Assessing the Demand for Annuities in an Undeveloped Market: Evidence from Hong Kong[*]

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Abstract

How to design an attractive annuity for an undeveloped market and how to assess the potential demand for such a product? We first conduct a discrete choice experiment among participants of a large-scale occupational defined contribution pension scheme in Hong Kong to identify desired product characteristics of an annuity. The preferred annuity is sold by an A-rated insurance company, provides nominal annuity payouts and a 10-year period-certain guarantee. Using a second survey, we then analyze the demand for the preferred annuity. Close to one third of respondents chooses to annuitize, a fraction that considerably exceeds observed annuitization rates in developed markets. Regarding household characteristics, we find that annuity demand decreases with general financial literacy but increases with specific knowledge about the annuity product. Remarkably, a self-reported bequest motive increases the demand for an annuity providing a 10-year period-certain guarantee.

1. Introduction

Assume a market that is characterized by a substantial and growing amount of retirement assets and a complete absence of life annuities. Introducing life annuity products to such an undeveloped market has the potential of improving the individual welfare of households as shown by Yaari (1965) and Davidoff et al. (2005). However, we know from developed annuity markets in the U.S. (Johnson et al., 2004) and the U.K. (Inkmann et al., 2011) that households are reluctant to voluntarily purchase annuities, an observation that has been described as the "annuitization puzzle" (Benartzi et al., 2011; Modigliani, 1986). How then should we design an attractive annuity for an undeveloped market and how can we assess the potential demand for such a product? This paper attempts to answer these two questions for a particular undeveloped annuity market, Hong Kong.

In Hong Kong, a large-scale, compulsory occupational defined contribution (DC) pension scheme, the Mandatory Provident Fund (MPF), has been introduced in 2000. Similar to 401(k) plans in the U.S., the MPF consists of individual accounts that are privately managed. While it will take another 25 years to mature, the size of the MPF is already substantial with approximately HKD 594.2 billion (USD 76.2 billion) in retirement assets accumulated by October 2015 (Commission on Poverty, 2015). The local annuity market in Hong Kong is not yet developed. While fixed-term annuities are offered by individual insurance firms,[1] life annuities that protect against outliving one's savings are completely absent (Commission on Poverty, 2015).

We conduct and analyze two representative surveys among 40-64 year old members of the MPF who are faced with the decision on how to decumulate their lump

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[1] In 2012, 11,321 fixed-term annuity contracts were sold in Hong Kong, compared to 1,069,548 individual life insurance policies in the same year.

sum retirement assets in a not too distant future. The first survey attempts to identify the desired *product characteristics* of an annuity. This is achieved by allowing respondents to repeatedly choose among hypothetical annuities with different product characteristics in a random sequence of annuity choices (discrete choice experiment, DCE), a strategy that has been employed recently in both economics (Beshears et al., 2014) and marketing (Shu et al., 2016) to design attractive annuity products. The second survey attempts to identify *household characteristics* that are related to the demand for the preferred annuity product obtained from the first survey. To our knowledge, ours is the first paper that employs a sequence of two surveys to determine the preferred annuity product in a first step and to assess the demand for this product in a second step. Unlike previous empirical studies that investigate the actual demand (revealed preferences) for annuities in developed markets (Brown, 2001; Bütler and Teppa, 2007; Inkmann et al., 2011), the use of surveys allows us to assess the demand for a hypothetical product (stated preferences) in an undeveloped market, for which we cannot observe actual life annuity purchases.

Numerous studies attempt to explain the annuitization puzzle. Barriers preventing households from purchasing annuities can be classified into two main broad categories related to annuity product and household characteristics. Individuals may be reluctant to buy annuities due to characteristics of the annuity product itself (Iwry and Turner, 2009). Beshears et al. (2014) document that U.S. households tend to prefer annuities that offer inflation protection over nominal annuities. Interestingly, Shu et al. (2016) find the opposite effect in line with Hurd and Rohwedder (2011), who show that actual household expenditures are reduced by 2% annually during retirement. Beshears et al. (2014) also find a preference for flexibility in form of a bonus payment in a given month of choice once per year, which allows household to exercise some control over the payout schedule. Shu et al. (2016) document a preference for annuities providing a period-certain guarantee of 10 to 20 years over annuities providing guarantees over either shorter or longer horizons.

An annuity with period-certain guarantee continues to provide monthly payouts to a designated beneficiary until the end of the guarantee period if the annuitant dies within this period. The authors also demonstrate a weak preference for annuities sold by a provider with AA credit rating compared to an annuity sold by an AAA-rated insurance company. This stands in contrast to fears of counterparty risk in the annuity market documented by Beshears et al. (2014). Plain vanilla annuity products that do not offer any of these preferred characteristics are less likely to be demanded. Based on the findings of these previous studies, we investigate in our first survey the preferred combination of indexed payouts, an annual bonus payment, period-certain guarantees, and counterparty risk among MPF members in Hong Kong.

Among the household characteristics, financial wealth is positively associated with annuity market participation (Inkmann et al., 2011) because poor households cannot afford to enter the annuity market or are excluded by minimum purchase requirements. Households with bequest motives are less likely to purchase annuities than those without (Ameriks et al., 2011; Brown, 2001; Inkmann et al., 2011; Lockwood, 2012). Uncertain expenses for healthcare or long-term care (Ameriks et al., 2011; Pang and Warshawsky, 2010; Poterba et al., 2011) may also be associated with a low annuitization rate, in particular for those in poor health (Turra and Mitchell, 2008) with low life expectancy. In Chinese societies, it is also common that older persons may want to keep some money for their funeral arrangements. Any existing or expected retirement income protection arrangements, such as welfare or family support, might crowd out the demand for annuities (Bütler et al., 2016; Bütler and Teppa, 2007; Pashchenko, 2010). Moreover, households may be reluctant to buy annuities because of loss aversion (Chalmers and Reuter, 2012), lack of financial literacy (in particular lack of understanding of annuities) (Brown et al., 2016; Lusardi and Mitchell, 2007, 2011, 2014), and an involvement in the stock market (Milevsky and Young, 2007). Based on these earlier studies, we relate these

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and other household characteristics that have been found to correlate with annuity demand (Beshears et al., 2014; Brown, 2001) in our second survey to the demand for the preferred annuity product that we designed based on our first survey.

