

HEC MONTRÉAL

**Evaluating the Price Elasticity of Demand for Life Annuities in Canada :
A Stated-Preference Experiment**

par

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(Option Économie Appliquée)**

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À l'attention de :
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Résumé

Une rente viagère est un produit financier qui consiste en une somme versée périodiquement à son propriétaire, et ce jusqu'à sa mort, en échange d'un paiement initial. Dans une majorité de pays développés, peu d'individus achètent volontairement ce genre de produits, malgré son utilité afin de protéger contre le risque de longévité. Nous enquêtons sur les causes de cette impopularité au Canada. Spécifiquement, nous conduisons une expérience de préférence déclarée (stated preference) où les répondants évaluent leurs chances d'acheter une rente sous divers scénarios. Nous varions de manière exogène le prix des rentes de sorte à obtenir l'élasticité prix de celles-ci. Nous modélisons également l'hétérogénéité dans l'élasticité prix. Nous obtenons trois résultats principaux. Premièrement, nous estimons une élasticité prix des rentes de -0,58. Deuxièmement, nous observons que les rentes viagères sont peu connues du public et que ce manque de connaissances est un facteur important pour expliquer le peu de demande pour ces produits. Troisièmement, nous observons une élasticité prix de la demande qui diffère significativement selon les caractéristiques des individus. Ceci a des implications au niveau de la discrimination par les prix et l'analyse du bien-être dans un contexte d'asymétrie d'information.

Abstract

An annuity is a financial product that provides its purchaser with a regular stream of payments lasting until death (benefits), in exchange for a one-time payment (premium). In most developed countries, observed take-up of such products is low, despite its use in mitigating longevity risk. We investigate causes for this low observed take-up in Canada. Specifically, we conduct a stated preference experiment in which respondents are asked to rate their chance of purchasing annuities under various scenarios. We use exogenous pricing variation to estimate price elasticity of demand. We also model heterogeneity in price elasticity. Our main findings are threefold. First, we estimate a price elasticity of demand of -0.58. Second, we find that lack of knowledge of annuities is pervasive and is important in explaining low annuity take-up. Third, we find significant heterogeneity in price elasticities. This has implications for price discrimination and welfare analysis in a context of asymmetric information.

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List of Acronyms

AEW Annuity Equivalent Wealth

CCHS Canadian Community Health Survey

CLHIA Canadian Life and Health Insurance Association

DB Defined Benefit

DC Defined Contribution

EPDV Expected Present Discounted Value

HIBP High Blood Pressure

HRS Health and Retirement Study

HS High School

LRIF Locked-In Retirement Income Fund

MWR Money's Worth Ratio

ON Ontario

RRIF Registered Retirement Income Fund

RRSP Registered Retirement Savings Plan

TFSA Tax-Free Savings Account

US United States

QC Quebec

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Introduction

In its simplest form, an annuity is a financial product that provides its purchaser with a regular stream of payments lasting until death (benefits), in exchange for a one-time payment (premium). Theoretically, such a product should be of great interest to consumers as it represents a way to insure against outliving one's savings. Furthermore, the return on annuities is often greater than that of other forms of fixed income such as government bonds. As life expectancy rises across the world, and people live a greater proportion of their life as retired persons, the appeal of such products should only increase.

In 1965, Menahem E. Yaari formally demonstrated that, under certain conditions, full annuitization of savings upon retirement would be optimal for a utility-maximizing consumer. Further theoretical work has confirmed this finding, and found that, even when relaxing several of Yaari's restrictive assumptions, partial annuitization remains widely optimal (Davidoff et al., 2005).

Given these theoretical findings, one would expect the market for annuities to be sizable. However, this is not the case. In most developed countries, the private market for annuities is relatively small (Milevsky and Shao, 2011; James and Song, 2001; Brown, 2007). There are numerous explanations for why this "puzzle" exists, most of which can be categorized as either behavioral or rational. The first explanations focus on the role of financial literacy, loss and regret aversion, mental accounting as well as various heuristics. The second deals with extending the original model of a utility-maximizing consumer by introducing such parameters as bequest motives, pre-existing annuitization, incomplete annuity markets, adverse selection and less than fair annuity pricing. A third possible

explanation is that individuals have never heard of annuities or have only very limited knowledge of them, making them unlikely to purchase such a product.

If less than fair annuity pricing is to be accepted as a major explanation for the puzzle, one must assume that consumers respond to variations in price. The importance of estimating price elasticity of demand has been stated explicitly by Jeffrey R. Brown:

"Regardless of the source of the price mark-up, however, the implicit assumption behind the belief that prices drive down annuity demand is that consumers are price sensitive, i.e., that they have a price elasticity of demand that is rather large (in absolute value). Perhaps surprisingly, we have relatively little in the way of empirical estimates about the price elasticity of demand for annuities" (Brown, 2007, p.12).

The main objective of this thesis is to provide such estimates of the price elasticity of demand for annuities.

In order to estimate such elasticities, we use a stated-preference experiment with 3000 Canadians. We vary prices exogenously and directly elicit choice probabilities. Annuity scenarios are presented to the individuals and we elicit the probability of buying each annuity according to the scenario presented to them. The scenarios vary by benefit level as well as by age at which the first payment is made. This age variation allows us to study deferred as well as immediate annuities. Deferred annuities are annuities whose benefits begin at a predetermined age rather than immediately. Studying these is important as, since longevity risk is most present at advanced ages, deferred annuities are able to insure against such risk at a lower cost. We also collect data on socio-demographic characteristics, which allows us to study various determinants of annuity demand as well as allowing for heterogeneity in price elasticity. A second contribution is to analyze the determinants of heterogeneity in the price elasticity of demand.

The stated-preference approach has both advantages and disadvantages (Diamond and Hausman, 1994; Louviere et al., 2000; Revelt and Train, 1998). We use a stated-preference approach for four main reasons. First, the thinness of annuity markets in

Canada means there is a dearth of data on real-life choices. Even if more data were available, prices faced by those who did not purchase annuities would be unknown, unlike when using survey data. Second, a revealed-preference experiment might be biased in that many Canadians are not aware of the existence of annuity products. In using data on only those who have purchased an annuity, a revealed-preference experiment would omit a significant number of potential annuitants. Third, since, in this context, we are not analyzing a public good, the incentive to answer strategically is less problematic. Fourth, as outlined in Manski (1999), the use of a probabilistic approach (0-100) instead of a binary choice approach (yes or no) enables us to gather information on the intensity of consumers' preferences. Indeed, since it is unrealistic to expect the respondent to know, with certainty, what they would do in each scenario, the probabilistic approach is appropriate. Furthermore, a priori assumptions about the distribution of responses or the process underlying the generation of these responses are not required using this method.

Estimating the price elasticity is also important for public policy. If the demand for annuities is found to be relatively elastic, and there is some form of market failure (ex. adverse selection), governments could consider encouraging their purchase with subsidies. Moreover, if certain groups of individuals were found to have significantly different price elasticities than others, a scenario in which price discrimination by firms would occur seems likely to emerge, thus negatively affecting consumer welfare.

The remainder of this thesis will be structured as follows: First, a review of the relevant literature will be presented. Second, we describe the Canadian annuity market. Third, the data and survey will be presented. Fourth, the methodology for obtaining the elasticity estimates will be outlined. Fifth, we present and comment upon our results. Finally, concluding remarks will be made and areas of further research suggested.

Literature Review

This section will first review theoretical insights on the value of annuities. Second, a review of various explanations for the annuity puzzle will be given. Third, focusing on the objective of this paper, we review the literature that have estimated price elasticity of demand.

1.1 The theoretical value of annuities

Yaari's 1965 paper, *Uncertain Lifetime, Life Insurance, and the Theory of the Consumer*, deals with the role of lifetime uncertainty in a consumer's retirement planning. Up to this point, the role of lifetime uncertainty had been largely ignored by economic theorists in their models. Yaari concentrates entirely on this issue and ignores other potential sources of uncertainty in order to demonstrate the optimal behavior of a consumer who chooses a consumption plan that maximizes utility under lifetime uncertainty. Yaari shows that the return on annuities will always be larger than that of a treasury note. Brown (2007) provides an intuitive explanation for this. Suppose the interest rate on a treasury note is 2% and an individual invests \$1,000 in such an asset, next period the consumer would have \$1,020. Now, with lifetime uncertainty, an individual has a non-zero probability of dying before next period. If the individual dies, the insurer who provides the annuity does not have to make an annuity payment. Let us say this probability is 1%. The annuity provider can therefore pay $\frac{\$1,020}{(1-0.01)} = \$1,030$ to the annuitant next period. Thus, the return on an annuity will be higher than that of a government bond or treasury note. The important conclusion reached by Yaari is that, in the absence of a bequest motive, an indi-

vidual should annuitize the totality of his savings. Since we assume the individual has no bequest motive and therefore reaps no utility from any assets he may leave as a bequest once he has passed, and since an annuity provides a greater return than regular notes or bonds, a consumer will always choose to annuitize the entirety of his wealth at retirement.

