner sells part of their housing wealth, receives a payment upfront, and also receives a proportional share of the sale proceeds when they die or permanently move out. The long-term care insurance product we tested is a joint life product that pays a regular monthly income (rather than reimburses expenses) when either or both of a couple qualifies for long-term care. The income can be used for various purposes, including (but not limited to) paying formal caregivers, compensating friends or family members for informal care, and paying for formal residential care.

Our study is based on an online experimental survey that was completed by 1,200 participants aged 45–64 who live in 49 of China's largest cities. We find that access to housing wealth increases the stated demand for long-term care insurance. When they could only use savings to

finance their long-term care insurance premiums, participants used an average of 5% of their total (hypothetical) wealth to purchase long-term care insurance. When they could use savings and a reverse mortgage, the survey participants used 15% of their total wealth to purchase long-term care insurance. With savings and home reversion, they used 12%. We also analyzed the impact of a broad range of covariates on the stated demand for long-term care insurance under the different funding mechanisms.

Our paper is the first to quantify the stated demand for combinations of long-term care insurance and home equity release products. Our results are consistent with theoretical studies which have used lifecycle models to show that the demand for long-term care insurance increases when home equity can be accessed to finance the insurance premium (e.g., Davidoff, 2010; Hanewald *et al*., 2016; Shao *et al.,* 2019). We find a larger effect of home equity release on long-term care insurance demand than a recent theoretical study by Achou (2021). Using a lifecycle model of single retirees in the US context, Achou finds that housing liquidity has a limited impact on long-term care insurance demand. His model suggests that, even if housing were made to be fully liquid, long-term care insurance rates would hardly rise above 10%, from a 5% baseline in his sample. The larger effect we find in our survey data from China may be due to a range of factors, including different long-term care risks and out-of-pocket costs individuals face in China. We also note differences in product design: We designed an income product that can be used to pay for informal care, while Auchou (2021) considered expense reimbursement long-term care insurance in his theoretical analysis.

Our study also contributes to the growing body of empirical research exploring the demand for long-term care insurance. Lambregts and Schut (2020) provided a systematic literature review of the reasons for the low uptake of long-term care insurance and life annuities. They included 62 empirical studies that analyze long-term care insurance uptake in different high-income countries. Lambregts and Schut (2020) report that most studies find a positive association between education, income or wealth and long-term care insurance uptake, while home ownership is associated with lower uptake (e.g., Boyer *et al*., 2017, Costa-Font and Rovira-Forns, 2008, Wu *et al*., 2021). When housing assets cannot be used as a financial resource to fund long-term care insurance premiums, housing wealth may crowd out the demand for long-term care insurance as it may be retained for precautionary purposes (Boyer *et al.*, 2017; Costa-Font and Rovira-Forns, 2008). Our study is one of the first empirical studies to examine how access to housing assets via home equity release products impacts the demand for long-term care insurance.

Our results inform the design of new public and/or private sector programs that allow individuals to access their housing wealth while still living in their homes. Hanewald *et al*. (2020b) discussed how such combined products could be introduced into the US market. Mayhew *et al.* (2017) developed a pricing framework for selling a proportion of housing wealth to purchase long-term care insurance, while Mayhew *et al.* (2021) evaluated the benefit of different financing strategies to purchase long-term care insurance. These authors argued that both a single premium and a regular monthly premium for purchasing long-term care insurance would severely impact the daily expenses of retirees, particularly for those who are asset rich but cash poor. Instead, it could be beneficial to finance long-term care insurance through home equity release, either via a reverse mortgage or home reversion. A program like this could also be offered by the government; for example, the Australian Home Equity Access Scheme could be extended to cover long-term care costs (see Sun *et al*., 2022, for a description of the Home Equity Access Scheme). By identifying an additional funding source for long-term care, our findings can also facilitate the development of long-term care services. The additional funding generated through access to housing wealth could attract more service providers to the market and may also increase the availability of informal carers who can be compensated according to the health of the care receiver through the design of the LTCI product.

Our results also inform current policy reforms in China, which aim to increase long-term care insurance coverage through government-funded schemes and the development of a private market for commercial long-term care products. In recent years, the Chinese government has focused on the development and enhancement of the long-term care funding system in various five-year plans. In 2016, long-term care insurance pilot programs were launched in 15 different cities and extended to 49 cities in 2020 (General Office of the State Council of PRC, 2020). Currently, the public long-term care insurance pilot program covers more than 130 million residents, with more than 1.3 million residents having received benefits from the scheme (Li *et al.*, 2021). The program focuses on providing basic services or funding for basic long-term care services and aims to reimburse 70% of the basic long-term care costs. The government plans to enhance the public long-term care scheme and develop the commercial long-term care insurance market to supplement the public scheme (General Office of the State Council PRC, 2020). Thus, there is potential to develop the long-term care insurance market in China.

The Chinese government has also shown interest in developing the home equity release market. Homeownership rates are high, and property prices have increased substantially (People's Bank of China, 2020). In 2014, a reverse mortgage program (known as the "House-for-Pension"

scheme) was introduced in several large cities. Although uptake of the pilot scheme was low, the findings of a recent experimental study suggest a potential demand for simpler and more flexible reverse mortgage products (Hanewald *et al.,* 2020a). Our results indicate that home equity release products could provide an additional source of funding for purchasing long-term care insurance.

The remainder of this paper is organized as follows. Section 2 provides the background information on public and private long-term care insurance, housing wealth, and reverse mortgage programs in China; Section 3 describes the survey design; Section 4 reports descriptive statistics; Section 5 presents the regression analysis of the survey data; finally, Section 6 concludes.

2. Background

2.1 Long-term care needs and insurance in China

China's population is rapidly aging, and there is a growing need for long-term care. In 2019, 12% of the population was aged 65 or above, and this proportion is projected to increase to 17% by 2030 and to 26% by 2050 (United Nations, 2020). Assuming current pension eligibility ages in China, we estimate that the chance of requiring long-term care for men aged 60 is 40% and for women aged 55 is 30% (see Section B.3.2 in the Online Appendix for detailed calculations).

Long-term care in China is traditionally provided by spouses and other family members. When Chinese retirees are disabled, they expect their partners and/or children—especially their daughters and daughters-in-law—to take care of them (Zimmer, 2005; Chappell and Kusch, 2007; Lin, 2014; Scheil-Adlung, 2015). However, the increasing demand for informal care is met by inadequate supply. There are fewer children available to be caregivers as a result of the change in China's population structure associated with the one-child policy, which was in effect from the late 1970s to 2015 (Rowland, 2009; Ku *et al.,* 2013; Zeng and Hesketh, 2016). The resulting "4-2-1" family structure—comprising four grandparents, two parents, and one child—places an increased level of responsibility for long-term care on that single child who has no siblings to share the responsibility. Moreover, the increased mobility of workers due to the changes in the labor market has weakened family connections, making it increasingly difficult for children to provide informal care for their elders (Arnsberger *et al.,* 2000; Ku *et al*., 2013; Feng *et al.,* 2020). Less availability of informal care has led to a higher demand for formal care and unmet care needs.

To address this issue, China is developing its formal care facilities and services. Before the long-term care plan reform in 2016, most long-term care related services were provided in hospitals (Mi *et al.*, 2020). In 2016, the central government commenced a public long-term care pilot program in 15 cities, which was further extended to 49 cities in 2020. Since the plans and systems vary from city to city, we use Qingdao as an illustrative example. Qingdao is one of two focus cities for the development of the public long-term care pilot program. The current system provides two types of services: medical care and daily living care. For medical services, the public long-term care plan pays up to RMB 1600 per year for mobile clinic care, up to RMB 50 per day for home care services, up to RMB 65 per day for nursing home care, and up to RMB 170 per day for hospital care.[1] For daily care, the payment from the public plan is up to RMB 50 per day for daytime nursing home services and up to RMB 65 per day for short- and long-term nursing home services. These amounts only support relatively basic services. Individuals or their families have to cover comprehensive services out-of-pocket.

In the private insurance market, only critical illness insurance and retirement village investment products are currently offered by insurers.[1] The former typically provides a lump-sum benefit that does not provide an income stream to hedge long-term care risks, whereas the latter does not provide risk pooling. Since the government aims to further support the public long-term care scheme, it would be beneficial for it to develop the commercial long-term care insurance market to supplement the public scheme (General Office of the State Council PRC, 2020). The research reported in this paper examines the potential demand for long-term care insurance products that can top up the current government-funded long-term care scheme by using both out-of-pocket financial wealth and housing wealth.

2.2 Housing wealth and reverse mortgages in China

For most Chinese households, most of their wealth is in housing. In 2019, the homeownership rate of urban households was 96%, and they held 74% of their total household wealth in housing (People's Bank of China, 2020). Furthermore, in the past 20 years, house price growth in China has been substantial. According to the Bank for International Settlements (2021), the average annual growth rate for housing prices in China was 7.4% p.a. from 2011 to 2021.

[1] We use RMB to refer to the Chinese currency CNY. The CNY/USD exchange was 0.16 USD on 16 Dec 2021.

[1] China Life Insurance Company, People's Insurance Company of China, Cathay Life Insurance and Kunlun Health Insurance Company had offered monthly income benefit long-term care insurance products to the public, but due to various reasons such as low profitability and low demand, these companies now longer offer monthly income benefit long-term care insurance products.

In 2013, the Chinese government released a policy document to encourage the development of a reverse mortgage market.[2] The government strongly recommended that financial institutions develop new financial products (specifically reverse mortgages) to support retirement financing, especially the cost of long-term care services. While several insurers obtained a license to offer reverse mortgage products, only one—Happy Life Insurance—followed through with the introduction of the "House for Pension" scheme in July 2014. However, this product has been unpopular, and take-up has been extremely low. The product is relatively complex and inflexible since it provides fixed monthly payments for life that are partly structured as a deferred annuity (Hanewald *et al.*, 2020a). The product design remained unchanged between the launch in 2014 and mid-2021 when this research was conducted. However, research by Hanewald *et al*. (2020a) suggests that there could be a higher demand for an appropriately designed product that provides flexibility for older households to access liquidity from their housing assets to finance the purchase of long-term care insurance.