The results from our first survey indicate that MPF members in Hong Kong prefer a nominal annuity with a 10-year period-certain guarantee provided by an insurance company with an A-rated credit rating. These results are very similar to those obtained by Shu et al. (2016) for the U.S.. A nominal annuity is in line with preferences against declining annuity payouts documented by Beshears et al. (2014) for the U.S., although a majority of participants in their study prefer inflation-adjusted annuity payouts. Compared to this study, participants in our study seem to be less concerned about counterparty risk.

Confronted with the decision whether to annuitize, 32.4% of the participants in our second survey choose the preferred annuity product designed from the first survey. This percentage is substantially higher than the observed percentages of households voluntarily purchasing an annuity in developed markets like the U.S. (10%) (Johnson et al., 2004) and the U.K. (6%) (Inkmann et al., 2011). In this sense, our strategy of designing a preferred annuity product for an undeveloped market appears to be successful.

Two correlates of the demand for the preferred annuity product are particularly worth emphasizing: first, a self-reported bequest motive has a significant and positive impact on the demand for the preferred annuity product. Our explanation for this result is the presence of the 10-year period-certain guarantee in the preferred annuity product, which seems to suggest that bequest motives are operational over a medium-term horizon. Second, in line with Agnew et al. (2008), financial literacy has a significant and negative impact on the demand for the preferred annuity product. In our context, financial literacy does not approximate for the ability to understand the rather complex annuity product because we separately control for this in our regression. Instead, the financially literate seem to prefer to manage their retirement assets on their own, which might include a

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desire to maintain stock market exposure during retirement. Exploring the relationship between financial literacy and annuity demand in more detail opens an avenue for future research.

The outline of the paper is as follows: Section 2 overviews institutional details of retirement income protection in Hong Kong. Section 3 discusses the design of our two surveys. Section 4 presents the empirical results and Section 5 concludes.

2. Retirement income protection in Hong Kong

Due to both a longer life expectancy and a low fertility rate, Hong Kong is a rapidly aging society as the aged population will more than double from 1.07 million in 2014 to 2.58 million in 2064 (Census and Statistics Department, 2015). According to the multi-pillar model proposed by the World Bank (2005), Hong Kong's retirement income protection currently rests on four pillars: publicly-funded social security schemes, privately-managed mandatory occupational pension schemes, voluntary savings, and public services as well as family support. The first pillar in Hong Kong consists of three programs (Chou et al., 2004) that cover approximately 70% of older persons in Hong Kong: the Old Age Category of Comprehensive Social Security Assistance (Old Age CSSA) scheme (13%), the Old Age Living Allowance (OALA) (37%), and the Old Age Allowance (OAA) (19%). All three schemes are non-contributory, financed from tax revenues and means-tested except the third one (Commission on Poverty, 2015). The Old Age CSSA provides the highest benefits among the three schemes in this pillar but is subject to the strictest means-testing and administrative procedure. The OALA, launched in 2013, is designed for persons aged 65 and older who have financial needs but are not eligible for CSSA due to its means-testing criteria or some other reasons. All persons aged 70 and older are eligible to apply for OAA which is universal in nature and provides monthly benefits of HKD 1,235 (USD 158.3).

The Mandatory Provident Fund scheme is the second pillar as it consists of compulsory, employment-based individual defined contribution savings accounts that are privately managed. In the third quarter of 2015, 73% of the 3.46 million working population were covered by the MPF scheme (MPFA, 2016). The third pillar of retirement protection in Hong Kong consists of private savings. Due to the anticipated decline in financial support traditionally provided by adult children, employees increasingly save for their own retirement income on a voluntary basis (AXA, 2005; Chou et al., 2015; HSBC, 2006). The findings of our previous survey of adults aged between 25 and 64 conducted in 2012, indicate that the total amount of private retirement savings was approximately USD 50.8 billion (Chou et al., 2015). The fourth pillar of retirement protection in Hong Kong consists of both family financial support, mainly from adult children (Chou et al., 2004), and public services or tangible assistance. The total amount of annual financial support received from children was about USD 2.97 billion (HKD 23.2 billion) (Chou, 2009). Other components of the fourth pillar include public housing, highly subsidized public health care, long term care services including community care and residential services, a public transportation fare concession scheme as well as an elderly health care voucher scheme (Commission on Poverty, 2015). In summary, savings in the MPF and private retirement savings are projected to increase substantially in the coming decades and measures are needed to facilitate the decumulation of these savings after retirement while reducing longevity risk and the risks associated with investment.

3. Survey design

3.1 Sampling scheme

We conducted two surveys to which we will refer as the discrete choice experiment or DCE and the household survey in the following. The target population for both surveys is

restricted to full-time working members of the MPF, aged between 40 and 64 years. The latter criterion is in line with previous work (Beshears et al., 2014; Shu et al., 2016) and the earliest age (65) at which participants in the MPF can withdraw their savings. The sampling for both the DCE and the household survey was random sampling and the sample frame was provided by the Department of Census and Statistics. This is the most up-to-date, complete and authoritative sampling frame available in Hong Kong. A two-stage stratified sample design was adopted. In the first stage, a random sample of addresses at which at least one target respondent was living, was selected. In the second stage, one household member aged between 40 and 64 years who is full-time working and participating in the MPF scheme was invited for an interview by the last birthday method (i.e. the one who had the most recent birthday). 631 and 1,066 respondents were successfully interviewed for the DCE and household survey, yielding the same response rate of 60.0%. Both the DCE and the household survey were conducted in 2015 in a face-to-face format.

3.2 Discrete choice experiment

The DCE started with a definition of an annuity: an "annuity is referring to a financial product in which you pay a lump sum of money to an annuity provider at the moment when you retire and in return the provider will pay a monthly income to you until you die." This was followed by a description of the advantage of annuitization: "the main benefit of an annuity is that you are certain to receive a monthly amount of money from the provider until you die; if you self-manage your retirement savings, you risk spending all of your savings long before you die, if you happen to live longer than you had expected." Unlike previous authors (Beshears et al., 2014), we chose not to deliberately avoid the word "annuity" because it is unlikely that respondents have any negative associations with existing annuities in an undeveloped market.

We explained that a variety of annuity products can be distinguished by their "features" (or attributes): the level of indexation (0, 3, or 5 percent annual increase), annual bonus payments in a month of choice (absent or present), period-certain guarantee (0, 10, or 30 years of guarantee) and counterparty risk (A, AA, or AAA rating). We presented respondents with short descriptions of these features.[2] We told respondents that other than these features, the annuities were identical except for the monthly annuity payouts, which changed with these four features. Afterwards, respondents were asked to which extent they understood the features of the annuity on a four-point scale: completely not understood; not understood; understood and completely understood. Only those who either understood or completely understood (500 out of 631 respondents) were asked to participate in the DCE.