Many restrictive assumptions are made in Yaari's paper. These include the absence of forms of uncertainty other than those related to the date of death, the absence of bequest motives and the availability of actuarially fair annuities. Davidoff et al. (2005) relax many of these assumptions and find that, although full annuitization is no longer optimal, positive annuitization remains so. Davidoff et al. begin by demonstrating that annuities do not need to be actuarially fair in order for them to dominate other assets. In the absence of a bequest motive and with complete markets, all that is needed is for payouts from the annuity to be superior than that of conventional assets. They then show that the full-annuitization result survives even when the future is sub-divided into many periods with many different states possible in each. The authors then demonstrate that even illiquid or incomplete annuity markets do not reduce annuitization to zero. Bequest motives also do not eliminate the preference for annuitization. In most cases, it will lead individuals to simply divide their wealth into a portion that would be annuitized and used for their own consumption and another that would be set aside for a potential bequest and invested in another type of asset. Finally, Davidoff et al. simulate annuity valuation under a large set of parameters and find that, even in extreme cases annuity demand remains positive. This leads the authors to conclude that standard explanations cannot, on their own, explain the small size of the private annuity market. However, it is important to note that many consumers already benefit from partial-annuitization through various mandatory social security programs and for some of them it may not be optimal to further annuitize on the private market. Nevertheless, it is unlikely that this mandatory annuitization is the optimal level of annuitization for most consumers, especially those in middle to high income levels.

Scott (2007) as well as Gong and Webb (2007) present evidence on the value of deferred annuities. Deferred annuities are annuities in which payments do not start im-

mediately after purchase, but rather start at a predetermined future age. Both sets of authors show that, since longevity risk is most present at advanced ages, deferred annuities are able to insure against such risk at much lower cost than immediate annuities. Scott (2007) shows that, for a typical retired individual in the United States, allocating 10-15% of wealth to a deferred annuity bought at age 65 whose payouts begin at age 85 creates spending benefits¹ comparable to an immediate annuity allocation of 60% or more. Therefore it can be argued that such products should be even more attractive to consumers than immediate annuities.

The observed take-up of annuities (both immediate and deferred) on the private market in Canada is 6% according to James and Song (2001) and 11% among respondents to our survey. This suggests there is room for much more private annuitization. This low observed annuity demand stands in contrast to the theoretical results on annuities and is the basis of the annuity puzzle.

1.2 Explanations for the annuity puzzle

The main assumption in all theoretical explorations of why annuities are valuable to consumers is that the return on these assets is higher than that of other conventional assets that provide certain payouts, such as government bonds. If, because of adverse selection or high administrative costs, this were not to be the case, the negligible demand for annuities would be perfectly logical. Moving away from the theoretical framework on which the literature is built, we now explore the empirical reality of annuity markets by first exploring the evidence on annuity pricing.

Evidence on fairness of annuity pricing in the US, Canada and the UK is given by Mitchell (1999), Mitchell and McCarthy (2002), as well as Finkelstein and Poterba (2002). An actuarially fair annuity has a money's worth ratio (MWR) equal to one.

¹Amount of additional spending a typical consumer can enjoy.

Money's worth is defined as:

$$MWR = \frac{\text{Expected Net Present Value of Annuity Payouts}}{\text{Annuity Premium}} \quad (1.1)$$

Mitchell uses data on the annuities available in the private market, in the US in 1995, to construct money's worth ratios. She shows that money's worth ratios range from 0.80 to 0.85 for an individual chosen at random in the population, and between 0.90 and 0.94 for an individual chosen at random from those who purchase annuities. This means that for every dollar of annuity premium, the expected present discounted value of annuity payouts ranges from 0.8 to 0.94 dollars. One explanation for why MWR is higher for those who purchase annuities is that annuitants tend to live longer, which is suggestive of adverse selection. Mitchell and McCarthy compare money's worth ratios across developed countries and show that they generally range from 0.93 in the US to as high as 1.02 in Canada for annuitants and from 0.81 (US) to 0.93 (Canada) for non-annuitants. Finkelstein and Poterba find similar values for money's worth ratios based on administrative data in the United Kingdom. Evidence of adverse selection is also reported. In our context, adverse selection occurs if consumers, having more knowledge than annuity providers about their future health state, choose to buy annuities only when they believe they will live longer than the average consumer. Thus, the average annuitant would be longer-lived than the average non-annuitant. In both Finkelstein and Poterba (2002) and Finkelstein and Poterba (2000), evidence of adverse selection is presented as annuitants seem to be longer-lived than non-annuitants, individuals who buy "back-loaded" annuities (such as annuities where payouts are fixed in real terms but increase in nominal terms) are also more likely to live longer. Although this difference is suggestive of the effect of adverse selection, it is important to note that this does not seem to greatly affect the pricing of annuities, as most evidence points to money's worth ratios of around 0.9.

In light of this evidence, it does not seem as though annuities are a particularly "bad deal", with pricing very close to fair when accounting for the fact that annuitants are, on average, longer-lived than the general population. However, if consumers are very price sensitive, even small deviations from the actuarially fair price could cause annuity de-

mand to be significantly reduced.

Brown (2001) examines whether the life-cycle model proposed by Yaari is consistent with individuals' decisions by comparing their decisions to their annuity equivalent wealth (AEW). AEW represents the amount of additional wealth that individuals who access the annuity market would need to maintain the same utility level if annuity markets were to close. By using data from the Health and Retirement Study (HRS)², Brown finds that a one percentage point increase in annuity equivalent wealth leads to a 0.6089 percentage point increase in the probability of stating that one plans to annuitize their defined contribution accounts upon retirement. The results show that annuity equivalent wealth is correlated to annuitization decisions, suggesting that the theoretical model is helpful in explaining the annuity puzzle. Bütler and Teppa (2007) find that a 1 percentage point increase in the AEW is associated with a 1.57 percentage point increase in the annuitization rate. This confirms the importance of pricing in explaining at least part of the annuity puzzle. Simulation based papers such as Lockwood (2012), Purcal and Piggott (2008), Bommier and LeGrand (2014), Ameriks et al. (2011), and Davidoff et al. (2005) all demonstrate that bequest motives can significantly reduce annuity demand. In contrast, many empirical papers, such as Bütler and Teppa (2007), Brown (2001) and Brown et al. (2007), find bequests to have little to no influence. In light of this evidence, as well as the evidence presented previously on annuity pricing, it becomes clear that rational factors cannot fully explain the lack of annuitization observed in most developed economies.

A substantial literature examining the behavioral aspects of annuity demand has developed in response to the inconclusive evidence provided by purely rational explanations for low annuity demand. Brown et al. (2017) outline how complex the annuity purchase decision is. It requires knowledge of mortality rates, market returns, inflation as well as future expenditures and income. It can therefore be expected that consumers would not always value annuities in an optimal manner. They present hypothetical choices between a lump sum and social security annuity to consumers. In each case consumers own an annuity. The lump sum amount they would be willing to accept to give part of it up

²A longitudinal study that follows Americans over 50.

(sell scenario) or the amount they would be willing to accept in order to increase the annuity amount (buy scenario) is elicited. Brown et al. find that a significant portion of the population have annuity valuations that are inconsistent with optimizing behavior, no matter the possible parameter values and that such consumers are usually less educated than the population. They also find a large discrepancy in buy and sell valuations and that valuations are sensitive to anchoring³. For identical annuities, individuals are willing to sell annuities for a much higher price than they are willing to buy them. Also, individuals who were shown higher lump-sum amounts in the first scenario had higher annuity valuations than others, confirming the effect of anchoring. Beshears et al. (2014) elicit hypothetical annuity choices and show that framing and the illusion of control (or lack thereof) is important in determining whether consumers decide to annuitize or not. This means individuals feel they lack control when they own an annuity and are affected by the way annuities are marketed. Previtero (2014) demonstrates that individuals are affected by stock market returns in their annuitization decisions. He finds that a change from the 35th to the 75th percentile of the stock market distribution of the past 12 months reduces the probability of selecting an annuity by about 10.4 percentage points. Agnew et al. (2008) emphasize the role of framing by showing individuals a 5 minute slide-show before they are asked to make a hypothetical annuitization decision and find that individuals are significantly affected by the way in which information is presented to them. They also find women are significantly more risk averse and more likely to choose the annuity. Finally, Agarwal et al. (2009) present evidence showing that cognitive ability significantly declines as one reaches old age. Potential annuitants, being almost exclusively over 65 years of age, are therefore particularly vulnerable to poor financial decision making due to cognitive limitations.

³The tendency for individuals to put more weight, or overly rely, on the first piece of information they receive when making a decision.

1.3 Price elasticity estimates

This thesis takes into account both behavioral evidence and classic rational explanations to the annuity puzzle. The questionnaire used in the present study is designed to be able to, at least in part, examine such explanations. However, its focus remains on estimating price elasticity as this determines the extent to which potentially unfair annuity pricing affects demand. It is therefore necessary to provide an in-depth review of previous papers that have estimated the price elasticity of demand for annuities.

To our knowledge, five studies were identified that attempt to analyze price sensitivity of annuities, two of which are survey-based and three of which use a natural experiment with administrative data. In the following section, these papers will be analyzed in order for the reader to be able to discern the value of this new estimate as well as the context in which it inserts itself in the literature.