One potential concern for developing China's home equity release market is property rights. In China, homeowners only own the buildings but not the land. Residential property owners need a grant contract to obtain 70-year land-use rights, which are transferrable when a property is sold. However, according to Article 22 of the Law of the People's Republic of China on the Management of Urban Real Estate, land users (e.g., homeowners) can apply for an extension one year before the end of the term and may receive a renewal contract for the granting of land use rights upon approval. Additionally, Article 149 states that the right to use the land for residential construction should be automatically renewed upon the expiration of the grant contract. Moreover, Article 359 of the new Civil Code (which came into effect on 1 January 2021) states that the land use rights for residential construction will be automatically renewed by the payment of fees under the provisions of the law and administrative regulations. Furthermore, Article 366 of the Civil Code establishes a new right: the right to live on a property. In summary, property rights and the establishment of the right to live should not hinder the development of the home equity release market in China.

3. Survey design

We designed an online experimental survey to investigate the potential demand for long-term care insurance financed from savings and/or housing assets by middle-aged urban homeowners

[2] Several Opinions of the State Council on Accelerating the Development of the Elderly Service Industry, which was issued September 2013.

in China. The experimental task elicited the demand for three alternative hypothetical long-term care insurance products. All three products provide a monthly income to the policyholder and their partner if at least one of the couple is disabled and qualifies for long-term care. The three products differ in the way the one-off premium (paid at the beginning of the contract) is financed: by cash from savings; by a combination of savings and borrowing against home equity via a reverse mortgage; by a combination of savings and selling part of one's home equity via home reversion.

3.1 Focus group testing

We developed a first draft of the survey based on related studies on the demand for long-term care insurance (Wu *et al.,* 2021) and reverse mortgages (e.g., Dillingh *et al.,* 2017; Fornero *et al.,* 2016; Davidoff *et al.,* 2019; Hanewald *et al.,* 2020a). We used focus groups to pre-test the survey design—particularly the wording and level of detail of long-term care insurance product descriptions and the format of the choice tasks. The focus group discussions were conducted by the market research company Horizon Dataway in Shanghai, China, on 20–21 December 2018. The recruitment of focus group participants was aligned with the screening criteria for the online survey: urban homeowners aged 45–64 with no difficulties in performing any activities of daily living (ADLs). We provided a script to the moderator from Horizon Dataway to lead the discussion in Mandarin Chinese. Two focus groups, each with six participants, undertook a facilitated discussion of the product information and draft choice tasks for 2 hours.

The video-recorded focus group discussions allowed us to considerably improve the presentation of the product information and the setup of the choice tasks. The focus group participants asked many detailed questions about the definition of long-term care and how the hypothetical products work. These questions and suggestions helped to refine the product descriptions presented in the online survey. For example, the participants asked whether non-permanent injuries would be covered, which party is responsible for appointing the doctor to determine the insured's health state, how the benefits are paid out, and whether the products provide a death benefit. The participants reported that numerical examples were critical for them to understand the products and provided some suggestions for the Chinese translation of the draft survey. We used this feedback to develop our final survey.

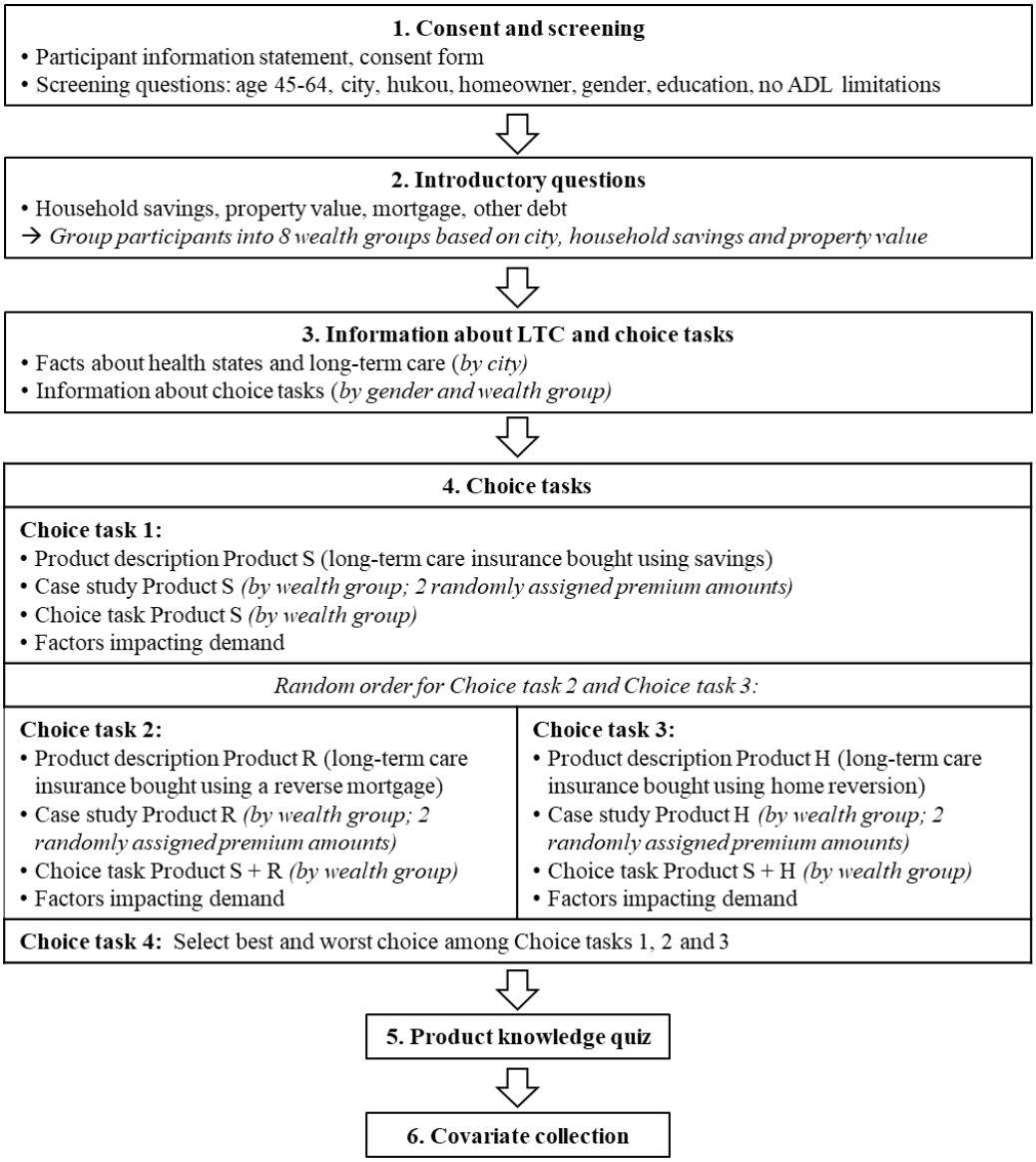
3.2 Survey structure

Figure 1 summarizes the structure of the final version of the survey. The survey commenced with screening questions followed by information about health states and long-term care, the

choice tasks, and finally, questions to collect covariate data. We will describe the survey components in detail in the following sections. The online survey was programmed in English and Chinese by the survey company dataSpring and administered in Chinese. Screenshots of the English version of the survey are available in Appendix A.[3] As shown in the screenshots, we used bold font and red font to emphasize important information. We used blue font color to highlight technical terms, which were explained via pop-up windows. We also required the survey participants to remain on important survey screens for at least 20 seconds.

[3] The live survey can be found at:
English: https://pro.wenjuan.com/s2/5d6e41097e634b90c7a7c319/?test_mode=1
Chinese: https://pro.wenjuan.com/s2/5da15ed57e634b50a6b3e6d1/?test_mode=1.

Figure 1: Overview of the survey design.



3.3 Sample

The Chinese version of the survey was fielded in November 2019 by the online survey firm dataSpring to a sample of 1,200 participants. dataSpring recruited the participants through email and an app from their database of over 1 million Chinese urban residents and from their network of panel suppliers to expand the reach of their database. The participation rate was approximately 5–10%. Participants who completed the survey were paid a fixed amount. Additionally, a bonus payment was based on the results of the product knowledge quiz. The median completion time for the survey was 19 minutes.

The survey targeted urban homeowners aged 45–64 years, who could be potential customers for the long-term care insurance products we tested. We included quotas to target 50% males and 50% females, broad coverage of education levels, and representative geographical coverage across four Tier 1 cities (Shanghai, Beijing, Shenzhen, and Guangzhou) and 45 Tier 2 cities in China.[4] We required 50% of the participants to reside in Tier 1 cities and the other 50% to reside in Tier 2 cities. Tier 1 and 2 cities differ in population size, income level, business opportunity, and consumer behaviors. We also required the participants to have the urban "*hukou*" registration of the cities they reside in since this identifies participants who have a long-term relationship with the city. We identified homeowners by asking participants whether they (or their spouse) own at least one property (with an owner certificate). We excluded participants with difficulties performing ADLs since such conditions would make them immediately eligible for long-term care insurance benefits and would therefore disqualify them from purchasing any of the long-term care insurance products.

3.4 Wealth groups

Eligible participants began the survey with nine introductory questions to provide information that would help us allocate the participants into different wealth groups. Based on the self-reported answers regarding their (net of loans) savings, the current (net of mortgages) values of their properties, and the tier of the city they live in, participants were allocated into one of eight wealth groups (see Table 1). The participants were then assigned hypothetical home values and saving amounts close to their self-reported values.