Respondents were then asked to imagine that they were 65 years old now and there was HKD 1 million in their MPF retirement savings account.[3] Then they were presented 18 choice sets and in each choice set there were two rounds: in the first round, they had three options: two annuity options and one no-choice opt-out option that said "I refuse to choose and I defer my choice and continue to self-manage my retirement savings." If respondents chose the opt-out option, then in the second round they were forced to make a choice between the two remaining annuity options. In this way, the choice in the first round is most realistic and allows estimating the actual take-up of annuities (Dhar and Simonson, 2003; Lancsar and Louviere, 2008), while in the second round, we ensure to have

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[2] The complete descriptions are available from the first author upon request.

[3] HKD 1 million (about USD 128,000) is in the magnitude of the projected MPF benefit at age 65 in today's value (assuming an inflation rate of 3%) of a 20-year-old person with median monthly income of HKD 15,000, assuming an annual investment return of 3.5% in line with average historical MPF returns. For comparison, the average (median) 401(k) account balance in Vanguard DC plans for the age group 55-64 was about USD 178,000 (USD 72,000) in 2015 in the U.S (Vanguard, 2016).

sufficient information to determine the trade-offs between the annuity features in our subsequent econometric analysis (Hensher et al., 2005). The annuity options were generated by varying the levels of indexation, annual bonus payments, period-certain guarantee, and counterparty risk within the aforementioned ranges. Respondents were told that the annual inflation rate was assumed to be 3% in the coming decades (as in (Brown, 2007; Shu et al., 2016).

To facilitate an informed decision in the first round of the DCE that allows for an opt-out option without annuitization, respondents were shown the number of years they were able to withdraw HKD 5000, 6000 or 7000 on a monthly basis from their retirement account before depleting their savings assuming an annual investment return of 5%. The same information was given for a second scenario in which monthly withdrawals increase by 3% annually in order to compensate for inflation. For example, in the former case (no indexation), monthly withdrawals of HKD 6000 are possible for 23.3 years, while in the latter case (3% indexation) this number reduces to 16.4 years.

For every annuity option, the starting income was presented (as in (Beshears et al., 2014; Shu et al., 2016) to elicit a more informed decision from respondents and we calculate starting income based on a purchase price of HKD 1 million[4] and the values of the four annuity features by an actuarial model assuming 3% inflation, investment returns for different ratings of the insurance company (5%, 5.5% and 6.0% for AAA, AA and A, respectively[5]), mortality rates of U.S. healthy annuitants with expected longevity

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[4] In Shu et al., 2016, different annuity options have different values and therefore purchase prices that may substantially deviate from the amount of accumulated assets in the retirement account. The authors control for the value of the annuity in their regressions. We ensure that all options have the same value corresponding to a purchase price of HKD 1 million.

[5] For the AAA category, the average historical nominal rate of return on the Hong Kong Exchange Fund was used as reported by the Hong Kong Monetary Authority in January 2015. The

improvement, and insurance companies charging a loading of 10% for administrative expenses, profits and risk margin.[6] Due to differences in life expectancy, female and male respondents were presented with different starting incomes. The experimental design was generated in the software program Ngene version 1.1.1 (ChoiceMetrics, 2012). See Appendix A for details regarding the design of the DCE.

3.3 Household survey

In the household survey, interviews were conducted by five well-trained part-time interviewers and the interviews took about 30 minutes to complete. Like in the DCE, a brief introduction of the annuity and its four selected features was presented and respondents were asked whether they understood the brief description or not. Based on the findings of the DCE (which we will discuss in detail below), we designed the preferred annuity with a fixed monthly income, a 10-year guarantee period, without bonus payments, and provided by an A-rated insurance company (starting income for females and males is HKD 5,957 and HKD 6,208, respectively). Respondents were told: "Suppose that you are 65 years old. You are about to retire and have accumulated HKD 1 million in your MPF account. We want to know whether you prefer to use the money to buy an annuity or continue to self-manage the savings."

We collected a number of household characteristics in addition to this annuitization information. The amount of current total assets was collected by asking respondents to report their possession of four categories of assets, cash and savings; stocks, bonds, and mutual funds; self-occupied properties; and property they do not occupy using a 16-option

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questionnaire emphasized that a lower rating implies a higher default probability.

[6] Mitchell et al. (1999) document load factors between 8% and 20% for the U.S. annuity market. We do not observe load factors for Hong Kong because a market for life annuities does not exist. We stay close to the lower bound of the load factors reported for the U.S. because tax and labor costs in Hong Kong are likely to be cheaper than in the U.S.

item. Retirement savings were assessed by collecting the amount of MPF savings, savings in other retirement schemes and private retirement savings.

In terms of expected utilization of assets, respondents were asked how much they had reserved for funeral arrangements as well as for anticipated expenditures for health and long-term care services after retirement. The latter two were calculated by multiplying the subjective probability of using health or long-term care services and the amount of money they would use on those services. Respondents were also asked whether they had purchased any health or long-term care insurance. Moreover, their self-rated health on a 5-point scale ranging from excellent to very poor was measured and the presence of 21 chronic illnesses (e.g. arthritis, heart disease, hypertension, diabetes, Parkinson's disease, dementia, stroke, cancer) was collected as well. The item on self-rated health was dichotomized into 1 = poor or very poor and 0 = otherwise. Subjective life expectancy was collected by asking respondents to assess the chance that they would live to 65, with a scale ranging from zero to 100.

After a brief introduction of the old-age CSSA, the OALA, and the OAA including the amount of benefits and their eligibility criteria (age, income and asset limit), respondents were asked to assess the likelihood of being eligible for the two means-tested welfare schemes separately (old-age CSSA and OALA) and the likelihood of applying for these three schemes if they are eligible on a scale from zero to 100%. Consequently, the probability of receiving income from these three schemes is calculated by multiplying the chance of becoming eligible with the chance of applying for it. Because the OAA is universal, the chance of becoming eligible is assumed to be 100%.

Respondents were asked how many children they had, whether they expected financial support from their adult children and how much they might expect when they retired. Regarding a potential bequest motive, respondents were asked whether they have a bequest motive towards their spouse, children or other family members. Risk aversion

was measured by asking respondents to assess the risk they were willing to take on investments on a 4-point scale ranging from high (3) to none (0).