Brown et al. (2007) use survey data from the 2004 HRS in order to examine individuals' willingness to exchange part of their Social Security inflation-indexed annuity benefit for a lump sum payment. They ask the following question:

Imagine you are 65 years old, and you are receiving \$1,000 per month in Social Security benefits. Suppose you were given the choice to lower that benefit by half, to \$500 per month. This one-half benefit reduction will continue as long as you live. In return, you would be given a one-time, lump-sum payment of \$87,000. Would you take the \$1,000 monthly benefit for life or the lower monthly benefit with the lump-sum payment?

The \$87,000 represents the approximately actuarially fair value of the lump sum for a 50% reduction in the annuity benefit, assuming a 3% real interest rate. In this scenario, 59% of the 990 respondents prefer the lump sum. The authors highlight that this preliminary result implies pricing is most likely not the principal explanation for low annuity demand, as even when the annuity is fairly priced, a majority of individuals prefer the lump sum. The authors present two other scenarios to the survey respondents. To those

who responded that they wished to receive the full annuity benefit (39% of the respondents), the value of the lump sum was increased by 25% (to \$109,000). To those who responded they would prefer the lump sum, the lump sum amount was reduced by 25% (to \$65,000). The sample was thus divided into four groups, those that:

1. Always prefer the lump sum (37%)
2. Prefer the lump sum at \$87,000 but preferred the annuity over the \$65,000 lump sum (22%)
3. Prefer the annuity at \$87,000 but preferred the lump sum at \$109,000 (11%)
4. Always prefer the annuity (30%)

The price elasticity is estimated by observing the percentage of respondents who change their answer to the question (go from preferring the annuity to the lump sum and vice versa) when the lump sum amount is changed. Twenty-two percent indicate they initially preferred the lump sum but when the amount was reduced changed their minds (individuals in group 2), 11% only chose the lump sum once its value was augmented to \$109,000 (individuals in group 3). These figures can be used to compute price elasticity. Consider the *price* of an annuity to be the lump sum amount one is giving up in order to keep the full annuity benefit. A 25% price increase leads to an 11% decrease in demand. Indeed, when the price of the annuity went up to \$109,000, 11% of respondents switched to the lump sum from the annuity. The price elasticity is given by:

$$\frac{\% \Delta Q_d}{\% \Delta P} \quad (1.2)$$

This yields a price elasticity of demand of $\frac{-11}{25} = -0.44$. A 25% decrease in price leads to a 22% increase in annuity demand. When the price of the annuity went down to \$65,000, 22% of respondents switched to the annuity from the lump sum. Thus the elasticity here is of $\frac{22}{-25} = -0.88$.

Cappelletti et al. (2011) use a relatively similar approach to obtain an elasticity estimate. They use data from the Survey of Household Income and Wealth (SHIW), a

representative survey of the Italian population conducted by the Bank of Italy every two years. In the 2008 edition of the survey, a special module was added to study annuitization choices. Approximately 7,000 Italian heads of household completed this module. Specifically, they answered the following question:

Imagine you are 65 years old and receive a total pension income of 1,000 euros a month (adjusted for inflation). Would you be willing to give up half that pension for the whole of your old age in exchange for a lump sum of 60,000 euros to be paid immediately?

Those who preferred the annuity were then asked the same question with the lump sum increased to 80,000 euros. If they still preferred the annuity the lump sum amount was increased to 100,000 euros. The actuarially fair amount, that would leave an individual indifferent between the annuity and lump sum is 80,000 euros, assuming a 3% real interest rate. Similarly to Brown et al., Cappelletti et al. construct four categories depending on the answers given to the different scenarios presented to survey respondents. Specifically:

1. Always prefer the lump sum (18%)
2. Prefer the lump sum at 80,000 euros but prefer the annuity at 60,000 euros (13%)
3. Prefer the annuity at 80,000 euros but prefer the lump sum at 100,000 euros (29%)
4. Always prefer the annuity (40%)

A 33% ($\frac{80,000}{60,000} = 1.33$) decrease in price leads to a 13% increase in annuity demand, thus the elasticity for this price change is of $\frac{13}{-33} = -0.39$. A 20% ($\frac{100,000}{80,000} = 1.2$) increase in price leads to a 29% decrease in demand, the elasticity along this portion of the demand curve is of $\frac{-29}{20} = -1.45$. These results imply that demand is relatively elastic on the portion of the demand curve where the lump sum amount is more than actuarially fair whereas it is relatively inelastic on the portion of the demand curve where the lump sum amount is less than actuarially fair.

Chalmers and Reuter (2009) study the payout choices of 32,000 retirees covered by

the Oregon Public Employees Retirement System (PERS) between 1990 and 2012. Each retiree has to choose whether to receive higher annuity payments and no lump sum, or lower annuity payments and a lump sum. For the median retiree, the money's worth ratio of the annuity is 1.45, a figure much higher than in private annuity markets. Most individuals seem to understand this, as only 15% of them choose the lump sum option. The plausibly exogenous variation in prices comes from two sources. First, annuity benefits are calculated using three methods depending on whether the individual is covered by a defined-benefit (DB), defined-contribution (DC) or DCDB (mix of DC and DB) plan and the money's worth ratios of each is slightly different. The authors call this type of price variation "cross-sectional" variation. Second, since PERS offers retirees a risk-free rate of return of approximately 10% regardless of market conditions, variation over time in the risk-free rate offered on US treasuries generates variation in the relative value of PERS annuities (when the risk-free rate is lower, they offer comparatively more value and vice versa). This is considered "time-series" price variation. The authors estimate logit models in order to obtain the elasticity coefficient associated with cross-sectional variation in annuity pricing. Certain retirees are ineligible for specific types of retirement plans and face, on average, prices that are 11.1% higher. In these cases, demand for the annuity option is predicted to be 1.3 percentage points lower. This implies a price elasticity of demand of $\frac{-1.3}{11.1} = -0.12$. Interestingly, when the authors estimate time-series regressions, comparing the money's worth of PERS annuities with those offered on the private market, they find a positive price elasticity. A one-standard-deviation increase in the relative value of the PERS annuities is associated with a 2.5 percentage point increase in demand for the lump sum, one would expect the opposite result.

Direr and Ennajar-Sayadi (2016) use administrative data from a large insurance company and a French regulatory reform to estimate the price elasticity of demand for annuities. As part of the French pension system, savings can be converted into an annuity between the ages of 55 and 75. These types of contracts are mostly used by self-employed members of the population as these individuals are not covered by corporate pensions and receive less income from state pension programs than wage-earners. The annuity is calcu-

lated so as to be actuarially fair, using official mortality tables provided by the government and an assumed interest rate of 1.5%. Mortality tables are updated approximately every 5-10 years by the government. Direr and Ennajar-Sayadi concentrate on the 2007 regulatory reform. The main impact of this reform was to produce mortality tables by gender, as well as updating longevity. Previous tables were unisex and based on female mortality. In concrete terms, this reform had a neutral effect on men (the increase in life expectancy from the past tables was cancelled out by the fact that men were now counted separately) and had a negative effect on women (they only experience the effect of increased life expectancy). For example, the conversion rate⁴ for women fell from 5% to 4.5% whereas it remained approximately the same for men. Using data on approximately 8,000 subscriptions provided by a large insurer, the authors analyze the effects of the reform. Six months prior to the reform coming into effect, a subscription peak is observed for both men and women (seven and five-fold increase, respectively). The female peak is easily explained by the relative appeal of the older mortality tables, but the men seem confused by the effect of the reform. This confirms the finding that annuities are a complex product that are not easily understood by the layperson. The authors utilize a differences-in-differences design, making the assumption that male and female demand would have remained parallel over time without the reform. They estimate the variation in female subscriptions attributable to the reform to be -14.6% for the first two years following the change in mortality tables. The average decrease in conversion rate is 9.74% for women, meaning the price of an annuity increases by 9.74%. Price elasticity of demand is thus $\frac{-14.6}{9.74} = -1.5$.

Bütler et al. (2013) use data from four large Swiss insurance companies, covering 10% of the workforce, to estimate the impact of an increase in price on annuity demand. As part of the Swiss pension system, individuals who accumulate capital in a certain type of account may withdraw this amount either as a lump sum or an annuity (or a mix of the two) upon retirement. Capital (K) is converted into a yearly nominal annuity benefit

⁴The rate at which the premium is converted into annual annuity payments. For example, a rate of 5% would yield yearly benefits of \$5,000 for a \$100,000 premium.