Table 1: Wealth group allocation.

Self-reported home value in RMB	Self-reported savings in RMB	City Tier	Wealth group	Hypothetical home value (H) in RMB	Hypothetical savings (W) in RMB
≥ 3,000,000	≥ 500,000	1	1	5,000,000	750,000
≥ 3,000,000	< 500,000	1	2	5,000,000	250,000
< 3,000,000	≥ 500,000	1	3	1,500,000	750,000
< 3,000,000	< 500,000	1	4	1,500,000	250,000
≥ 1,000,000	≥ 150,000	2	5	1,500,000	750,000
≥ 1,000,000	< 150,000	2	6	1,500,000	250,000
< 1,000,000	≥ 150,000	2	7	800,000	250,000
< 1,000,000	< 150,000	2	8	800,000	75,000

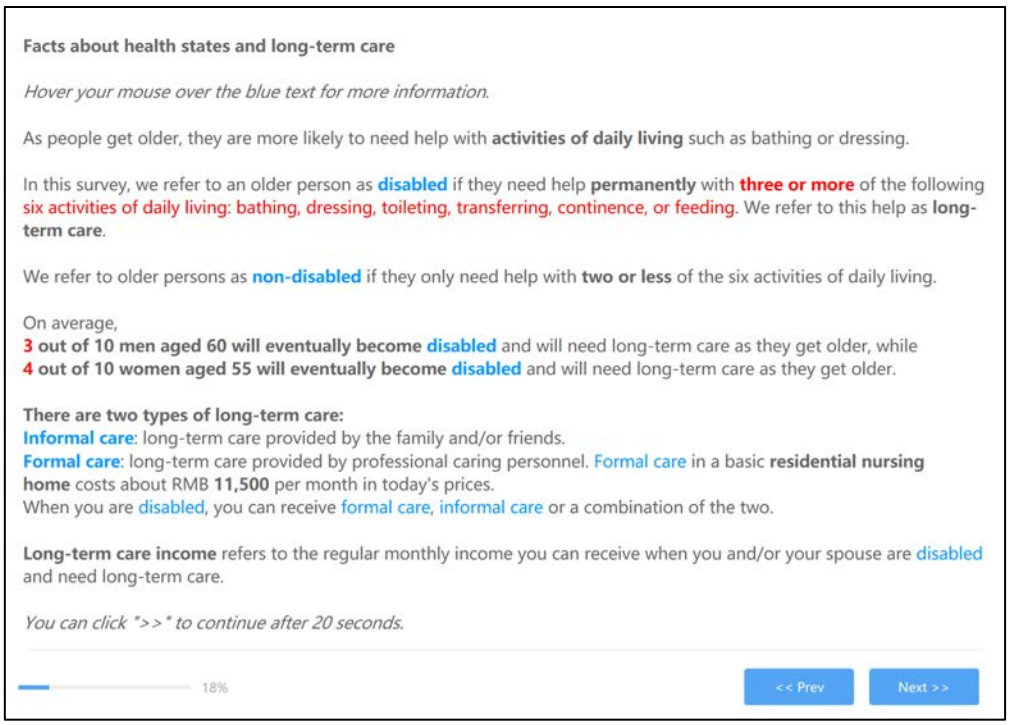
Notes: This table shows how we assigned participants into one of eight wealth groups based on their self-reported home values, savings, and the tier of the city they live in. The wealth groups have different hypothetical home values and saving amounts close to their self-reported values.

[4] The Chinese city tier system is not an official list. We used the definition by the Chinese Business Network (2021) to determine the tiers of the cities. We grouped New Tier 1 cities and Tier 2 cities into one group and called them Tier 2 cities. The ranking system is updated on an annual basis, but the Tier 1 cities have remained unchanged for several years.

3.5 Information about long-term care and choice tasks

The participants then saw a screen titled "Facts about health states and long-term care", which explained long-term care, health status, and other key technical terms used in the survey in easy-to-understand language (see Figure 2). We developed this description based on insights from the focus group testing and previous research (Wu *et al*., 2021). We provided estimates for the chance of requiring long-term care for men aged 60 and women aged 55. These ages correspond to the pension eligibility ages for men and blue-collar women under China's Basic Old-Age Insurance program, which covers urban employees and public servants (Deng *et al.*, 2020). Section B.3 in the Online Appendix describes how we calculated these rates using individual-level data from two household panel surveys in China: the Chinese Longitudinal Healthy Longevity Survey (CLHLS) and the China Health and Retirement Longitudinal Study (CHARLS).

Figure 2: Screenshot of "Facts about health states and long-term care" (translated).



The "Facts about health states and long-term care" screen also included information about residential nursing home costs. The participants saw different prices according to the tier of the city they reside in. Participants in Tier 1 cities saw the cost of RMB 11,500 per month, whereas those in Tier 2 cities saw the cost of RMB 9,500. We estimated these costs based on the average cost of residential long-term care in Tier 1 and Tier 2 cities according to "58 Daojia," the

national service provider that publishes residential long-term care costs in different cities every month (see Section B.3.5 in the Online Appendix).

On the next two screens, we prepared participants for the choice tasks. We explained that they would be asked to make choices regarding three new financial products designed to fund long-term care. We informed the participants that each product would provide them with an income when they require long-term care. Participants were told that they would see product descriptions and a case study for each of the three long-term care income products before completing four choice tasks. We asked the participants to read the product descriptions carefully and that their understanding would affect the bonus amount they could earn from the survey (e.g., Hanewald *et al.,* 2020a used similar incentives).

We asked participants to ignore their financial circumstances in the choice tasks and imagine that they were aged 60 for males (55 for females), married to a spouse aged 55 (60 for females), about to retire, that they own their own home at a given value, that they have a given amount in a savings account, and that they have no other assets. We then showed the participants a hypothetical home value and savings amount close to their self-reported financial situation, as described in Section 3.4.

3.6 Choice tasks 1–3

As indicated in the overview of the survey design in Figure 1, participants then proceeded to Choice Tasks 1–3, each of which involved a different long-term care insurance product. Each choice task consisted of a product description, a case study of the product, and a choice task for the stated demand. All participants started with Choice Task 1, which was for Long-Term Care Income Product S (long-term care insurance bought using savings). They then completed either Choice Task 2, in which participants could use savings and a reverse mortgage loan (via Long-Term Care Income Products S and R, respectively) to purchase long-term care insurance, or choice task 3, in which participants could use savings and home reversion (via Long-Term Care Income Products S and H, respectively) to purchase long-term care insurance. We randomized the order of Choice Tasks 2 and 3 to avoid potential ordering effects. We used “S”, “R”, and “H” as the product names to avoid any (positive or negative) connection with existing financial products. We did not refer to the products as insurance. Instead, we called them “products” or “contracts.”

The remainder of this section describes other components of the choice tasks.

Product descriptions

Choice Tasks 1, 2, and 3 each began with the description of a new hypothetical product. The product descriptions consisted of a summary of the product and a detailed product description in a question-and-answer style presented in table format. Screenshots of all product descriptions can be found in Appendix A. We explain the underlying pricing in Section B.3 of the Online Appendix.

The product description for Long-Term Care Income Product S explained that the participants could buy this product with a single payment from their savings and would receive a regular monthly income if they and/or their spouse required long-term care. The detailed description (in table format) explained that Product S was offered by a state-owned bank, would require a single payment at the start of the contract, would provide a monthly income for life in the case of being disabled and requiring long-term care services, and outlined other features.

The product description for Long-Term Care Income Product R explained that the participants could buy this product by borrowing against their home. It also stated that the product would pay a regular monthly income if the participant and/or their spouse required long-term care. The description of the long-term care insurance component was similar to that of Product S. The description of the reverse mortgage component was informed by the mortgage product description developed by Hanewald *et al.* (2020a), which reported high rates of product understanding. We explained that Product R would not require payment at the start of the contract but would incur a loan that accumulates a fixed interest of 5.8%[5]. We also explained that no repayments would be required while the participant and/or their spouse live in their home. Instead, the product provider would sell the property at the highest possible market price after both partners had passed away or moved to a residential nursing home and would use the sale proceeds to repay the loan. The participants were also informed that if the sale proceeds were insufficient to cover the debt, they, their spouse, or their heirs would not be required to make any extra payment. That is, Product R included a non-negative equity guarantee, which is a common regulatory requirement for reverse mortgages.[6]

[5] Happy Life Insurance Company launched the pilot reverse mortgage in China in 2014. At the time when the survey was conducted , the interest rate charged was 5.5% p.a. In addation, there are several types of fees charged each year (including lawyers' fee, policy fee and surveyor fee) and at the beginning of the contract. We estimated the equivalent interest charged for these fees is around 0.3% p.a. Therefore, we used 5.5% + 0.3% =5.8% p.a. as the interest rate charged in Product R.

[6] Compared to Hanewald *et al.* (2020a), this product is less flexible as it is only used for financing the premium of long-term care income product. However, in terms of the no-negative equity guarantee, the right of renting out the property, and the arrangement of terminating the contract, Long-Term Care income Product R is similar to the

The product description for Long-Term Care Income Product H explained that the participants could buy this product by selling part of their home. The description of the long-term care insurance component was similar to those for Products S and R. The description of the home reversion component explained that Product H would not require payment at the start of the contract. Instead, the participant would sell a part of the home to the product provider. We also explained that the product provider would sell the property at the highest possible market price after both partners had passed away or moved to a residential nursing home and that the sale proceeds would be split between the product provider and the participant, their spouse (if in a nursing home), or their heirs.