Financial literacy was assessed by three questions (related to compounding, inflation and diversification) that were originally designed for the 2004 Health and Retirement Study (HRS) and subsequently adopted in other national surveys such as the National Longitudinal Survey of Youth 2007-2008 as well as various household surveys in other countries (Almenberg and Säve-Söderbergh, 2011; Bucher-Koenen and Lusardi, 2011; Fornero and Monticone, 2011). The financial literacy score is the sum of correct answers to these three questions. Respondents were also asked whether they had ever participated in the stock market and if so whether they were still participating at the time of the interview. Finally, age, gender, marital status, education, personal and household income were collected as basic socio-economic variables.

3.3 Econometric techniques

For the analysis of the DCE data, conditional and mixed logit models were used to estimate the relative importance of the four annuity features (see Appendix B for details on these models). We used a binomial logit model for the analysis of the annuitization question in the household survey. We report average marginal effects for all of these discrete choice models. We examined multicollinearity between all covariates and found that all tolerance values were at an acceptable level. We performed the data management and estimated the regression models using SPSS for Windows 16.0 (SPSS, 2006).

4. Results

4.1 Discrete choice experiment

The DCE seeks to determine the preferred annuity product along four dimensions that have been motivated by previous literature (Beshears et al., 2014; Shu et al., 2016).

Descriptive statistics for the 500 participants in the DCE are shown in Table 1.

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Insert Table 1 about here

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Recall that we designed the DCE in two rounds: in the first round, respondents had the choice between two annuity options and an opt-out option, corresponding to non-annuitization. In the second round, respondents who opted out in the first round, had to decide between two annuitization options. Table 2 shows the average number of times respondents refused to annuitize across the 18 choice sets. It turns out, that a large majority of participants (69.6%) never refused to annuitize while a minority of participants (9.8%) always refused to annuitize. These numbers indicate that the large majority of MPF participants in Hong Kong is certainly willing to consider annuity purchases.

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Insert Table 2 about here

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The estimated average marginal effects for the conditional and mixed logit models are shown in Table 3. The standard errors are given in parentheses where for the mixed logit model, they were obtained from 1,000 bootstrap iterations.

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Several product characteristics turn out to be significant predictors of annuity choice independent of the model specification (conditional versus mixed logit). First, given equivalent expected present values, a nominal annuity is strictly preferred over alternative annuity products that generate annual increases in annuity payouts. Recall that participants were told to assume 3% annual inflation. In the conditional logit model, the

likelihood of choosing a certain annuity is reduced by about 6.7 and 8.8 percentage points if annual annuity payouts increase by 3% or 5%, respectively. The difference of these two percentage points is statistically significant according to a Wald test. The mixed logit estimates are very similar but the Wald test fails to reject equality of the parameters related to a 3% and 5% increase, respectively. Beshears et al. (2014) find in a similar experiment that 19% of the respondents have a preference for declining annuity payouts, while 32% prefer a nominal payout and 50% an increasing payout in line with inflation. It is not clear from these results whether the difference between the latter two percentages is statistically significant. Assuming it is, the difference in preferences among respondents in Hong Kong and the U.S. could be explained by recent inflation experience: the most recent annual inflation rate was 2.8% (Composite CPI, published by the Census and Statistics Department in Hong Kong) in April 2015, when our survey was conducted. The corresponding statistic was 3.8% (CPI for all urban consumers, published by the U.S. Bureau of Labor Statistics) in August 2011, when the Beshears et al. (2014) data were collected. However, the average experienced annual inflation rates over the 5 (10) (30) years preceding the surveys were 4.2% (3.1%) (4.0%) in Hong Kong and 2.1% (2.4%) (3.1%) in the U.S.. Thus, the preference for nominal annuities in Hong Kong seems to be inconsistent with medium- to long-term inflation experience but consistent with short-term experience. Our results are also compatible with a preference for higher payouts during the initial period of retirement, which the average person will survive with a relatively high probability. Our findings are very similar to those of Shu et al. (2016) who also report a preference for nominal annuities and consistent with Hurd and Rohwedder (2011) who find that actual household expenditures are reduced by 2% per year during retirement, which may serve to compensate inflation.

Second, while the participants in our DCE in general prefer annuities with period-certain guarantees, an annuity with a 10-year guarantee is preferred to an annuity

with a 30-year guarantee. Compared to an annuity without guarantee, a 10-year (30-year) guarantee significantly increases the choice probability by about 11.4 (9.4) percentage points in the conditional logit model. The mixed logit model again generates very similar estimates. In both models, the difference of these two percentage points is statistically significant according to a Wald test. Similar to our results, Shu et al. (2016) document a preference for medium-term (10 to 20-year) guarantees in comparison to short- (5-year) and long-term (30-year) guarantees using U.S. data. The preference for period-certain guarantees is intrinsically tied to the presence of bequest motives. An extensive literature in economics and finance presents arguments against (e.g. (Hurd, 1987, 1989)) or in favor of (e.g. (Inkmann and Michaelides, 2012; Kopczuk and Lupton, 2007) the existence of bequest motives. Starting with Yaari (1965), bequest motives have been recognized as a major hurdle for annuity demand (Friedman and Warshawsky, 1990). Our findings, along with those of Shu et al. (2016), introduce a new element to this discussion: preferences for period-certain guarantees seem to suggest that bequest motives are mostly operational over a medium-term horizon of about 10 to 20 years after an annuitant's death and decline afterwards.

The third product characteristic under consideration, annual bonus payments, does not significantly affect individual preferences for annuity design in our DCE, regardless of the econometric specification. Beshears et al. (2014) report that bonus payments are preferred by 60% of respondents. It is not clear whether this is a statistically significant majority. Finally, the fourth attribute, financial safety of the annuity issuer (or counterparty risk), significantly affects annuity product choice. According to both models, decreasing counterparty risk from A to AA, reduced the demand for annuities by about 1.4-2.1 percentage points, depending on the econometric specification, while the transition from A to AAA has no significant impact on annuity demand. In both models, Wald tests confirm a significant difference in the parameter estimates related to an AA and AAA rating,

respectively. Similar to our results, Shu et al. (2016) find that a decrease in counterparty risk corresponding to a transition from AA to AAA reduces annuity demand, although the effect is statistically insignificant. Lopes and Michaelides (2007) argue that rare events like defaults of annuity providers are unlikely to explain the lack of annuity demand. This is because only households with high risk aversion will change their behavior in the presence of small default probabilities while high risk aversion at the same time also increases the demand for annuities. This argument might explain the somewhat mixed evidence we obtain for AA- and AAA-rated companies.