(B) using the following formula $B = \gamma \times K$ where γ represents the conversion rate (7.1% on average). It is important to note that only those earning more than 75,960 CHF can take advantage of this particularity of the Swiss pension system. Also of note is that employers choose the insurers that provide the annuities. The only choice employees have is whether or not to annuitize. At the beginning of 2004, 4 large insurers reduced their conversion rates. The authors characterize this price variation as exogenous for two reasons. First, since employees cannot choose their insurers, it was virtually impossible for them to avoid a loss in annuity value. Second, there was no public discussion of a potential reduction in conversion rates prior to the announcement by the insurers. Similarly to Direr and Ennajar-Sayadi, Bütler et al. estimate a differences-in-differences model. Their control group is represented by clients of a large insurance company that reduced their conversion rate later and more gradually (in 2005) than the other four. The control group was made up of approximately 9,000 men and the treatment group of approximately 6,000 men. Once again, the identifying assumption is that the trend in annuitization rates would have remained the same in each group, controlling for certain observable characteristics. The authors estimate a large price elasticity. The conversion rate decreases by 8% on average while the propensity to annuitize among those affected is reduced by 16.8 percentage points. The price elasticity of demand in this case is $\frac{-16.8}{8} = -2.1$.

Table 1.1 presents the different elasticity estimates arrived at in the papers that have just been reviewed. One observes that the range of estimates is quite large, from -0.12 to -2.1 depending on the paper. One also observes that two methodologies are used, either a survey based approach or an approach based on a natural experiment and an administrative dataset.

Table 1.1: Elasticity Estimates

Paper	Methodology	Estimate range
<i>Brown et al. (2007)</i>	Survey	-0.44 to -0.88
<i>Bütler et al. (2013)</i>	Natural experiment	-2.1
<i>Cappelletti et al. (2011)</i>	Survey	-0.39 to -1.45
<i>Chalmers and Reuter (2009)</i>	Natural experiment	-0.12
<i>Direr and Ennajar-Sayadi (2016)</i>	Natural experiment	-1.5

Both methodologies contain significant drawbacks. In all the papers reviewed that utilize administrative data, there is a large degree of self-selection, as none of the samples are representative of the population as a whole. Furthermore, much socio-demographic data and data on risk-aversion, bequest motives or financial literacy is missing from this type of analysis and is therefore not controlled for in the estimates. Also, in natural experiments, one cannot control for the market context. The Swiss annuity market is different than the Canadian one, in that many Swiss pensioners face a choice between annuities and lump-sums upon retirement, a decision most Canadians are not explicitly asked to make. This may render elasticity estimates less comparable between countries. A survey can address these drawbacks by placing respondents in a relatively neutral setting and asking respondents to answer questions that provide the researcher with more controls. However, the major disadvantage of the survey approach is that the choices made by respondents may not reflect those they would make in a real life setting. Although this paper will address most of these methodological issues, the setting remains hypothetical, even though an effort has been made to present respondents with scenarios that are as close to reality as possible.

Chapter 2

The Canadian Annuity Market

Having reviewed the relevant literature, we now focus our attention on reviewing the relevant elements of the Canadian annuity market. First, we study the different forms an annuity can take. Second, we examine the regulatory framework for annuities in Canada. Third, the size of the market is detailed. Fourth, pricing of annuities is analyzed.

There exist several types of life annuities. Immediate life annuities provide a constant stream of benefits, starting one period after purchase, for the remainder of one's life. This is the most common type of annuity purchased on the private market. Deferred annuities are similar but with payouts beginning many periods after purchase. Joint life annuities provide payouts until both spouses have passed away. Finally, guaranteed life annuities guarantee payments for a certain number of years, regardless of if the individual is alive.

In Canada, as in many other countries, annuities can be acquired using either registered¹ or non-registered funds. Milevsky and Shao (2011) provide an overview of the implications of each. If one purchases an annuity from a registered fund, the income, having not yet been subject to taxation, is treated as regular income and taxed in the year one receives it. If, on the other hand, the annuity is purchased using non-registered funds, the tax treatment depends on whether the annuity is prescribed or not. For the annuity to be prescribed, the annuity benefit must be level (payments are the same every period) and

¹Ex. Registered Retirement Savings Plan (RRSP), Registered Retirement Income Fund (RRIF), Locked-In Retirement Income Fund (LRIF)

owned by the same individual who receives the benefits. Non-prescribed annuities are held by individuals wishing to have non-level annuity benefits (payments may vary each period) or whose annuity is purchased by a corporation. For prescribed annuities, the total interest expected to be earned is spread evenly over all periods and taxed in each. For non-prescribed annuities, taxation is subject to accrual and therefore less advantageous. In this paper, we focus on prescribed annuities, as this is the most tax advantageous type of annuity, as well as its simplest form.

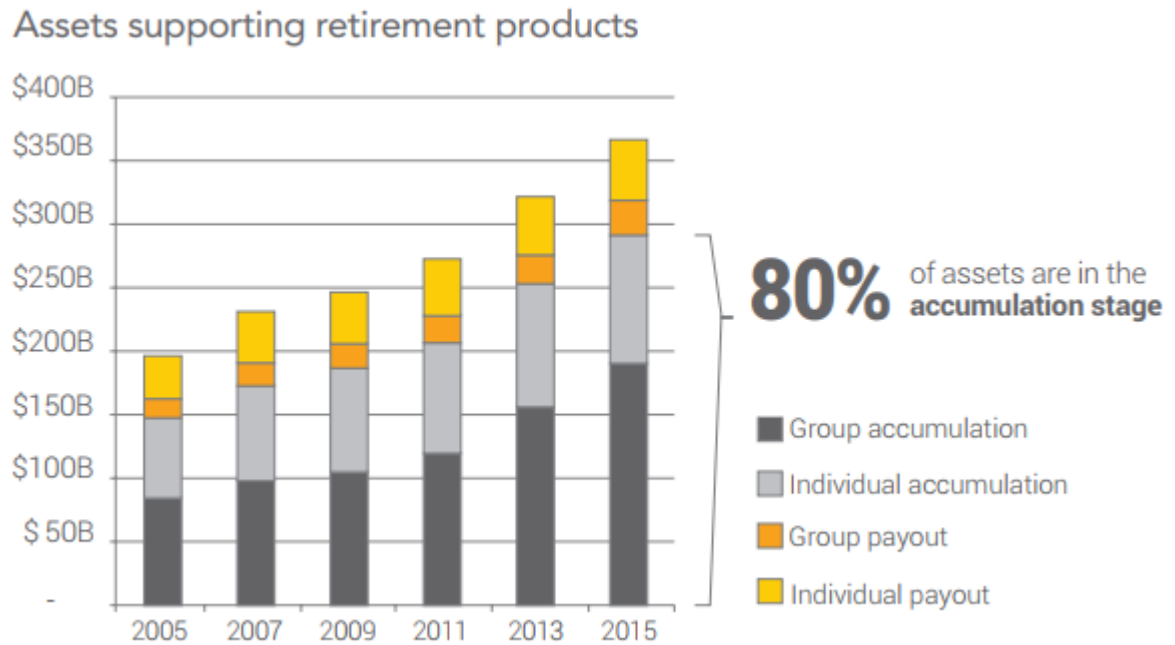
The overall "annuity" market is quite large in Canada. The Canadian Life and Health Insurance Association (CLHIA) estimates that, in 2015, annuity premiums accounted for \$ 45 billion in premiums, more than twice the amount for life insurance (CLHIA, 2016). However, this amount includes "accumulating annuities" such as RRSPs, TFSAs, pension plans and non-registered funds during the savings stage. Only a small portion of the \$45 billion can be considered annuities by the definition considered here². In fact, James and Song (2001) estimate that immediate life annuities represent only 6% of the total premium amount for annuities in Canada, a figure similar to that of the US. This is confirmed in figure 2.1, showing that only a very small proportion of assets supporting retirement products are in the form of individual payouts.

James and Song highlight that only in countries where annuitization on the private market of retirement savings is, at least in part, mandatory are annuity markets more developed. Even then, annuitization rates seem to generally hover around 30%. In Canada, some annuitization is mandatory. This is done through the Canada Pension Plans or its Quebec equivalent (Quebec Pension Plan), which are publicly provided plans to which all working Canadians contribute. Annuitization on the private market is not mandatory. Around 24% of employed men and 33% of employed women are covered by a defined-benefit (DB) pension plan (Drolet and Morissette, 2014). This still leaves much room for annuitization on the private market in Canada, as all those who are not enrolled in a DB plan or who do not rely solely on government transfers at retirement³ could be expected

²Immediate life annuities

³To give an idea of the size of this group, approximately 14% of Canadians live at or below the poverty line, according to the latest StatCan estimate: <http://www5.statcan.gc.ca/cansim/a26?lang=eng&id=2060042>

Figure 2.1: Size of the annuity market (individual payouts) in Canada (CLHIA, 2016)



to want to annuitize on the private market. Out of the countries studied, Chile has the highest annuitization rate at 50%. Chileans are encouraged to drawdown their retirement savings in the form of an annuity by various incentives, such as the possibility to retire early when one chooses to annuitize. In our survey of 55 to 75 year old Canadians, 11% stated they had purchased an immediate life annuity in the private market. This confirms the finding that the Canadian annuity market, much like other annuity markets around the world, is quite small relative to the size one could expect it to have.