We included several product features in Products R and H that the focus group participants identified as important. Both product descriptions clarified that the participant would have a guaranteed right to live in their home while they or their spouse are non-disabled. Furthermore, the participants would retain full legal rights to their homes and would be allowed to rent them out. We also included an option for them to terminate the contract early and—importantly—an option for their heirs to repay the debt (with Product R) or buy back the share of housing wealth (with Product H) to keep the property when the contract terminates. Focus groups discussions suggested that these options are important for the acceptance of home equity release products.

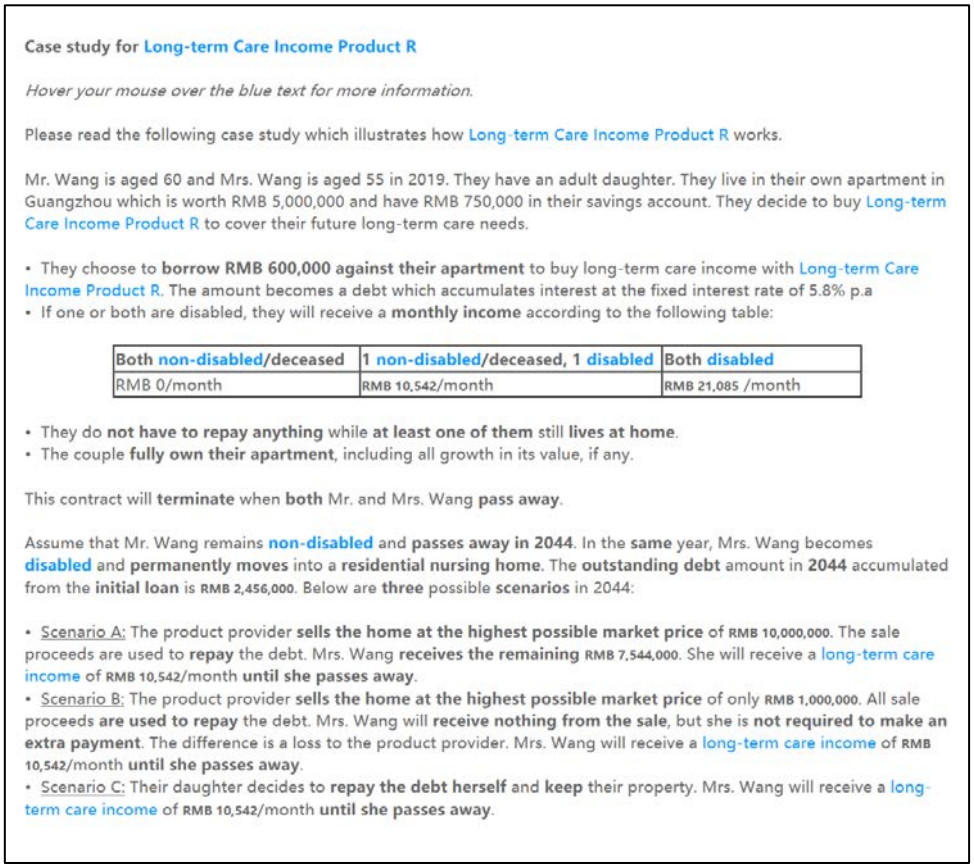
Case study

After each product description, the participants were shown a case study. The case study illustrated how each product works, using as an example a hypothetical couple in the same wealth group as the participants. The case study described how the purchase of the product would impact the couple's initial housing wealth and savings, the monthly long-term care income they received when they became disabled, and described the transactions at the end of the contract. For Products R and H, which involve the use of housing wealth, we described the outcomes for three possible scenarios at the time of the contract termination to illustrate the impact of house price growth and the option for their heirs to keep the property when the contract terminates. Figure 3 shows a screenshot of the case study for Long-Term Care Income

product described by Hanewald *et al.* (2020a). We reduced the complexity of the current existing reverse mortgage product launched by Happy Life Insurance by removing the deferred annuity component (both premium and benefit component) and different types of fees.

Product R. The case studies for Products S and H have a similar structure and are shown in Appendix A.

Figure 3: Partial screenshot of the case study for Long-term Care Income Product R (translated).



Case study for Long-term Care Income Product R

Hover your mouse over the blue text for more information.

Please read the following case study which illustrates how Long-term Care Income Product R works.

Mr. Wang is aged 60 and Mrs. Wang is aged 55 in 2019. They have an adult daughter. They live in their own apartment in Guangzhou which is worth RMB 5,000,000 and have RMB 750,000 in their savings account. They decide to buy Long-term Care Income Product R to cover their future long-term care needs.

- They choose to **borrow RMB 600,000 against their apartment** to buy long-term care income with Long-term Care Income Product R. The amount becomes a debt which accumulates interest at the fixed interest rate of 5.8% p.a
- If one or both are disabled, they will receive a **monthly income** according to the following table:

Both non-disabled/deceased	1 non-disabled/deceased, 1 disabled	Both disabled
RMB 0/month	RMB 10,542/month	RMB 21,085 /month

- They do **not have to repay anything** while **at least one of them** still **lives at home**.
- The couple **fully own their apartment**, including all growth in its value, if any.

This contract will **terminate** when **both** Mr. and Mrs. Wang **pass away**.

Assume that Mr. Wang remains **non-disabled** and **passes away in 2044**. In the **same** year, Mrs. Wang becomes **disabled** and **permanently moves** into a **residential nursing home**. The **outstanding debt** amount in **2044** accumulated from the **initial loan** is RMB 2,456,000. Below are **three** possible **scenarios** in 2044:

- Scenario A: The product provider **sells the home at the highest possible market price** of RMB 10,000,000. The sale proceeds are used to **repay** the debt. Mrs. Wang **receives the remaining** RMB 7,544,000. She will receive a long-term care income of RMB 10,542/month **until she passes away**.
- Scenario B: The product provider **sells the home at the highest possible market price** of only RMB 1,000,000. All sale proceeds **are used to repay** the debt. Mrs. Wang will **receive nothing from the sale**, but she is **not required to make an extra payment**. The difference is a loss to the product provider. Mrs. Wang will receive a long-term care income of RMB 10,542/month **until she passes away**.
- Scenario C: Their daughter decides to **repay the debt herself** and **keep** their property. Mrs. Wang will receive a long-term care income of RMB 10,542/month **until she passes away**.

We randomly showed the participants in each treatment group one of two different amounts of long-term care insurance purchased in the numerical example to avoid that this amount influenced the demand for long-term care insurance in the later choice tasks. We adjusted the financial consequences in the case study accordingly.

Below the case study, we asked participants to rate their understanding of the product described on the same screen. The five possible answers ranged from *Completely clear* to *Completely confusing*. Participants could only proceed to the next screen after 20 seconds.

Choice task

After reading the case study, participants proceeded to the choice task. In each choice task, the participants were asked to assume that they have a given amount of savings and own a home worth a given amount, as described in Section 3.4. The amounts were the same in Choice Tasks

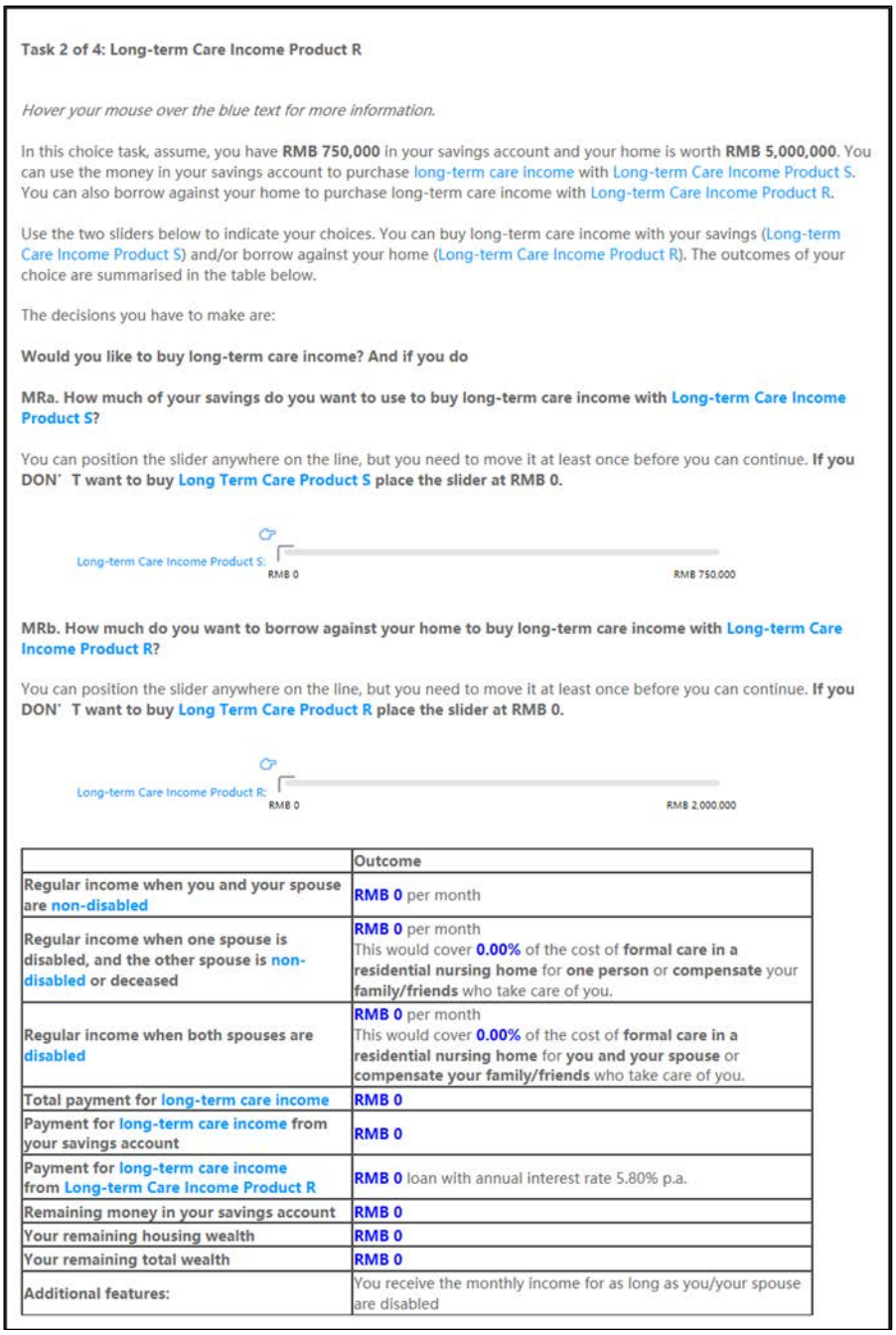
1, 2, and 3. Participants were asked to assume the hypothetical home values and saving amounts listed in Table 1 to perform the choice tasks, which were close to their reported wealth amounts.