4.2 Household survey

Descriptive statistics for the 1,066 respondents who participated in the second survey are shown in Table 4. About one-third of respondents (345 out of 1,066) chose the preferred annuity product that was "optimized" based on the earlier DCE. Even accounting for the fact that survey responses (unlike observed annuity purchases) do not affect the actual life outcomes of respondents, this fraction seems high in comparison to observed annuity market participation rates in developed markets. Inkmann et al. (2011), for example, report that less than 6% of retired households living in England voluntarily purchase annuities.

Insert Table 4 about here

Table 5 shows descriptive statistics for the subsamples of annuitants and non-annuitants and tests for differences in the composition of these subsamples.

Insert Table 5 about here

Analyzing the determinants of annuity demand, several results stand out from the binomial logit model in Table 6.

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Similar to Inkmann et al. (2011), annuitization probabilities monotonically increase over the distribution of retirement savings. For example, compared to households with less than HKD 500,000 in retirement savings, households with savings between HKD 1,000,000 and 1,500,000 have an 11 percentage point higher probability of annuitizing which increases to 16 percentage points for households in the next bracket of retirement savings between HKD 1,500,000 and 3,000,000. Only for the 8.8% wealthiest households in the sample with more than HKD 3,000,000 in retirement savings, the impact of savings becomes statistically insignificant.

The chance of receiving any first-pillar pension benefits has an economically negligible impact on annuity demand. However, anticipated financial support from adult children significantly crowds out annuity demand. Compared to households without financial support from their children, households expecting financial support in a magnitude of up to HKD 30,000 per year are about 11.7 percentage points less likely to annuitize. The impact becomes statistically insignificant for larger transfers from adult children.

Those reporting a bequest motive for their spouse, children, or other family members have a 13 percentage point larger probability of purchasing the preferred annuity. This impact of a bequest motive on annuity demand is statistically and economically highly significant. This is a remarkable result. As mentioned earlier, bequest motives are usually seen as a major obstacle to annuitization. Our question deliberately includes family members other than children because previous work by Kopczuk and Lupton (2007)

shows that a focus on children (Hurd, 1987, 1989) may overlook bequest motives. Indeed, Brown (2001) and Inkmann et al. (2011) do not find a significant impact of children on annuity demand but report a negative and significant impact of being married, which can be interpreted as a bequest motive for a surviving spouse. In contrast, we find that bequest motives increase the demand for the preferred annuity product. Recall that the preferred annuity product includes a period-certain guarantee of 10 years, which we interpreted as evidence for a bequest motive that is operating over the first part of retirement. The annuity demand analysis seems to confirm this interpretation. Once a 10-year period-certain guarantee is granted, bequest motives are no longer an obstacle to annuitization and actually increase the demand for annuities. This is an important insight, which shows how relevant it is to design an appealing annuity product.

Since we already control for bequest motives, the positive and significant impact of "never married" compared to "married" on choosing the annuity must be unrelated to any bequest considerations. Compared to married households, never married individuals are about 21 percentage points more likely to purchase the preferred annuity. A possible explanation for this result is intra-household hedging of longevity risk (Hubener et al., 2014; Kotlikoff and Spivak, 1981), which is not available to unmarried households. The presence of children does not significantly affect annuity demand in our empirical analysis.

We find a negative and significant impact of financial literacy on the demand for the preferred annuity product. A unit increase in the financial literacy score, reduces annuity demand by about 9 percentage points. On first sight, this seems to stand in contrast to a literature overviewed by Lusardi and Mitchell (2014) that documents a positive relationship between financial literacy, planning for retirement and accumulation of retirement assets (Lusardi and Mitchell, (2007, 2011). In the conext of annuities, Brown et al. (2016) document that financially less literate individuals are less likely to correctly value annuity products, using the same index of financial literacy employed in our analysis. Our results

are in line with Agnew et al. (2008), who also report a negative and significant impact of a financial literacy score on annuitization probabilities. One possible explanation is that those who are financially literate prefer to self-manage their retirement savings instead of purchasing an annuity. We find a negative and significant impact of past stock market experience on annuity demand in Table 6. Financial literacy might serve as a proxy for the wish to maintain stock market exposure in future.[7]

The negative impact of general financial literacy is dominated by a significant and positive impact of annuity-specific knowledge. Those indicating to understand the features of the preferred annuity product described in the questionnaire (about 73% of the sample), are about 20 percentage points more likely to purchase the annuity. This result indicates that decisions involving a complex retirement product like an annuity are driven by a household's ability and effort to understand the specific features of the product rather than general knowledge (Bateman et al., 2016). This is confirmed by the finding that the level of general education does not significantly affect annuity demand.

The impact of survival probabilities on annuity demand is statistically significant and negative, contrary to previous findings by Inkmann et al. (2011). However, the magnitude of the coefficient is economically very small (35 basis points). Individuals close to retirement age (aged 55-64) are about 16 percentage points more likely to purchase an annuity than younger individuals (aged 40-44).

5. Conclusion

We started this paper with two questions: How should we design an attractive

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[7] If participants in the DCE were less financially literate than those in the household survey, they might have designed an annuity product that was not appealing to the latter group. However, the general education levels of both groups of participants in Tables 1 and 4 do not seem to support this hypothesis for the negative impact of financial literacy on annuity demand.

annuity for an undeveloped annuity market and how can we assess the potential demand for such a product? We have answered these questions for a particular undeveloped annuity market, Hong Kong. The market is characterized by substantial and growing retirement assets in the Mandatory Provident Fund (MPF), a large-scale, compulsory occupational defined contribution pension scheme, and a complete absence of life annuities. Using a discrete choice experiment, we first identified the particular characteristics of an annuity product, which are desired by MPF members of age 40-64 who need to decide on how to decumulate their retirement assets in a not too distant future. It turned out that the preferred annuity product provides nominal payouts, is sold by an A-rated insurance company, and offers a period-certain guarantee of 10 years.

We then took this preferred annuity to a second sample of MPF members who were asked to decide whether they would purchase such an annuity product. About one third of sample members chose to annuitize, which can be seen as a success given the much lower annuitization percentages observed in developed annuity markets. Among the household characteristics significantly affecting the demand for the preferred annuity, retirement savings significantly increase annuitization probabilities except for the wealthiest households. Financial support from children crowds out annuity demand. A self-reported bequest motive increases the demand for the preferred annuity product contrary to an extensive literature discussing bequest motives as an obstacle for annuitization. We explain our result with the presence of a 10-year period-certain guarantee in the preferred annuity product. In line with previous work, financial literacy has a negative impact on the demand for the preferred annuity, which we explain with a desire of the financially literate to manage their retirement assets on their own. Future work could try to shed more light on this particular result.