In Canada, detailed annuity pricing information is provided by CANNEX. Pricing data was collected from June to September 2017 from the CANNEX database. Sixty-five year old Canadians can buy annuities from nine different insurance companies. Over the period ranging from when access to data was given until the time of writing, the average monthly benefit associated with a \$100,000 premium for an immediate life annuity was \$508 for 65 year old males and \$463 for females. For the same contract, a 75 year old male would receive an average of \$652 and a female would receive \$600. Of note

is that this amount is not affected by the province of residence of the annuitant. There is also little price variation across insurance companies. In any given month, the spread between the highest and lowest benefit ranged from \$41 to \$32, only about 7% of the average benefit, for men. For women, this figure was slightly smaller at approximately 6%. This rather limited spread could be indicative of strong competition. Further evidence supporting this hypothesis would emerge if it were found that money's worth ratios were close to 1, as this would imply insurers are simply satisfying the zero-profit condition, or obtaining profits in other ways than with annuity premiums (ex. through their investment activities).

It is therefore worthwhile to explore the money's worth of annuities in Canada, not only to explain the annuity puzzle, but also to explore the competitive dynamics of the Canadian annuity market. As we know from equation 1.1 the money's worth ratio of an annuity is the expected present discounted value of benefits received (EPDV) divided by the premium paid. The following formula yields the expected present discounted value for a 65 year old who is expected to live no longer than 110 years⁴:

$$EPDV = \sum_{t=1}^{45} (\beta \times \rho_t \times \delta^t) \quad (2.1)$$

$$\text{Where: } \delta = \frac{1}{(1+r)} \quad (2.2)$$

β represents the annual annuity benefit, ρ_t is the probability of being alive in period t , δ^t is the discount rate in period t and r is the real interest rate. Survival probabilities ρ are calculated directly from the most recent publicly available StatCan life tables⁵, which cover the period from 2009-2011. The assumption is made that no one lives past the age of 110, which is consistent with the life tables provided by Statistics Canada. The real interest rate, r , is set at 2%, which seems like a realistic proposition given the current yield on a 10 year Canadian government bond is approximately 2%⁶. This is also consistent with the literature as Mitchell (1999) also uses treasury bond yields as her measure for

⁴110 – 65 = 45 periods

⁵<http://www.statcan.gc.ca/pub/84-537-x/84-537-x2013005-eng.htm>

⁶<http://www.bankofcanada.ca/rates/interest-rates/canadian-bonds/>

real interest rates. Using the above formulas and parameters, we obtain money's worth ratios of 0.91 and 0.92 for men and women, respectively.

These figures are comparable to those found in Mitchell (1999) and provide additional credence to the argument that pricing is not the main reason for the small size of the private voluntary annuity market in Canada, unless demand is very price elastic. Furthermore, it points to a relatively competitive market structure as, unless administrative costs and adverse selection are minimal to non-existent, such a high money's worth ratio does not leave much room for high profit margins on annuities. Since we know there does seem to be evidence of adverse selection in annuity markets (Mitchell, 1999; Brown et al., 2007; Einav et al., 2010; Finkelstein and Poterba, 2002, 2000) it seems plausible that insurers have very low profit margins for their annuity products, adding to the puzzle of why consumers do not further annuitize given evidence of relatively fair pricing. Very elastic demand could provide part of the explanation. The remainder of this paper focuses on the process, results and implications of estimating price elasticity of demand for annuities.

Chapter 3

Survey and Data

3.1 Questionnaire and survey methodology

As outlined previously, two methods can be used when one wants to obtain an estimate for the price elasticity of demand for annuities. The first is a natural experiment, where the exogenous price variation usually comes from a change in the regulatory environment. The second is by surveying individuals' willingness to buy the product at different price levels. This second method is the one we use. This type of survey having never, to our knowledge, been conducted in Canada, we partnered with AskingCanadians in order to field a survey and conduct our experiment.

AskingCanadians is a marketing research firm that designs and implements online surveys. Members of AskingCanadians' panel answer surveys for which they receive points they can redeem through various loyalty programs¹. In June 2017, 3000 randomly chosen Canadians between the ages of 55 and 75 living in British Columbia, Ontario or Québec (1/3 from each province) answered the survey. We made sure half of respondents come from the metropolitan areas of Vancouver, Toronto and Montreal. This was included as a sub-component of the survey focused on housing and insurance products aimed to extract home equity to finance current spending. The age range is selected to represent the age at

¹ Aeroplan, Petro-Points, Hudson's Bay, Via Rail.

which most would be considering purchasing an annuity. Owing, possibly, to the fact that this survey excluded those Canadians who do not have internet access, it is not perfectly representative of the Canadian population. This is mostly seen in the educational attainment of respondents, who are generally more educated than the population as a whole, as seen in table 3.1. The divergence emerges especially in the tails of the distribution as there are less very poorly educated (less than high school) and more highly educated (university) individuals in the survey. Our survey also includes more individuals who live in metropolitan areas than a perfectly representative sample would.

Table 3.1: Education: Canadian population vs. Survey participants

	Population²	Survey
Highest level		
<i>Less than High School</i>	26.27	3.4
<i>High School</i>	31.93	21.2
<i>College, Cegep, or trade</i>	17.17	29.8
<i>University</i>	24.64	45.58

Notes. This table presents the education of survey respondents versus that of the Canadian population.

Since very poorly educated Canadians (those with less than a high school degree) are also likely to earn, on average, much less than their more educated peers and are much more likely to depend on government funds for their income (Uppal, 2017), they are much less likely to buy an annuity on the private market. Firstly, because they may not have enough savings accumulated to do so. Secondly, because the pension that will be provided to them by government programs will likely constitute most of their late-life income and be sufficient for them to maintain their pre-retirement standard of living. For these reasons, the relative lack of poorly educated Canadians in the survey is not of great concern as they would, in any case, be very unlikely to buy an annuity. Nevertheless, we stratify by age, gender, province and education³ and re-weigh the data using the 2010 Canadian

²Data is from the 2010 Canadian Community Health Survey (CCHS).

³4 categories: less than HS, HS, college, university.

Community Health Survey (CCHS), a nationally representative survey.

The questionnaire is composed of 7 sections⁴. The first section asks respondents to answer questions regarding their socio-demographic background. For example, education, income, health, marital status, number of children, retirement status and pension plan information. The second section focuses on risk perception. Examples of information obtained from this section include: bequest motives, perception of chances of living to 85, risk-aversion and the role of family in retirement. In the third section, financial literacy and knowledge are evaluated. We test whether respondents understand various concepts such as: compound interest, inflation and probabilities. Section 4 focuses on annuities, evaluating respondents' knowledge of annuities. The final section of interest presents scenarios to individuals in which they are asked to evaluate, on a scale of 0-100, the probability of buying the annuity product presented to them. The final two sections evaluate respondents' knowledge of reverse mortgages and present scenarios for these. In the final section of interest, individuals are first shown this introductory text:

*We are going to show you some simple annuities and ask you to rate them.
You can assume that the institution offering the annuity will pay the monthly
benefit no matter the circumstances. Once you pay the premium, you receive
monthly benefits and have nothing else to pay.*

Each product has two attributes:

- a) a premium you have to pay;*
- b) a monthly benefit starting at a given age and lasting until death.*

The benefit is adjusted for inflation (indexed).

They are then asked:

⁴The full questionnaire can be found in the appendix

What are the chances, 0% meaning no chance and 100% meaning for sure, that you would purchase this product if it were offered to you by [a trusted / an] insurance company within the next year?

Where, for 50% of individuals, the word "trusted" was included and for the remaining 50% the word "trusted" did not appear. This is done to test the importance of behavioral factors in decision making. By varying the use of the word "trusted" we are able to study the impact of framing on the annuity purchase decision.

Each scenario is presented in the following manner to the individual:

When you buy the annuity	Starting at age α
You pay π	You receive β per month until death, indexed annually for inflation

Where π represents the premium amount, α represents the age at which the benefits come into force and β the monthly benefit.

Each individual is presented with five scenarios. These scenarios are randomized on three levels: The age at which the first benefit is paid (α), the monthly benefit (β) and the load (τ) on the annuity premium. These values are randomized in the following way:

$$\alpha = [(age + 1), 75, 85] \text{ with probability } [2/5, 2/5, 1/5]$$

where $age + 1 = \text{the age of the respondent} + 1$

$$\beta = [\$200, \$600, \$1,000] \text{ each with probability } 1/3$$

$$\tau = [0.5(0.1)2.0] \text{ each with probability } 1/6$$

By varying the age, we are able to study both immediate and deferred annuities. All else equal, the variation in τ provides the exogenous price variation necessary to estimate price elasticity of demand.

π is obtained using the following formula:

$$\pi = \pi_p \times \tau \quad (3.1)$$

Where π_p is the actuarially fair annuity premium. The expected present discounted value of the annual income A multiplied by survival probability ρ and the appropriate discount factor δ , returns the actuarially fair premium π_p .

$$\pi_p = \sum_{t=1}^{110-a} (A \times \rho \times \delta) \quad (3.2)$$

where a represents the age at which annuity payouts begin, and

$$\delta = \frac{1}{(1+r)^t} \quad (3.3)$$

$$A = \beta \times 12 \quad (3.4)$$

We use the same assumptions regarding survival probabilities (ρ) and interest rates (r) as those used to calculate money's worth ratios. We also use the same most recent publicly available Statistics Canada life tables. Setting the monthly annuity benefits at \$200, \$600 and \$1000 (\$2,400, \$7,200, \$12,000 annually), we obtain the actuarially fair annuity premiums in table 3.2. These premiums, multiplied by τ and rounded to the nearest \$500 give the premium, π , shown to respondents. Given values for π , β and α the individuals are able to express their preferences regarding each product that is presented to them, stating on a scale of 0-100 the chance of them purchasing such a product.