In Choice task 1, the participants were informed that they could use the money in their savings account to purchase long-term care income with Long-term Care Income Product S. They were then asked to make the following decisions: (1) *Would you like to buy long-term care income with Long-term Care Income Product S? And if you do;* (2) *How much of your savings do you want to use to buy long-term care income?* The participants used a configurator to indicate their choice. The configurator ranged from 0 to the hypothetical amount of savings.

Figure 4 shows a screenshot of the choice task for Choice Task 2. The participants were informed that they could use both Long-term Care Income Product S and R to purchase long-term care income and were asked to make the following decisions: (1) *Would you like to buy long-term care income? And if you do,* (2) *How much of your savings do you want to use to buy long-term care income with Long-term Care Income Product S?* (3) *How much do you want to borrow against your home to purchase long-term care income with Long-term Care Income Product R?* As shown in the middle of Figure 4, the participants were prompted to use two configurators to indicate their choice: one configurator for Long-term Care Income Product S (range: 0 to the hypothetical savings amount) and one for Long-term Care Income Product R (range: 0 to 40% of the hypothetical amount of housing wealth). With this setting, we assumed a maximum initial loan to value of 40% for the reverse mortgage component in Product R.[7]

[7] We chose a maximum initial loan to value of 40% based on research by Alai et al. (2014) on the cash flows and risk profiles of reverse mortgage from the provider's perspective.

Figure 4: Partial screenshot of Choice task 2 (translated).



Task 2 of 4: Long-term Care Income Product R

Hover your mouse over the blue text for more information.

In this choice task, assume, you have **RMB 750,000** in your savings account and your home is worth **RMB 5,000,000**. You can use the money in your savings account to purchase long-term care income with Long-term Care Income Product S. You can also borrow against your home to purchase long-term care income with Long-term Care Income Product R.

Use the two sliders below to indicate your choices. You can buy long-term care income with your savings (Long-term Care Income Product S) and/or borrow against your home (Long-term Care Income Product R). The outcomes of your choice are summarised in the table below.

The decisions you have to make are:

Would you like to buy long-term care income? And if you do

MRa. How much of your savings do you want to use to buy long-term care income with Long-term Care Income Product S?

You can position the slider anywhere on the line, but you need to move it at least once before you can continue. **If you DON' T want to buy Long Term Care Product S place the slider at RMB 0.**

Long-term Care Income Product S: RMB 0 RMB 750,000

MRb. How much do you want to borrow against your home to buy long-term care income with Long-term Care Income Product R?

You can position the slider anywhere on the line, but you need to move it at least once before you can continue. **If you DON' T want to buy Long Term Care Product R place the slider at RMB 0.**

Long-term Care Income Product R: RMB 0 RMB 2,000,000

	Outcome
Regular income when you and your spouse are non-disabled	**RMB 0** per month
Regular income when one spouse is disabled, and the other spouse is non-disabled or deceased	**RMB 0** per month This would cover **0.00%** of the cost of **formal care in a residential nursing home** for **one person** or **compensate** your **family/friends** who take care of you.
Regular income when both spouses are disabled	**RMB 0** per month This would cover **0.00%** of the cost of **formal care in a residential nursing home** for **you and your spouse** or **compensate your family/friends** who take care of you.
Total payment for long-term care income	**RMB 0**
Payment for long-term care income from your savings account	**RMB 0**
Payment for long-term care income from Long-term Care Income Product R	**RMB 0** loan with annual interest rate 5.80% p.a.
Remaining money in your savings account	**RMB 0**
Your remaining housing wealth	**RMB 0**
Your remaining total wealth	**RMB 0**
Additional features:	You receive the monthly income for as long as you/your spouse are disabled

Choice Task 3 involved Long-term Care Income Product S and Long-term Care Income Product H. The participants faced the following decisions: (1) *Would you like to buy long-term care income? And if you do*, (2) *How much of your savings do you want to use to buy long-term care income with Long-term Care Income Product S?* (3) *How much of your home do you want to sell to buy long-term care income with Long-term Care Income Product H?* Again the participants were prompted to use two configurators to indicate their choice: one configurator for Long-term Care Income Product S (range: 0 to the hypothetical savings amount) and one

for Long-term Care Income Product H (range: 0 to the maximum proportion of housing wealth that can be used to purchase long-term care insurance under home reversion.[8]).

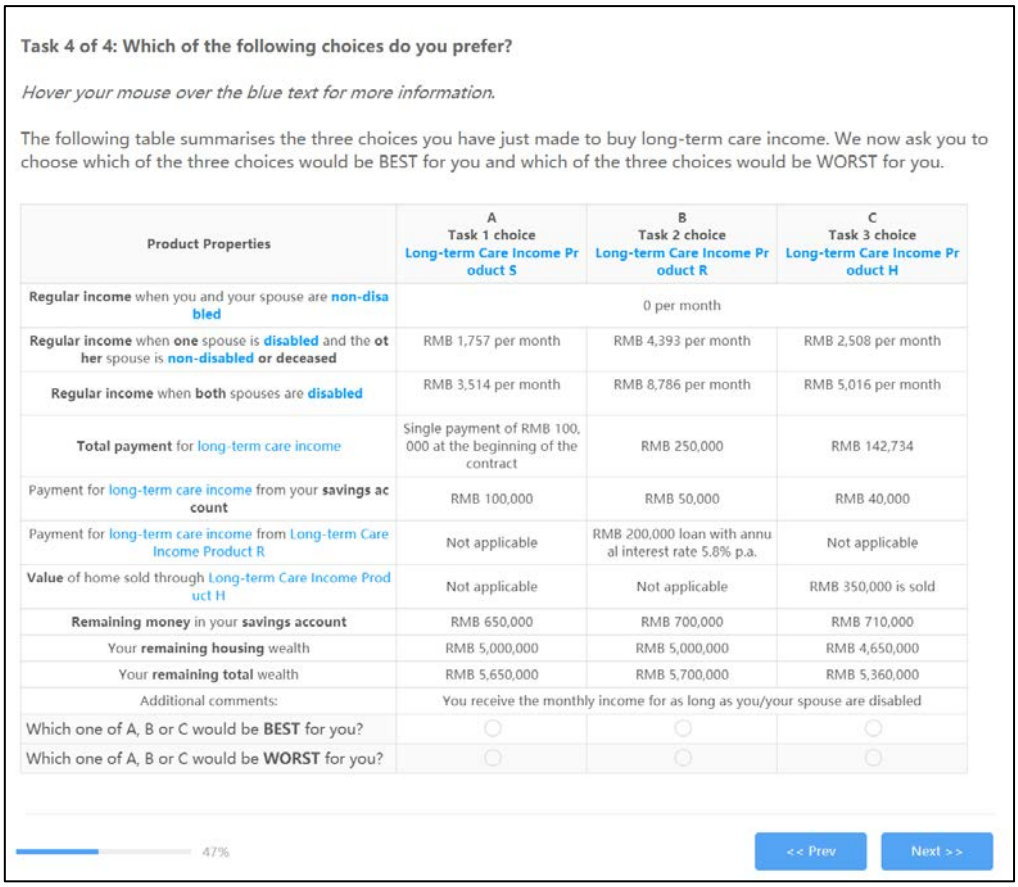
The configurators in each choice task were initially set to 0. The participants read: *You can position the slider anywhere on the line, but you need to move it at least once before you can continue. If you DON'T want to buy Long-Term Care Product, place the configurator at RMB 0.* For each choice task, we showed an output table below the configurator(s) illustrating the financial consequences of the participant's choices, including the regular income in different disability states, the required payments, and the remaining wealth (see Figure 4, bottom). The table also reported the percentage of the cost of formal care or informal care that participants would be able to cover with the selected amount of long-term care income. The participants could review their choice and observe how their choice would impact their income and wealth in different scenarios. The numbers in dark blue changed when the participants moved the cursor on the configurator. Below the output table (not shown in the screenshot in Figure 4), participants were asked to select the main reason (from a list of seven possible reasons) for why they did not purchase more of the respective product.

[8] See Section B.3.4 in the Online for the calculation of the home reversion values.

3.7 Choice task 4

Following the separate decisions in Choice Tasks 1, 2, and 3, the participants were then asked to choose their most and least preferred of the three product choices using a table that summarized the choices they made in Choice Tasks 1, 2, and 3 (see Figure 5).

Figure 5: Screenshot of Choice Task 4 (translated).



Task 4 of 4: Which of the following choices do you prefer?

Hover your mouse over the blue text for more information.

The following table summarises the three choices you have just made to buy long-term care income. We now ask you to choose which of the three choices would be BEST for you and which of the three choices would be WORST for you.