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Appendix

Appendix A: Design of the DCE

We decided to present 18 choice sets to each individual, which is seen as a practical limit before boredom sets in (Hanson et al., 2005). Since the number of choice sets defines the maximum number of parameters that are identified, this gives a comfortable buffer to identify all main effects of the feature levels. We chose to generate an "efficient design" that chooses the 18 most informative choice sets, for a given set of prior values. Apart from statistical efficiency, an important advantage is that efficient designs avoid so-called dominant alternatives – uninformative choice sets where one of the two annuities is superior in all levels of the attributes. In the design we minimize the mean "D-Error", which is the determinant of the asymptotic variance-covariance (AVC) matrix of the parameters (Huber and Zwerina, 1996). The prior values are directly based upon previous work by Shu et al. (2016), where we use Bayesian priors with 1000 Halton draws from a Normal distribution to ensure robustness against misspecification and against possible differences in preferences between Hong Kong and the U.S.

We use a multinomial logit model to generate the design with three alternatives, with in total 18 choice sets. While ideally the design reflects the ultimate model to be estimated, the generation of 18 choice sets using a panel mixed logit specification with Bayesian priors is infeasible given the computational complexity (Bliemer and Rose, 2010; Rose and Bliemer, 2013). Instead, we opt for the cross-sectional multinomial logit model with Bayesian priors to generate our design. While this seems like a large departure from a panel mixed logit model, numerous case studies and simulations show that there is only a slight loss in efficiency, and the performance of cross-sectional multinomial logit is better than cross-sectional mixed logit if the true model is panel mixed logit (Bliemer and Rose, 2010).

The algorithm minimizes the mean D-error, uses row swapping, and we set the convergence criterion such that convergence is achieved if no improvement is found in 10 minutes. Since we have an unlabeled design, all parameters are generic across the alternatives, and there is no constant specified (Hensher et al., 2005). The prior values of the parameters are set using Bayesian priors using 1000 Halton draws from a Normal distribution (see Table A1 for an overview).

Table A1: Prior distribution for each level

Attribute	Prior distribution
Income increase (baseline 5%)	
0%	N(-0.874,0.218)
3%	N(-0.191,0.062)
Bonus (baseline "Yes")	
No	N(-0.5,0.161)
Period-certain (baseline 30 years)	
0 years	N(-0.909,0.147)
10 years	N(-0.452,0.146)
Rating (baseline AAA)	
A	N(-0.826,0.133)
AA	N(-0.413,0.133)

Notes: The prior for the opt-out option is N(-0.2,0.2).

Appendix B: Analysis of the DCE data

In the analysis of the DCE, conditional and mixed logit models were used to estimate the relative importance of the four annuity product features: the level of indexation (0, 3, or 5 percent annual increase), annual bonus payments in a month of choice (absent or present), period-certain guarantee (0, 10, or 30 years of guarantee) and counterparty risk (A, AA, or AAA rating). The mixed logit model allows preference to be heterogeneous (see e.g. Lancsar and Louviere, 2008). These models assume that an individual n (n = 1,…,N) derives a certain amount of latent utility from each alternative j (j = 1,2) in a choice situation t (t = 1,..,18). This utility is determined by the attributes of alternative j in choice situation t, characteristics of individual n as the decision maker, and a random component. In each choice situation, the respondent compares the utility of choosing alternative j = 1 with the utility of choosing alternative j = 2, and chooses the alternative with greater utility. What we observe is the outcome of these latent utility comparisons. Hence, the dependent variable is a binary indicator for which of the two alternatives was chosen in choice situation t for respondent n. Estimation of the model provides us with the determinants of annuity demand, where we take into account the "panel" structure of the data since the same individual responds to 18 choice sets. Different from the mixed logit model, the conditional logit model assumes preferences are the same (homogenous) for all individuals in our sample.

Table 1: Characteristics of respondents in the DCE

	Percentage
Age	
40 – 44	35.2%
45 – 49	23.8%
50 – 54	19.4%
55 – 64	21.6%
Age (Mean, SD)	48.30 (6.81)
Sex	
Male	38.6%
Female	61.4%
Marital status	
Married	76.2%
Never married	14.8%
Widowed/Divorced/Separated	9.0%
Educational attainment	
Lower secondary or below	24.0%
Upper secondary	59.8%
Post-secondary or above	16.2%
Personal income	
Less than HK$10,000	17.0%
HK$10,000 – HK$15,000	25.4%
HK$15,000 – HK$20,000	28.2%
HK$20,000+	29.4%
Household income	
Less than HK$20,000	17.6%
HK$20,000 – HK$30,000	33.4%
HK$30,000 – HK$50,000	35.0%
HK$50,000+	14.0%

Notes: The table shows descriptive statistics for the participants in the discrete choice experiment. The sample size is N = 500.

Table 2: Proportion of respondents who refused annuitization in the DCE

Number of times refused annuitization	Percentage
0	69.6%
1	5.4%
2	4.2%
3	3.8%
4	1.4%
5	0.8%
6	0.6%
7	0.8%
8	0.6%
9	0.8%
10	1.2%
11	0.4%
12	0.2%
13	0.4%
14	0.0%
15	0.0%
16	0.0%
17	0.0%
18	9.8%

Notes: The table shows the distribution of the number of times respondents refused annuitization across the 18 choice sets they were confronted with during the discrete choice experiment. The sample size is N = 500.

Table 3: Average marginal effects of conditional and mixed logit models

	Conditional logit	Mixed logit
Annual increase (Ref.: No increase)		
3% increase	−0.0673 (0.0102)***	−0.0551 (0.0108)***
5% increase	−0.0881 (0.0133)***	−0.0855 (0.0186)***
Having bonus payment	0.0028 (0.0043)	0.0035 (0.0041)
Period-certain guarantee (Ref.: No guarantee)		
10 years	0.1137 (0.0125)***	0.1107 (0.0152)***
30 years	0.0945 (0.0101)***	0.0842 (0.0096)***
Company rating (Ref.: A)		
AA	−0.0212 (0.0064)***	−0.0140 (0.0065)**
AAA	−0.0069 (0.0075)	0.0078 (0.0071)
Percentage of correct prediction	59.7%	60.1%
β(3% increase) = β(5% increase)	6.49**	2.08
β(10 years) = β(30 years)	4.66**	2.51
β(AA) = β(AAA)	3.96**	12.18***

Notes: ***: $p < 0.01$; **: $p < 0.05$; *: $p < 0.10$. The table shows estimated average marginal effects of annuity product characteristics on annuitization probabilities obtained from conditional and mixed logit models. Standard errors are given in parentheses; for the mixed logit model, these were obtained from 1,000 bootstrap iterations. The lower panel of the table contains Wald test statistics for tests of parameter equality. The sample size is N = 500.