Table 3.2: Actuarially fair annuity premiums (benefit in \$ per month)

If annuity starts at age+1

Benefit = 200			Benefit = 600			Benefit = 1000		
Age	Male	Female	Age	Male	Female	Age	Male	Female
55-59	45,111.40	49,890.91	55-59	135,334.20	149,672.72	55-59	225,557.00	249,454.53
60-64	38,942.44	43,719.50	60-64	116,827.32	131,158.51	60-64	194,712.20	218,597.52
65-69	32,755.36	37,352.10	65-69	98,266.07	112,056.30	65-69	163,776.79	186,760.50
70-75	26,135.90	30,292.54	70-75	78,407.71	90,877.61	70-75	130,679.51	151,462.69

If annuity starts at 75

Benefit = 200			Benefit = 600			Benefit = 1000		
Age	Male	Female	Age	Male	Female	Age	Male	Female
55-59	13,691.16	17,442.92	55-59	41,073.47	52,328.77	55-59	68,455.79	87,214.61
60-64	15,677.30	19,700.10	60-64	47,031.89	59,100.30	60-64	78,386.48	98,500.51
65-69	18,361.54	22,559.95	65-69	55,084.62	67,679.85	65-69	91,807.70	112,799.74
70-75	22,467.80	26,560.34	70-75	67,403.40	79,681.01	70-75	112,339.00	132,801.69

If annuity starts at 85

Benefit = 200			Benefit = 600			Benefit = 1000		
Age	Male	Female	Age	Male	Female	Age	Male	Female
55-59	3,912.57	5,959.01	55-59	11,737.70	17,877.03	55-59	19,562.83	29,795.06
60-64	4,480.15	6,730.13	60-64	13,440.45	20,190.39	60-64	22,400.75	33,650.65
65-69	5,247.24	7,707.14	65-69	15,741.71	23,121.41	65-69	26,236.18	38,535.69
70-75	6,535.00	9,210.44	70-75	19,605.01	27,631.32	70-75	32,675.02	46,052.19

Notes. This table presents the actuarially fair premiums for each benefit level and age.

3.2 Descriptive statistics

Table 3.3 presents the main results from the annuity section of the questionnaire. 11% of respondents have at least one annuity, consistent with the observation that annuities are not a popular financial product. Perhaps surprisingly, less than 30% of annuitants purport to have "a lot" of knowledge of them. Although this figure is nearly double that among non-annuitants, it is worrisome that over 70% of those with an annuity have little to no knowledge of the product they own, only about 10% less than non-annuitants. Interestingly, only a relatively low proportion (21%) of annuitants actually searched themselves for one, with most coming to own one because it was offered to them. Among those who do not own an annuity, the most popular reason for not owning one is believing that one does not need it. This affirmation runs contrary to economic theory, which implies that almost everyone would benefit from at least partially annuitizing their savings. Another explanation could be that these individuals have defined-benefit pension plans, which already provide an annuity for retirement. The second most popular reason, never being offered one or having thought about it, seems to imply such products are not marketed very aggressively by insurance companies. This would be consistent with the finding that margins are low on such products and therefore insurance companies have little incentive to market them aggressively. A significant portion (17%) of individuals state they do not have sufficient savings to buy an annuity. This category corresponds to individuals with very low income who are not expected to need or want to annuitize. In fact, around 23% of respondents do not have enough in accumulated retirement savings to buy any of the annuity products presented. A significant portion of individuals (9%) judge annuities to be bad value for their money. We also asked respondents who owned an annuity to provide the premium they paid and benefit they obtained. However, 30% stated having paid a premium under \$1,000 and 50% stated having paid less than \$10,000. As it is virtually impossible to purchase an annuity at these prices, it is clear respondents are not very familiar with them. Furthermore, 10% of respondents reported benefits associated

with their annuity of \$5,000 per month, a more realistic figure would be a maximum of \$1,000. We therefore do not include these results in table 3.3. These results also cast doubt on the accuracy of other responses provided, notably that of owning an annuity or not. One would expect owners of an annuity to be able to correctly recall the premium they paid and the monthly benefit they receive. It is possible individuals confused participating annuities (such as employer provided pension plans) with individual annuities.

Table 3.3: Annuities and annuity knowledge

No Annuity		Annuity	
Fraction (%)	77.98	Fraction (%)	10.65
Knowledge of annuities (%)		Knowledge of annuities (%)	
<i>A lot</i>	12.36	<i>A lot</i>	27.67
<i>A little</i>	62.93	<i>A little</i>	65.76
<i>None at all</i>	24.71	<i>None at all</i>	6.57
Why don't you have an annuity? (%)		How did you come to purchase annuity? (%)	
<i>Never offered or thought about</i>	19.71	<i>Offered</i>	67.39
<i>Not yet made decision</i>	9.43	<i>Searched myself</i>	21.24
<i>Don't have sufficient savings</i>	17.36	<i>Other</i>	11.37
<i>Bad value for money</i>	9.19		
<i>Doesn't cover my needs</i>	8.6		
<i>No need</i>	21.28		
<i>Don't know what it is</i>	9.01		
<i>Other</i>	5.42		

Notes. This table presents weighted descriptive statistics in regards to survey respondents' annuity knowledge .

As shown in table 3.4, demographically, it seems there are a few salient differences between annuitants and non-annuitants. They have approximately the same education levels, are slightly more likely to be married and to have children, and have similar median income levels. Annuitants do have higher median savings, which is consistent with the fact that purchasing an annuity requires a significant amount of accumulated savings. Nevertheless, the mean projected income at retirement is only slightly higher among annuitants. Unsurprisingly, those with annuities are more likely to be retired. Interestingly,

annuitants are also much more likely to contribute to an employer provided pension plan. Perhaps this is what allows them to accumulate greater savings, given almost identical median household incomes.

Table 3.4: Demographics

No Annuity		Annuity	
Province of residence (%)		Province of residence (%)	
<i>BC</i>	18.58	<i>BC</i>	17.74
<i>Ontario</i>	50.38	<i>Ontario</i>	31.62
<i>Quebec</i>	31.04	<i>Quebec</i>	50.64
Education (%)		Education (%)	
<i>Less than HS</i>	23.95	<i>Less than HS</i>	19.2
<i>HS</i>	31.5	<i>HS</i>	36.32
<i>Trade certificate or diploma</i>	4.46	<i>Trade certificate or diploma</i>	4.27
<i>College or Cegep</i>	13.46	<i>College or Cegep</i>	13.94
<i>Some Undergraduate</i>	4.74	<i>Some Undergraduate</i>	5.3
<i>Undergraduate</i>	13.37	<i>Undergraduate</i>	12.21
<i>Graduate</i>	8.51	<i>Graduate</i>	8.77
Marital status (%)		Marital status (%)	
<i>Married</i>	51.77	<i>Married</i>	66.09
<i>Common-law</i>	12.01	<i>Common-law</i>	8.83
<i>Widowed</i>	7.19	<i>Widowed</i>	5.01
<i>Separated</i>	3.19	<i>Separated</i>	1.44
<i>Divorced</i>	13.44	<i>Divorced</i>	8.8
<i>Single, never married</i>	12.4	<i>Single, never married</i>	9.84
Children		Children	
<i>Proportion who have children (%)</i>	72.56	<i>Proportion who have children (%)</i>	78.73
<i>Mean # of children</i>	1.58	<i>Mean # of children</i>	1.78
Income		Income	
<i>Mean household total income</i>	\$ 91,729	<i>Mean household total income</i>	\$ 86,649
<i>Median household total income</i>	\$ 60,000	<i>Median household total income</i>	\$ 63,000
<i>Mean household total savings</i>	\$ 265,916	<i>Mean household total savings</i>	\$ 223,482
<i>Median household total savings</i>	\$ 72,000	<i>Median household total savings</i>	\$ 100,000
Retirement		Retirement	
<i>Retired (%)</i>	63.66	<i>Retired (%)</i>	74.31
<i>Mean projected income at retirement (% of current)</i>	56.71	<i>Mean projected income at retirement (% of current)</i>	58.86
<i>Employer provided pension plan (%)</i>	48.88	<i>Employer provided pension plan (%)</i>	63.43

Notes. This table presents weighted descriptive statistics of demographic variables from our survey.

According to economic theory, longer-lived individuals should value annuities more than individuals who die early. As seen in table 3.5, annuitants in our study report a

perceived probability of living to at least 85 years that is higher, by about 3 percentage points on average, than non-annuitants. This is suggestive of a certain degree of adverse selection in annuity markets. Bequest motives are also thought to be an important factor in annuitization. Indeed, individuals who are more likely to leave a large bequest should, in theory, be less interested in annuitizing. In our data, this relation does not seem to hold, as individuals who own an annuity are more likely to express the intention to leave a bequest greater than \$10,000. Theory also states that more risk averse individuals should gain more utility from annuities than those who are less risk averse. Interestingly, individuals who own an annuity seem to be somewhat less risk averse. This is seen mostly in the proportion who state they are willing to take absolutely no financial risk. Hence, some of these patterns run contrary to theoretical predictions.