Product Properties	A Task 1 choice Long-term Care Income Product S	B Task 2 choice Long-term Care Income Product R	C Task 3 choice Long-term Care Income Product H
Regular income when you and your spouse are **non-disabled**	0 per month		
Regular income when **one** spouse is **disabled** and the **other** spouse is **non-disabled** **or deceased**	RMB 1,757 per month	RMB 4,393 per month	RMB 2,508 per month
Regular income when **both** spouses are **disabled**	RMB 3,514 per month	RMB 8,786 per month	RMB 5,016 per month
Total payment for long-term care income	Single payment of RMB 100,000 at the beginning of the contract	RMB 250,000	RMB 142,734
Payment for long-term care income from your **savings account**	RMB 100,000	RMB 50,000	RMB 40,000
Payment for long-term care income from Long-term Care Income Product R	Not applicable	RMB 200,000 loan with annual interest rate 5.8% p.a.	Not applicable
Value of home sold through Long-term Care Income Product H	Not applicable	Not applicable	RMB 350,000 is sold
Remaining money in your **savings account**	RMB 650,000	RMB 700,000	RMB 710,000
Your **remaining housing** wealth	RMB 5,000,000	RMB 5,000,000	RMB 4,650,000
Your **remaining total** wealth	RMB 5,650,000	RMB 5,700,000	RMB 5,360,000
Additional comments:	You receive the monthly income for as long as you/your spouse are disabled		
Which one of A, B or C would be **BEST** for you?	○	○	○
Which one of A, B or C would be **WORST** for you?	○	○	○

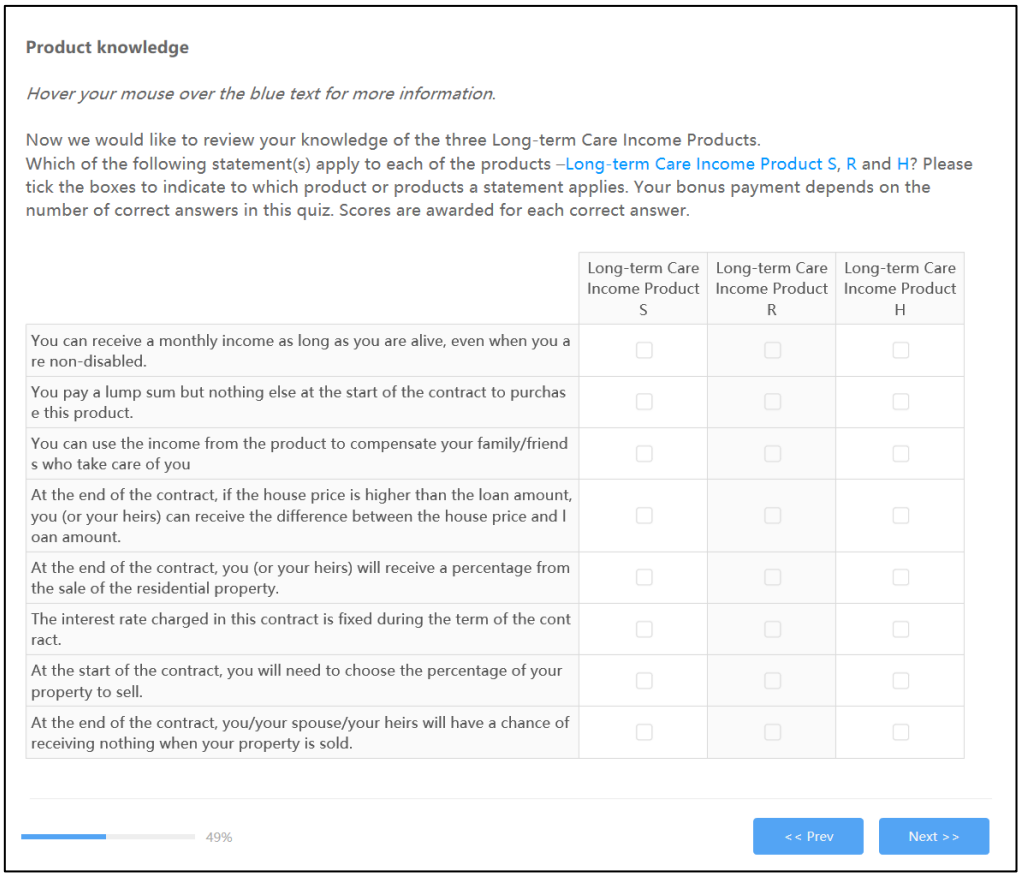
47%

<< Prev Next >>

3.8 *Product quiz*

After completing the choice tasks, the participants completed an incentivized product knowledge quiz comprising eight statements (as shown in Figure 6) that tested their understanding of Long-term Care Income Products S, R, and H. The participants were asked to select whether the statements applied to each of the three products.

Figure 6: Screenshot of the product knowledge quiz (translated).



Product knowledge

Hover your mouse over the blue text for more information.

Now we would like to review your knowledge of the three Long-term Care Income Products.
Which of the following statement(s) apply to each of the products –Long-term Care Income Product S, R and H? Please tick the boxes to indicate to which product or products a statement applies. Your bonus payment depends on the number of correct answers in this quiz. Scores are awarded for each correct answer.

	Long-term Care Income Product S	Long-term Care Income Product R	Long-term Care Income Product H
You can receive a monthly income as long as you are alive, even when you a re non-disabled.	☐	☐	☐
You pay a lump sum but nothing else at the start of the contract to purchas e this product.	☐	☐	☐
You can use the income from the product to compensate your family/friend s who take care of you	☐	☐	☐
At the end of the contract, if the house price is higher than the loan amount, you (or your heirs) can receive the difference between the house price and l oan amount.	☐	☐	☐
At the end of the contract, you (or your heirs) will receive a percentage from the sale of the residential property.	☐	☐	☐
The interest rate charged in this contract is fixed during the term of the cont ract.	☐	☐	☐
At the start of the contract, you will need to choose the percentage of your property to sell.	☐	☐	☐
At the end of the contract, you/your spouse/your heirs will have a chance of receiving nothing when your property is sold.	☐	☐	☐

49%

<< Prev Next >>

3.9 Covariate collection

The final part of the survey asked questions to collect data for covariates, including demographics and information about children and grandchildren, health and subjective life expectancy, household income and wealth, financial literacy and numeracy, retirement plans, financial risk attitudes and personality traits, bequest plans, and expectations of house price growth and long-term care arrangements. Where possible, we used standard questions to ensure comparability with other surveys, including the CHARLS and CLHLS. We drew on Lusardi and Mitchell (2011) for the financial literacy questions, while the numeracy questions were from Lipkus *et al.* (2001). Personality traits were elicited using the Big Five personality questions (Borghans *et al.*, 2008; Agnew *et al.*, 2018). We also included an instructional manipulation check (IMC), which allowed us to identify inattention by repeating a question in the survey and asking the participants whether they had seen this question before (Oppenheimer *et al.*, 2009). Questions eliciting bequest preferences, subjective views on retirement plans, and house price expectations were adopted from related studies on life care annuities and reverse mortgages (Davidoff *et al.*, 2017; Wu *et al.*, 2021; Hanewald *et al.*, 2020a). We also measured

the time taken to complete the survey. To gauge the quality of the survey design, we asked participants to rate the clarity of the survey questions.

4. Descriptive statistics

4.1 Sample characteristics

Table 2 reports the average values for key demographic and socioeconomic variables for our sample and compares them with data from the nationally representative CHARLS. For this comparison, we used similar sample criteria to select a sample from the 2018 CHARLS survey wave. That is, we report statistics for all CHARLS participants aged 45–64 with an urban *hukou* (residence permit) who live in a household that owns at least one property. Notably, our study sample is younger and has more children than the CHARLS sample. Furthermore, the participants in our survey were more educated and wealthier than those who participated in the CHARLS. These differences are likely due to the following factors: (i) the interview method (since our survey was conducted through an online commercial web panel, whereas the CHARLS used face-to-face interviews); (ii) the sampling method (since the participants in our survey were recruited from 49 selected cities—four Tier 1 cities and 45 Tier 2 cities—whereas the CHARLS recruited participants from cities all over China).

Table 2: Participant characteristics: Comparison with CHARLS 2018 data.

	Our survey	CHARLS sample
Age (mean)	52.1	55.4
Male	50.0%	48.3%
Married	97.8%	91.5%
Number of children (mean)	1.3	1.1
Highest education attained		
Junior middle school and below	17.7%	71.3%
Senior middle school/college degree/diploma	49.2%	24.8%
Bachelor and above	33.1%	3.0%
Current work status		
Employed	84.1%	69.5%
Retired	14.4%	31.3%
Other	1.5%	0.2%
Urban *hukou*	100%	100%
Number of properties	1.3	1.5
HH savings (median)	RMB 150,001-250,000	[RMB 8,500]
HH house value (median)	RMB 1,600,000	[RMB 160,000]
HH debt excluding mortgage (median)	RMB 2,000 – RMB 9,999	[RMB 0]
N	1,200	3,867

Notes: HH denotes household. The CHARLS sample was obtained from the 2018 wave of the China Health and Retirement Longitudinal Study. [] indicates that variable definitions differ.

4.2 Product familiarity, understanding, and survey clarity

Most participants had heard about reverse mortgages and long-term care insurance before taking the survey. Overall, 58% indicated that they had heard about a "House for Pension" scheme (i.e., the reverse mortgage product offered in China, see Section 2.2), while 73% indicated that they had heard of long-term care insurance.