Table 4: Characteristics of respondents in the household survey

	Percentage
Chose annuity	32.4%
Financial wealth, bequest motives, other uses of assets and health status	
Current total asset	
Less than HK$300,000	18.8%
HK$300,000 – HK$600,000	21.1%
HK$600,000 – HK$2,000,000	10.5%
HK$2,000,000 – HK$4,400,000	14.5%
HK$4,400,000+	35.1%
Amount of retirement saving	
Less than HK$ 500,000	19.3%
HK$500,000 – HK$1,000,000	26.0%
HK$1,000,000 – HK$1,500,000	23.1%
HK$1,500,000 – HK$3,000,000	22.8%
HK$3,000,000+	8.8%
Bequest motive	
Leave savings to spouse, children, family members	65.7%
Do not leave savings to spouse, children, family members	34.3%
Anticipated expenditure for health care service	
Less than HK$20,000	24.0%
HK$20,000 – HK$50,000	27.4%
HK$50,000 – HK$100,000	19.0%
HK$100,000+	29.5%
Anticipated expenditure long-term care service	
HK$0	14.5%
HK$1 – HK$30,000	34.1%
HK$30,000 – HK$100,000	27.5%
HK$100,000+	23.8%
Anticipated expenditure for funeral arrangement	
HK$0	19.0%
HK$1 – HK$30,000	36.6%
HK$30,000 – HK$100,000	23.4%
HK$100,000+	21.0%
Purchased health care insurance	70.7%
Purchased long-term care insurance	15.9%
Poor self-rated health status	29.7%
Number of chronic illnesses (Mean, SD)	0.65 (1.12)
Anticipated sources of incomes after retirement	
Chance of receiving CSSA (Mean, SD)	15.74 (25.96)
Chance of receiving OALA (Mean, SD)	26.68 (33.22)
Chance of receiving OAA (Mean, SD)	88.42 (23.81)
Financial support from adult children	
HK$0	25.5%
HK$1 – HK$30,000	17.5%
HK$30,000 – HK$50,000	28.9%
HK$50,000+	28.0%
Other factors	
Willingness to take risk (Mean, SD)	1.36 (0.88)

Financial literacy (Mean, SD)	2.01 (0.92)
Experience in stock investment	
Now participating	38.6%
Experience in the past	24.0%
No experience	37.4%
Survival probability at the age of 65 (Mean, SD)	88.73 (12.31)
Understanding of annuity	73.3%
Socio-economic factors	
Age	
40 – 44	29.5%
45 – 49	26.3%
50 – 54	20.7%
55 – 64	23.5%
Age (Mean, SD)	48.86 (6.41)
Sex	
Male	44.2%
Female	55.8%
Marital status	
Married	76.2%
Never married	13.7%
Widowed/Divorced/Separated	10.1%
Educational attainment	
Lower secondary or below	28.4%
Upper secondary	54.2%
Post-secondary or above	17.4%
Number of children	
0	28.9%
1	32.1%
2+	39.0%
Personal income	
Less than HK$10,000	17.8%
HK$10,000 – HK$15,000	28.8%
HK$15,000 – HK$20,000	24.2%
HK$20,000+	29.2%
Household income	
Less than HK$20,000	22.6%
HK$20,000 – HK$30,000	33.8%
HK$30,000 – HK$50,000	27.2%
HK$50,000+	16.4%

Notes: The table shows descriptive statistics for the participants in the household survey. The sample size is N = 1,066.

Table 5: Bivariate analysis of choosing annuity

	Not choosing annuity (N = 721)	Choosing annuity (N=345)	χ²/t-test statistic
Financial wealth, bequest motives, other uses of assets and health status			
Current total asset			14.65***
Less than HK$300,000	19.8%	16.6%	
HK$300,000 – HK$600,000	19.5%	24.4%	
HK$600,000 – HK$2,000,000	11.5%	8.4%	
HK$2,000,000 – HK$4,400,000	12.3%	18.9%	
HK$4,400,000+	36.8%	31.7%	
Amount of retirement saving			3.90
Less than HK$500,000	20.0%	18.0%	
HK$500,000 – HK$1,000,000	26.5%	24.9%	
HK$1,000,000 – HK$1,500,000	22.1%	25.2%	
HK$1,500,000 – HK$3,000,000	21.9%	24.6%	
HK$3,000,000+	9.6%	7.2%	
Bequest motive			8.75***
Leave savings to spouse, children, family	62.7%	71.9%	
Do not leaves saving to spouse. children, f.	37.3%	28.1%	
Anticipated expenditure for health care service			14.95***
Less than HK$20,000	24.7%	22.6%	
HK$20,000 – HK$50,000	30.5%	20.9%	
HK$50,000 – HK$100,000	17.5%	22.3%	
HK$100,000+	27.3%	34.2%	
Anticipated expenditure long-term care service			4.19
HK$0	14.0%	15.7%	
HK$1 – HK$30,000	36.2%	29.9%	
HK$30,000 – HK$100,000	26.6%	29.3%	
HK$100,000+	23.2%	25.2%	
Anticipated expenditure for funeral arrangement			21.43***
HK$0	19.3%	18.6%	
HK$1 – HK$30,000	40.8%	27.8%	
HK$30,000 – HK$100,000	20.4%	29.6%	
HK$100,000+	19.6%	24.1%	
Purchased health care insurance	70.7%	70.7%	0.00
Purchased long-term care insurance	13.9%	20.3%	7.18***
Poor self-rated health status	29.4%	30.4%	0.12
Number of chronic illnesses (Mean, SD)	0.66 (1.15)	0.64 (1.05)	0.33
Anticipated sources of incomes after retirement			
Chance of receiving CSSA (Mean, SD)	13.40 (23.91)	20.65 (29.23)	–4.01***
Chance of receiving OALA (Mean, SD)	25.32 (33.05)	29.51 (33.45)	–1.92*
Chance of receiving OAA (Mean, SD)	90.75 (21.36)	83.54 (27.66)	4.27***
Financial support from adult children			14.42***
HK$0	26.8%	22.9%	
HK$1 – HK$30,000	20.0%	12.5%	
HK$30,000 – HK$50,000	26.6%	33.6%	