Table 3.5: Variables affecting annuity demand

No Annuity		Annuity	
Mean perceived probability of living to 85	68.7	Mean perceived probability of living to 85	71.59
Intention to leave bequest >10k	75.87	Intention to leave bequest >10k	85.46
Financial risk willing to take (%)		Financial risk willing to take (%)	
Substantial	2.68	Substantial	1.89
Above average	9.15	Above average	10.26
Average	44.74	Average	52.55
Under average	12.52	Under average	16.53
No risk	30.92	No risk	18.79

Notes. This table presents weighted descriptive statistics of variables known to affect annuity demand present in our survey.

Table 3.6 presents mean reported probabilities of buying an annuity for each combination of load factor and benefit, depending on whether the individuals saw the word "trusted" in the preamble. It also presents elasticities along a selection of arcs. Elasticities are calculated using the following formula, since the load is already expressed as a

percentage:

$$E_p = \frac{(p_i - p_1)}{p_1} \times \frac{1}{(\tau_i - 1)} \quad (3.5)$$

Where p_1 represents the mean probability of purchase at a load of 1 and p_i represents the mean probability of purchase at load τ_i for any given benefit.

As one would expect, demand is downward sloping overall, with average purchase probabilities of 18-35% for products with loads of 0.5, 13-20% for actuarially fair annuities and 6-11% for loads of 2. Overall mean probabilities, no matter the load, are around 13%. Interestingly, there is about a 1-4% difference in the mean probabilities between individuals who saw the word "trusted" and those that did not. This difference is statistically significant at the 0.001% level. This result confirms the importance of framing when presenting annuities to consumers. This result is similar to Agnew et al. (2008)'s finding, in that when annuities are presented in a more positive light, demand increases.

Elasticities are generally negative and relatively inelastic ($| < 1 |$) with average elasticity along the arcs studied ranging from -0.23 to -1.03. The largest elasticity, in absolute terms, is found along the 1 to 1.5 arc, whereas the smallest one is from 1 to 0.6. The benefit level seems to matter in our elasticity estimates. As illustrated in figure 3.1, demand at a benefit level of \$200 per month is more inelastic (steeper) than at the other two benefit levels. Figure 3.2 contrasts demand curves for those who saw the word "trusted" and those who did not. Demand shifts to the right (increases) when the word trusted is used and is slightly more elastic. This illustrates the result of a statistically significant increase in demand when the word "trusted" is used in the preamble to the scenarios presented to respondents.

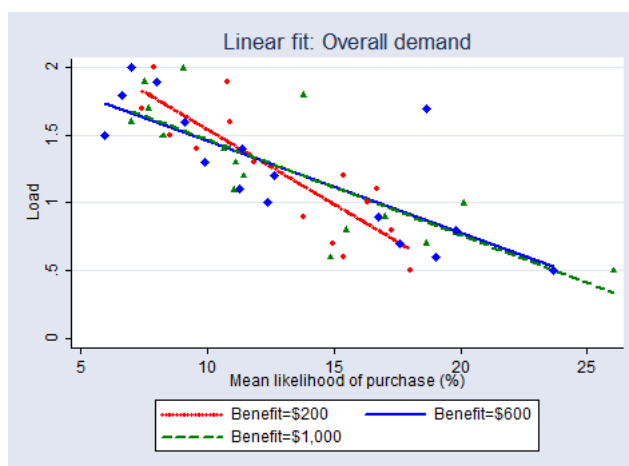
Table 3.6: Mean probability of purchase and elasticities

Overall				"Trusted"				No "trusted"			
	Ben=200	Ben=600	Ben=1000		Ben=200	Ben=600	Ben=1000		Ben=200	Ben=600	Ben=1000
Load factor	Mean			Load factor	Mean			Load factor	Mean		
0.50	18.02	23.65	26.05	0.50	25.98	26.44	34.39	0.50	11.31	21.97	18.37
0.60	15.39	19.01	14.83	0.60	17.26	22.46	14.97	0.60	14.14	13.20	14.68
0.70	14.97	17.60	18.66	0.70	11.26	21.13	21.28	0.70	17.59	13.38	15.33
0.80	17.26	19.83	15.48	0.80	14.98	22.75	18.30	0.80	19.44	17.43	11.94
0.90	13.79	16.76	17.00	0.90	16.09	18.47	16.99	0.90	11.59	14.96	17.00
1.00	16.32	12.35	20.12	1.00	13.71	11.10	23.08	1.00	19.21	13.42	15.08
1.10	16.70	11.25	11.05	1.10	16.39	17.13	12.60	1.10	16.98	7.10	9.93
1.20	15.37	12.66	11.44	1.20	12.69	15.48	13.18	1.20	18.64	8.90	10.28
1.30	11.85	9.90	11.12	1.30	14.21	12.95	7.72	1.30	9.63	7.41	14.05
1.40	9.59	11.36	10.62	1.40	10.07	10.25	9.17	1.40	9.12	12.85	11.66
1.50	8.55	5.95	8.23	1.50	7.94	5.36	8.91	1.50	9.18	6.62	7.84
1.60	10.88	9.08	6.99	1.60	9.58	7.08	9.28	1.60	11.93	11.29	5.04
1.70	7.42	18.67	7.69	1.70	8.54	21.05	9.40	1.70	6.18	15.66	6.10
1.80	7.71	6.65	13.82	1.80	9.10	8.80	18.75	1.80	5.66	4.73	7.80
1.90	10.80	7.97	7.51	1.90	12.92	5.61	9.88	1.90	8.83	10.84	5.36
2.00	7.90	6.97	9.04	2.00	5.91	7.23	10.04	2.00	9.46	6.74	8.13
Total	12.80	13.24	13.08	Total	12.95	14.68	15.28	Total	12.66	11.77	11.00

Segment	Elasticities			Segment	Elasticities			Segment	Elasticities			Average
<i>1 to 0.5</i>	-0.21	-1.83	-0.59	<i>1 to 0.5</i>	-1.79	-2.77	-0.98	<i>1 to 0.5</i>	0.82	-1.27	-0.44	-1.01
<i>1 to 0.6</i>	0.14	-1.35	0.66	<i>1 to 0.6</i>	-0.65	-2.56	0.88	<i>1 to 0.6</i>	0.66	0.04	0.07	-0.23
<i>1 to 1.5</i>	-0.95	-1.04	-1.18	<i>1 to 1.5</i>	-0.84	-1.03	-1.23	<i>1 to 1.5</i>	-1.04	-1.01	-0.96	-1.03
<i>1 to 2</i>	-0.52	-0.44	-0.55	<i>1 to 2</i>	-0.57	-0.35	-0.57	<i>1 to 2</i>	-0.51	-0.50	-0.46	-0.49

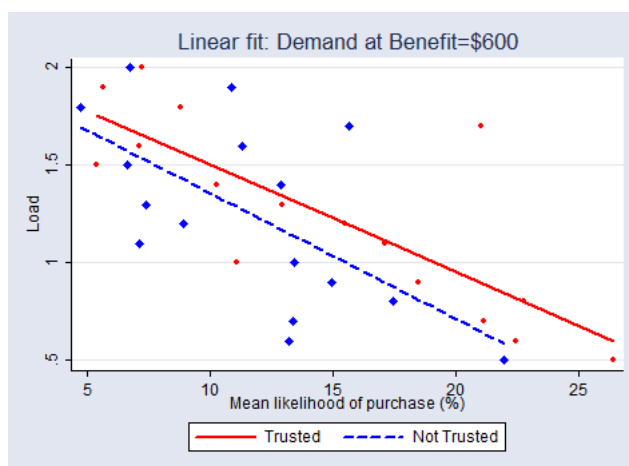
Notes. This table presents the mean probabilities of purchase per benefit level and per load, for all individuals, as well as specifically for those who were presented with the "trusted" preambles or not. It also presents elasticities between specific loads.

Figure 3.1: Demand curve, by benefit level



Notes. This figure presents the mean stated likelihood of purchasing an annuity per load level. The red line and dots indicate the annuity benefit would be \$200, the blue line and dots indicate a \$600 benefit and the green line and dots indicate a \$1,000 benefit.

Figure 3.2: Demand curve, trusted vs. no trusted



Notes. This figure presents the mean stated likelihood of purchasing an annuity per load level, given a fixed benefit level of \$600. The red line and dots indicate the annuity provider was identified as "trusted" and the blue line and dots indicate the word "trusted" was not seen by the survey respondent.

Chapter 4

Methodology

We elaborate a reduced-form econometric model to study the different determinants of annuity demand. We further exploit this model in order to estimate heterogeneity across population groups. Finally, we model individual-specific elasticities as a function of observable population characteristics in order to examine the effect of the latter on the former.