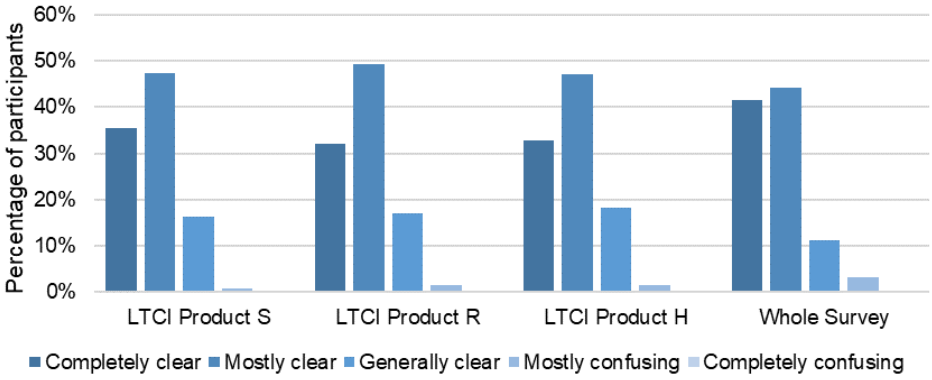
Long-term care insurance, reverse mortgages, and home reversion are complex financial products. In Section 3, we described several methods that we used in the survey design to help the participants better understand these products, including detailed product descriptions with case studies and pop-up windows with definitions for technical terms. Participants rated their product understanding following the product descriptions and numerical examples as relatively high.

Figure 7 reports the subjective product and survey understanding for the full sample and by product type. 36%, 32%, and 33% of the participants rated their product understanding as completely clear for Long-term Care Income Products S, R, and H, respectively. In addition, 48%, 49%, and 47% of participants rated their product understanding as mostly clear for Long-term Care Income Product S, R, and H, respectively. Only 1%, 2%, and 2% of participants rated their understanding as mostly confusing or completely confusing. Overall, 86% of participants reported that they found the questions in the survey completely or mostly clear.

We used 24 true-false questions to test the participants' objective understanding of the three long-term care income products. The data confirm that participants generally understood the products well, with 17% recording more than 80% correct answers in the quiz and 51% recording more than 75% correct answers.

Overall, these results suggest that the comprehensive product descriptions and numerical examples we developed based on previous research and focus group testing allowed participants to understand the complex financial products well.

Figure 7: Subjective product and survey understanding.

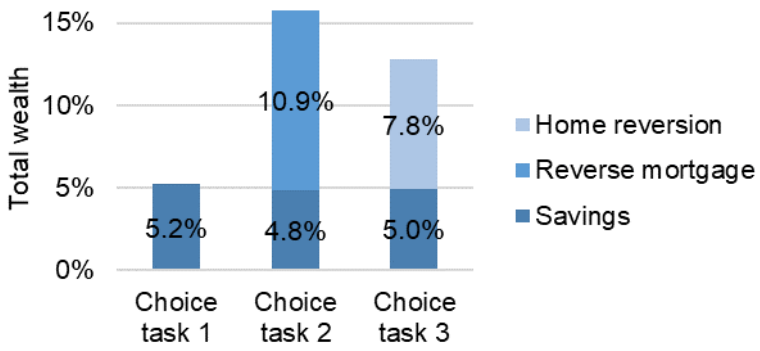


4.3 Demand for long-term care insurance

In Section 3.6, we explained that the survey contained three choice tasks in which participants indicated their demand for long-term care insurance with different financing methods: using savings (Product S) in Choice Task 1; using savings (Product S) and a reverse mortgage (Product R) in Choice Task 2; using savings (Product S) and home reversion (Product H) in Choice Task 3. The order of Choice Tasks 2 and 3 was random as described in Secion 3.6.

Figure 8 shows that the demand for long-term care insurance varied among the different financing methods.

Figure 8: Average demand for long-term care insurance.



The demand for long-term care insurance was highest in Choice Task 2 (using Product S and Product R), where savings and a reverse mortgage could be used to buy long-term care insurance. On average, the participants stated that they would use 33% of their savings and 13% of their home value (i.e., 15% of their total wealth) to purchase long-term care insurance. The average purchase amount across all wealth groups was RMB 384,825 (USD 60,442), while the median was RMB 250,000 (USD 39,266).

The demand for long-term care insurance in Choice Task 3, in which participants could use their savings and home reversion (which involved the partial sale of their home) to purchase long-term care insurance, was also higher than in Choice Task 1. On average, participants stated that they would use 32% of their savings and 9% of their home value (i.e., 12% of their total wealth) to purchase long-term care insurance. The mean stated purchase price across all wealth groups was RMB 308,762 (USD 48,495), while the median was RMB 203,877 (USD 32,021).

Table 3 compares the change in wealth allocation when housing wealth was available to purchase long-term care insurance. We first compare the difference in demand for long-term care insurance between Tasks 1 and 2 and Tasks 1 and 3. We also compare the allocation of savings wealth to long-term care insurance between Tasks 1 and 2 and between Tasks 1 and 3. We used Welch's *t*-test for these four comparisons since we did not need to assume that the variance of the samples was equal.

Table 3: Welch's *t*-test results for differences between tasks.

Test	Mean	Mean	D Mean	Test stat	df	*p*-value
Demand for long-term care insurance						
Task 1 vs. 2	5.2% (Task 1)	15.7% (Task 2)	10.5%	31.7	1645.3	< 2.2e-16***
Task 1 vs. 3	5.2% (Task 1)	12.8% (Task 3)	7.5%	27.1	1857.1	< 2.2e-16***
Savings allocated to long-term care insurance						
Task 1 vs. 2	36.0% (Task 1)	32.8% (Task 2)	-3.2%	-3.6	2391.7	1.8e-4 ***
Task 1 vs. 3	36.0% (Task 1)	33.7% (Task 3)	-2.3%	-2.6	2395.3	5.0e-3**

Notes: Test stat denotes the test statistic of Welch's *t*-test. df denotes degrees of freedom. "D Mean" refers to the difference in mean between treatment groups. Task 1 refers to using savings to purchase the long-term care insurance offered. Task 2 refers to using savings and reverse mortgages to purchase the long-term care insurance offered. Task 3 refers to using savings and home reversion to purchase the long-term care insurance offered.

For all comparisons, we found that when housing wealth (accessed by either home reversion or a reverse mortgage) was available to purchase long-term care insurance, the demand for long-term care insurance increased significantly. Furthermore, the amount of savings allocated to long-term care insurance was significantly reduced when housing wealth was available for purchasing long-term care insurance.

4.4 Preferred long-term care income products

In Choice Task 4, the participants were shown a table that summarized their choices in Choice Tasks 1–3. The participants indicated which of the three choices would be "best" for them and which would be "worst" for them. Overall, 42% of the participants selected their Task 1 choice as best, while 38% nominated their Task 2 choice, and 20% nominated their Task 3 choice.

The fact that Choice Task 1 was the most preferred on average is somewhat surprising. In Choice Task 1, only savings could be used to purchase long-term care income, while in Choice Tasks 2 and 3, savings **and** housing assets via a reverse mortgage **or** home reversion could be used. Thus, Choice Task 1 is a subset of Choice Tasks 2 and 3. The participants likely preferred Choice Task 1 because it was easier.

5. Regression results

We used regression analysis to better understand the factors driving individuals' preferences for long-term care insurance financing using home equity release. We regressed the demand for long-term care insurance in each task on different measures of product and survey understanding, the survey treatments, and covariates that have been identified as being associated with interest in long-term care insurance and reverse mortgages in previous research (e.g., Wu *et al.*, 2021; Brown *et al.*, 2012; Hanewald *et al.*, 2020a). The covariates included

economic and demographic factors, health variables, and measures of personality and expectations. We included two variables measuring whether the participants paid attention when completing the experimental survey: the IMC and the time taken to complete the experimental survey.

The variable definitions are listed in Section B.2 of the Online Appendix. Most covariates were coded as binary variables. We converted numerical and ordinal variables to binary indicators of whether the participants' responses were higher than the sample median.

Table 4 presents the regression results, where we analyzed the factors explaining long-term care insurance demand under the alternative funding mechanisms. We measured individuals' long-term care insurance demand as the percentage of total wealth (i.e., hypothetical home value plus savings) they used to purchase long-term care insurance. Since the dependent variable ranged between 0 and 1, we used beta regressions with a logit link function to estimate the relationships between the dependent variable and the independent variables (e.g., Ferrari and Cribari-Neto, 2004). This regression assumes that the underlying data has a beta distribution, which can be any shape depending on the combination of parameters under the beta law. We estimated separate regression models for Choice Tasks 1, 2, and 3: for the demand for long-term care insurance using savings only in Choice Task 1, using savings and housing assets accessed via a reverse mortgage in Choice Task 2, and using savings and housing assets accessed via home reversion in Choice Task 3. These results are reported in columns 1, 2, and 3 of Table 4.

In the following discussion, we discuss the association between demand for each of the three long-term care financing products and the covariates. We compare our results to those of related studies on the demand for long-term care insurance conducted in Australia (Wu *et al*., 2021), Canada (Boyer *et al.*, 2017), France (Courbage and Roudaut, 2008), Hong Kong (He and Chou, 2018), Spain (Costa-Font and Rovira-Forns, 2008; Jiménez-Martín *et al.*, 2016), and the US (Brown and Finkelstein, 2008; Brown *et al*., 2012; Chatterjee and Fan, 2017; Gottlieb and Mitchell, 2020; McGarry *et al.*, 2014; Schaber and Stum, 2007; Sloan and Norton, 1997; Van Houtven *et al.*, 2015). We note that these studies did not assess the demand for products that combine long-term care and home equity release (as in the present study).