HK$50,000+	26.6%	31.0%	
Other factors			
Willingness to take risk (Mean, SD)	1.39 (0.90)	1.30 (0.82)	1.59
Financial literacy (Mean, SD)	2.16 (0.86)	1.71 (0.96)	7.31***
Experience in stock investment			7.14**
Now participating	38.0%	39.7%	
Experience in the past	26.4%	19.1%	
No experience	35.6%	41.2%	
Life expectancy			
Survival probability at age 65	89.55 (12.05)	87.02 (12.67)	3.10***
Understanding of annuity	69.1%	82.0%	20.00***
Socio-economic factors			
Age			2.08
40 – 44	30.8%	26.7%	
45 – 49	25.7%	27.5%	
50 – 54	20.7%	20.9%	
55 – 64	22.9%	24.9%	
Sex			0.01
Male	44.1%	44.3%	
Female	55.9%	55.7%	
Marital status			6.02**
Married	78.4%	71.6%	
Never married	12.6%	15.9%	
Widowed/Divorced/Separated	9.0%	12.5%	
Educational attainment			0.46
Lower secondary or below	28.2%	29.0%	
Upper secondary	54.0%	54.8%	
Post-secondary or above	17.9%	16.2%	
Number of children			1.63
0	30.1%	26.4%	
1	31.8%	32.8%	
2+	38.1%	40.9%	
Personal income			0.98
Less than HK$10,000	17.9%	17.7%	
HK$10,000 – HK$15,000	27.9%	30.7%	
HK$15,000 – HK$20,000	24.7%	23.2%	
HK$20,000+	29.5%	28.4%	
Household income			3.89
Less than HK$20,000	22.5%	22.9%	
HK$20,000 – HK$30,000	32.0%	37.4%	
HK$30,000 – HK$50,000	28.2%	25.2%	
HK$50,000+	17.3%	14.5%	

Notes: ***: $p < 0.01$; **: $p < 0.05$; *: $p < 0.10$. The table shows descriptive statistics for the subsamples of annuitants and non-annuitants and tests for differences in the composition of these subsamples using χ^2/t-tests. The sample size is N = 1,066.

Table 6: Average marginal effects of choosing annuity

Variables	
Financial wealth, bequest motives, other uses of assets and health status	
Current total asset (Ref: <HK$300,000)	
HK$300,000 – HK$600,000	0.0869 (0.0556)
HK$600,000 – HK$2,000,000	−0.0590 (0.0600)
HK$2,000,000 – HK$4,400,000	0.0898 (0.0632)
HK$4,400,000+	0.0054 (0.0555)
Amount of retirement saving (Ref: <HK$500,000)	
HK$500,000 – HK$1,000,000	0.0401 (0.0539)
HK$1,000,000 – HK$1,500,000	0.1113 (0.0676)*
HK$1,500,000 – HK$3,000,000	0.1610 (0.0762)**
HK$3,000,000+	0.1355 (0.0967)
Bequest motive (Ref: Do not leave savings)	
Leave savings to spouse, children, family members	0.1343 (0.0345)***
Anticipated expenditure for health care service (Ref: <HK$20,000)	
HK$20,000 – HK$50,000	−0.0733 (0.0429)*
HK$50,000 – HK$100,000	0.0361 (0.0521)
HK$100,000+	0.0426 (0.0534)
Anticipated expenditure long-term care service (Ref: HK$100,000+)	
HK$0	0.0880 (0.0653)
HK$1 – HK$30,000	0.0124 (0.0517)
HK$30,000 – HK$100,000	0.0888 (0.0504)*
Anticipated expenditure for funeral arrangement (Ref: HK$0)	
HK$1 – HK$30,000	−0.0545 (0.0435)
HK$30,000 – HK$100,000	0.0977 (0.0528)*
HK$100,000+	0.0655 (0.0572)
Purchased health care insurance	−0.0231 (0.0397)
Purchased long-term care insurance	0.0720 (0.0466)
Poor self-rated health status	−0.0162 (0.0368)
Number of chronic illnesses	−0.0063 (0.0156)
Anticipated sources of incomes after retirement	
Chance of receiving CSSA	0.0029 (0.0009)***
Chance of receiving OALA	−0.0005 (0.0007)
Chance of receiving OAA	−0.0023 (0.0007)***
Financial support from adult children (Ref: HK$0)	
HK$1 – HK$30,000	−0.1170 (0.0430)**
HK$30,000 – HK$50,000	0.0301 (0.0453)
HK$50,000+	−0.0034 (0.0461)
Other factors	
Willingness to take risk	0.0023 (0.0207)
Financial literacy	−0.0906 (0.0176)***
Experience in stock investment (Ref: No experience)	
Now participating	−0.0329 (0.0406)
Experience in the past	−0.0727 (0.0390)*
Survival probability at the age of 65	−0.0035 (0.0013)***
Understanding of annuity	0.1986 (0.0297)***
Socio-economic factors	

Age (Ref: 40 – 44)	
45 – 49	0.0581 (0.0463)
50 – 54	0.0932 (0.0547)*
55 – 64	0.1561 (0.0638)**
Sex (Ref: Male)	
Female	0.0211 (0.0339)
Marital status (Ref: Married)	
Never married	0.2096 (0.0726)***
Widowed/Divorced/Separated	0.0936 (0.0603)
Educational attainment (Ref: Post-secondary or above)	
Lower secondary or below	0.0160 (0.0419)
Upper secondary	0.0124 (0.0461)
Number of children (Ref: 0)	
1	0.0584 (0.0553)
2+	0.0609 (0.0553)
Personal income (Ref: HK$20,000+)	
Less than HK$10,000	0.0929 (0.0738)
HK$10,000 – HK$15,000	0.0919 (0.0561)
HK$15,000 – HK$20,000	0.0419 (0.0511)
Household income (Ref: HK$50,000+)	
Less than HK$20,000	0.0619 (0.0687)
HK$20,000 – HK$30,000	0.1206 (0.0581)**
HK$30,000 – HK$50,000	0.0594 (0.0553)
Pseudo R^2	0.170

Notes: ***: $p < 0.01$; **: $p < 0.05$; *: $p < 0.10$. The table shows estimated average marginal effects of household characteristics on the annuitization probability obtained from a binomial logit model. Standard errors are given in parentheses. The sample size is N = 1,066.