Economic factors: As reported in Table 4, participants with higher self-reported household savings had a higher demand for long-term care insurance in all three tasks. Chatterjee and Fan (2017) and He and Chou (2018) also found that individuals with higher net non-housing wealth

have a higher demand for long-term care insurance. The coefficient for self-reported household savings was largest for Choice Task 1 (LTCI purchased with savings). Households with more debt would use the Product R and H more than Product S (as the coefficients are greater for those two products). It indicates that when individuals can access their housing wealth to purchase more long-term care insurance as they are not limited to their liquid wealth, which is needed to repay the loans. Furthermore, demand was higher for participants with a lower household income—while several previous studies found positive associations between income level and long-term care insurance demand (Schaber and Stum, 2007; Costa-Font and Rovira-Forns, 2008; Brown *et al.*, 2012; Jiménez-Martín *et al.*, 2016; Chatterjee and Fan, 2017). We note that the product offered in our survey is an income product, while other studies typically consider reimbursement products. In Choice Task 1, participants with a lower self-reported value for their primary property had a significantly higher demand for long-term care insurance. This finding aligns with Davidoff's (2009) argument that housing wealth is a substitute for long-term care insurance when housing wealth is illiquid.

Demographic factors: Similar to the results of McGarry *et al.* (2014) and Jiménez-Martín *et al.* (2016), there was no statistically significant link between long-term care insurance demand and age, retirement status, and gender. Married participants (including those in long-term relationships) had higher demand across all proposed products, which is in line with findings from Gottlieb and Mitchell (2020), but divergent from several other studies that found no link between marital status and long-term care insurance demand (Sloan and Norton, 1997; McGarry *et al.*, 2014; Jiménez-Martín *et al.*, 2016; Wu *et al.*, 2021). This might be because we asked individuals to assume that they were married in the hypothetical scenario in the choice task and the products offered were joint-life products. Thus, married participants could probably relate better to the task than single individuals. We also noted that 97.8% of the sample was married. When a home equity release was available to purchase long-term care insurance in Choice Tasks 2 (via a reverse mortgage) and 3 (via home reversion), participants with a daughter indicated a lower demand for long-term care insurance. One of the explanations is that these participants expected to rely on their daughters to provide long-term care. Notably, there was no link between long-term care insurance demand and the participants' number of children, which is congruent with the findings of McGarry *et al.* (2014), Van Houtven *et al.* (2015), and Wu *et al.* (2021). We also found that residents of Tier 2 cities had a higher demand for long-term care insurance.

Table 4: Explaining the demand for long-term care insurance.

	Demand for LTCI using Product S	Demand for LTCI using Product S + R	Demand for LTCI using Product S + H
Economic factors			
Household savings	0.619***	0.206***	0.216***
Household debt	0.227***	0.239***	0.272***
Household income	-0.086+	-0.129*	-0.129**
Social insurance	-0.038	-0.064	-0.276
Property value	-0.288***	-0.023	-0.081+
Mortgage amount	-0.028	-0.119	-0.147*
Demographic factors			
Age	0.013	0.002	0.016
Retired	0.056	0.104	0.073
Female	-0.018	-0.075	-0.071
Married	0.282+	0.423*	0.611***
1+ child	-0.045	0.198	-0.153
Daughter	-0.010	-0.093*	-0.114**
Child same HH	0.075	0.014	0.054
College above	0.043	-0.010	0.055
Tier 1 city	-0.131**	-0.144**	-0.161**
Health			
Health	-0.070	-0.014	-0.024
Life expectancy	-0.046	-0.094*	-0.098*
Smoker	0.023	-0.100+	-0.074
Personality and expectations			
Financial literacy and numeracy	0.032	-0.019	0.054
Awareness of financial products	-0.113*	-0.102+	-0.083
Awareness LTCI	0.067	0.124*	0.155**
Awareness RM	-0.023	-0.078	-0.061
House price expectations	0.034	0.142**	0.118*
Trust in banks	0.017	-0.002	0.016
Trust in insurer	0.039*	0.090***	0.084***
Thought of LTC	0.213***	0.264***	0.253***
Intended bequest	-0.203***	-0.273***	-0.280***
Product and survey understanding			
Subjective Product Understanding	0.245***	0.281***	0.292***
Product quiz	-0.016	-0.082+	-0.066
Survey clarity	0.024	0.015	0.039
Passed IMC	0.101	0.118	0.005
Survey time	-0.018	0.007	0.045
Treatments			
Version R	-0.089*	-0.099*	-0.120**
High premium in example	0.059	0.048	0.061
Intercept	-4.249***	-3.279***	-3.323***
N	1,200	1,200	1,200
R^2	0.183	0.151	0.183

Notes: This table presents the results of beta regressions of the percentage of total wealth allocated to long-term care insurance on independent variables. Variables are defined in Appendix B.2. +, *, **, and *** denote statistical significance at the 10%, 5%, 1%, and 0.1% level, respectively.

Health: Similar to the results of Chatterjee and Fan (2017) and Gottlieb and Mitchell (2020), we found no significant link between subjective health and long-term care insurance demand. When home equity release was available for purchasing long-term care insurance in Choice Tasks 2 and 3, participants with a shorter subjective life expectancy indicated a higher demand for long-term care insurance. This finding differs from existing studies that found no relationship between subjective life expectancy and the demand for long-term care insurance (Sloan and Norton, 1997; Wu *et al.*, 2021). It is likely that participants with a shorter subjective life expectancy worried more about long-term care risks and thus chose to purchase more long-term care insurance.

Personality and expectations: Participants who were familiar with fewer financial products had a higher demand for long-term care insurance in Choice Task 1 (only using savings to purchase the long-term care insurance). This might be because they did not know about other financial products (e.g., critical illness insurance and life annuities, both of which exist in China) that could (partially) cover their long-term care expenditure. Participants who had heard of long-term care insurance before taking the survey had a higher demand for long-term care insurance in Choice Tasks 2 and 3 (when housing wealth could be used through reverse mortgages or home reversions). Additionally, participants who had higher house price growth expectations had a higher demand for long-term care insurance when housing wealth could be used. Moreover, participants who had thought about how to pay for long-term care expenses before participating in the survey allocated a significantly higher proportion of their total wealth to long-term care insurance in all tasks. This result aligns with the results of Courbage and Roudaut (2008), Brown *et al*. (2012), and Jiménez-Martín *et al.* (2016). Trust in insurers was a significant factor in all three choice tasks, especially when housing wealth was available to finance long-term care insurance. Furthermore, long-term care insurance demand was higher for participants who had thought about how to pay for long-term-care expenses before participating in the survey and for those who were less certain about leaving an inheritance. In contrast, studies in Western countries found that individuals with stronger bequest motives have higher long-term care insurance demand, most likely to protect remaining wealth against high nursing home costs (Brown *et al.*, 2012; Boyer *et al*., 2017).

Product and survey understanding: Participants with higher subjective product understanding used a significantly higher percentage of total wealth to purchase long-term care insurance. The finding of a positive relationship between subjective understanding and demand

for the product aligns with previous studies such as Davidoff *et al.* (2017) and Hanewald *et al*. (2020a).

Treatments: Our survey included two random treatments: the order of Choice Tasks 2 and 3, and the amount of long-term care insurance used in the case study, as explained in Section 3.6. The results show that participants who completed Choice Task 2 first allocated less wealth to long-term care insurance in all tasks (participants were allowed to go back in the survey). There was no significant impact of the case study treatment on demand.

Summary: Section 4.3 showed that the demand for long-term care insurance was higher when housing wealth is available to finance long-term care insurance. This section reported plausible results for the effect of the independent variables on long-term care insurance demand in the different choice tasks. Our findings largely align with those of existing studies.

6. Conclusion

We conducted and analyzed an experimental online survey fielded to assess the potential demand for new public and/or private sector programs that allow individuals to access their housing wealth to purchase long-term care insurance, which pays an income when one or both of the couples are disabled. In our sample of 1,200 Chinese homeowners aged 45–64, we found that the stated demand for long-term care insurance in different hypothetical scenarios increased when individuals could use housing wealth in addition to savings to purchase long-term care insurance. The demand for long-term care insurance was higher when individuals could access housing wealth via reverse mortgage loans rather than via home reversion, which involves the partial sale of housing wealth.

We identified the stated demand for all three proposed long-term care insurance products. When they could only use savings, the participants used on average 5% of their hypothetical wealth to purchase long-term care insurance. The demand for long-term care insurance increased when the participants could access their (hypothetical) housing wealth. The participants allocated an average of 15% of their total wealth to long-term care insurance when a reverse mortgage was available and 12% of their total wealth to long-term care insurance when home reversion was available. Our results are in line with previous theoretical studies, which suggest that the demand for long-term care insurance increases when home equity can be used to finance the insurance premium (e.g., Davidoff, 2010; Hanewald *et al*., 2016; Shao *et al*., 2019; Achou, 2021). The increase in stated demand for our LTCI income product is

larger than the estimated effect for expense-reimbursement LTCI in a recent paper by Achou (2021).

We developed product designs associated with the descriptions and case studies that were well understood. Thus, these designs can be used to develop new public and/or private sector programs in China and other markets. For example, we included options for the homeowners' heirs to repay the reverse mortgage debt or buy back the home reversion share to keep the property upon contract termination.

Furthermore, we used regression results to identify factors driving the demand for long-term care insurance products in the different choice tasks in our study. Our findings confirm that economic circumstances, demographic factors, health, personality, expectations, and product understanding impact long-term care insurance demand. Importantly, we find - in line with previous studies (Davidoff *et al*., 2017; Hanewald *et al*., 2020a) - that a subjective product understanding is important in determining the stated demand for long-term care insurance.

We acknowledge that our survey sample of urban Chinese homeowners was more educated and wealthier than a comparison sample from the nationally representative CHARLS survey, as discussed in Section 4.1. The demand for long-term care insurance and the effect of home equity release on this demand may differ in the general population. Future research could aim to collect a broader sample and include individuals living in rural areas.

Overall, our study documented a positive stated demand for new financial arrangements that allow older homeowners to use their housing wealth to fund long-term care insurance. The arrangement was described as a ‘financial product’ offered by a ‘state-owned bank’, but the arrangement could also be offered as a government program similar to the Home Equity Access Scheme offered by the Australian government.

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