Specifically, we start by estimating the following equation:

$$P_{ij} = \alpha + \gamma\phi_{ij} + \beta X_{ij} + t_{ij} + S_{ij} + c_i + e_{ij}, \quad i = 1, \dots, 3001 \quad j = 1, \dots, 5 \quad (4.1)$$

Where:

- P_{ij} represents individual i 's stated probability of buying an annuity in scenario j
- α is a constant
- ϕ_{ij} is the percent change in the load applied on the premium shown to individual i in scenario j , $(\tau_{ij} - 1)$
- X_{ij} is a vector of controls that includes the variables listed in table 4.1

Table 4.1: Control variables

Variable	Definition	Variable	Definition
<i>Age</i>	Age of the respondent	<i>HIBP</i>	Ever had high blood pressure
<i>Female</i>	Is female	<i>Mental</i>	Ever had a mental health illness
<i>ON</i>	Lives in Ontario	<i>Cancer</i>	Ever had cancer
<i>QC</i>	Lives in Quebec	<i>Smoker</i>	Ever smoked daily
<i>HS or less</i>	Has a high school degree or less	<i>Pr. to live to 85>50%</i>	Think their probability of living past age 85 is > 50%
<i>Couple</i>	Has a spouse	<i>Bequest pr. >90%</i>	Think the chance they leave a bequest over 10k is >90%
<i>Haskids</i>	Has at least one child	<i>Risk averse</i>	Not willing to take average risk or above for average or above returns
<i>Retired</i>	Is retired	<i>False intrate</i>	Answer falsely a question on compound interest
<i>Income>100k</i>	Has annual income over 100k	<i>False stocks</i>	Answer falsely a question on stock market diversification
<i>Savings<50k</i>	Has savings of less than 50k	<i>False realint</i>	Answer falsely a question on inflation
<i>Emp pension</i>	Has an employer provided pension plan	<i>False prage 60</i>	Answer falsely a question on probabilities
<i>Heart disease</i>	Ever had heart disease	<i>Little annuity knowledge</i>	State having little annuity knowledge
<i>Stroke</i>	Ever had a stroke	<i>No annuity knowledge</i>	State having no annuity knowledge
<i>Lung disease</i>	Ever had lung disease	<i>Annuity</i>	Owns an annuity
<i>Diabetes</i>	Ever had diabetes		

- t_{ij} is a dummy variable equal to one if the individual saw the word "trusted" in the preamble
- S_{ij} are scenario dummies for each individual
- c_i is an individual-specific random effect
- e_{ij} is an error term which varies by combination of individual and scenario

We choose to use a linear model instead of a log-log model. With a linear model, we are not assuming that the slope of the demand curve (price elasticity) is constant. To assume so would run contrary to the results presented in table 3.6, which shows elasticity is not the same along all segments of the demand curve. Modelling demand in a linear manner is thus more appropriate. Furthermore, since load factors only range from 0.5 to 2, price variation is not substantial enough to properly model non-linearity in price elasticity of demand. Since load is randomized, our estimator will be unbiased regardless of whether we use pooled OLS, fixed effects or random effects. If we choose to include fixed effects all time-invariant dummy variables would be dropped from the model during estimation. As these variables are of interest and load is exogenous by definition, we are left with the choice of using either a pooled OLS or random effects model. Since the random effects estimator is more efficient than the OLS estimator, we use a random effects model. Separate regressions were run for deferred and immediate annuities but it was found that elasticity was almost identical in both groups. We therefore assume price elasticity of demand for immediate and deferred annuities is the same and include both in all regressions.

Following the estimation of equation 4.1 we obtain our elasticity estimate by dividing γ by $\overline{P_{ij}}$, the average stated probability of purchasing an annuity.

We differentiate equation 4.1 with respect to ϕ_{ij} :

$$\frac{\partial P_{ij}}{\partial \phi_{ij}} = \partial P_{ij} / \frac{\partial \tau_{ij}}{\tau_{ij}} = \gamma \quad (4.2)$$

Thus, γ represents the effect of a one percent increase in τ , the load factor, on the stated probability of buying an annuity. The formula for elasticity in our case is:

$$E_p = \frac{\partial P_{ij}}{\overline{P_{ij}}} / \frac{\partial \tau_{ij}}{\tau_{ij}} \quad (4.3)$$

$$E_p = \frac{\gamma}{\overline{P_{ij}}}$$

Thus elasticity is the coefficient, γ , divided by the average stated probability of purchasing an annuity.

Given the data available, an interesting extension to the basic model is to estimate price elasticity for specific groups of agents. In order to do this, we modify equation 4.1 in the following manner:

$$P_{ij} = \alpha + (\gamma_0 + \gamma_g Z_i) \phi_{ij} + \delta Z_i + \beta X_{ij} + t_{ij} + s_{ij} + c_i + e_{ij}, \quad i = 1, \dots, 3001 \quad j = 1, \dots, 5 \quad (4.4)$$

Where Z_i is a vector of indicator variables which are equal to one if individual i is part of a certain sub-group and equal to zero if not. These variables are *HS or less*, *Income > 100k*, *Savings < 50k*, *False intrate*, *False stocks*, *False realint*, *False prage*, *No annuity knowledge* and *Risk averse*. This helps us study whether education, income, financial literacy and risk aversion have an impact on price elasticity.

To obtain price elasticity per sub-group, we differentiate equation 4.4 with respect to ϕ_{ij} and obtain:

$$\frac{\partial P_{ij}}{\partial \phi_{ij}} = \gamma_0 + \gamma_g \quad (4.5)$$

Thus, for each sub-group, elasticity will be equal to:

$$E_p = \frac{\gamma_0 + \gamma_g}{\overline{P_g}} \quad (4.6)$$

Where γ_g is the estimate in the Γ matrix for individuals belonging to group g , γ_0 is the overall estimate outside the sub-groups and $\overline{P_g}$ is the average purchase probability in group g .

Another way of seeing how sensitive price elasticity is to various individual characteristics is to regress individual-specific elasticity on a vector of characteristics.

To obtain individual-specific elasticities, we estimate the following equation for each individual in our survey:

$$P_i = \alpha + \gamma_i \phi_i \quad (4.7)$$

Where P_i represents the stated probability of buying the annuity in each scenario and ϕ_i represents the percent change in the load in scenario j .

We then divide the estimate for γ_i obtained for each individual in equation 4.7 by the average stated probability of purchase for each individual:

$$E_{pi} = \frac{\gamma_i}{\bar{P}_i}, \forall \bar{P}_i \geq 0 \quad (4.8)$$

For individuals for whom $\bar{P}_i = 0$ (those who never report a positive probability of buying an annuity), we set price elasticity equal to zero. This yields specific price elasticities for each respondent.

In order to study the impact of various characteristics on price elasticity of demand, we estimate the following equation:

$$E_{pi} = \alpha + \theta b_i + \beta X_i + e_i \quad i = 1, \dots, 3001 \quad (4.9)$$

Where α is a constant, X_i is the same vector of individual characteristics as in equation 4.1, b_i is the average benefit level associated to the scenarios presented to each individual and e_i is an error term. Estimating equation 4.9 allows us to identify the effect of individual characteristics on the price elasticity of demand for annuities.

Chapter 5

Results and Discussion

5.1 Results

Tables 5.1 to 5.3 present the results of the estimation of equation 4.2. The large breadth of variables available from the survey allows us to study the effect of variables other than price on the propensity to purchase an annuity. Table 5.1 presents the estimated coefficients for socio-demographic variables. Being female, residing in the province of Quebec, being retired and having an income greater than \$100,000 all have significant negative effects on the stated probability of buying an annuity. The sign of the coefficient associated with the female variable is surprising. Given women are generally longer-lived than men, annuities should be more attractive to them. Interestingly, education has no significant effect on annuity demand. This is inconsistent with previous findings by Cappelletti et al. (2011) showing that low education levels can reduce annuity demand. Finally, having an employer-provided pension plan is associated with an increase in stated annuity demand of almost four percentage points. Individuals who have such a plan are perhaps more comfortable with financial decision making than others and thus more likely to purchase an annuity.

In table 5.2 we see that a certain degree of adverse-selection exists in annuity markets.

Table 5.1: Socio-demographic variables

Variable	Coefficient
<i>Age</i>	-0.129 (0.0742)
<i>Female</i>	-3.439*** (0.743)
<i>ON</i>	-0.267 (0.961)
<i>QC</i>	-5.336*** (1.085)
<i>HS or less</i>	-1.038 (0.789)
<i>Couple</i>	0.515 (0.806)
<i>Has Child</i>	0.699 (0.840)
<i>Retired</i>	-3.859*** (0.853)
<i>Income >100k</i>	-2.069* (0.869)
<i>Savings <50k</i>	2.182** (0.817)
<i>Employer pension</i>	3.911** (0.726)
<i>N</i>	15005
Standard errors in parentheses	
* p<0.05 ** p<0.01 *** p<0.001	

Notes. This table presents results from estimating equation 4.1. Specifically, it presents the effect of socio-demographic characteristics on the stated probability of purchasing an annuity.

Indeed, individuals who state their probability of living past the age of 85 is greater than 50% are about four percentage points more likely to purchase annuities. This result is consistent with Finkelstein and Poterba (2000) and Finkelstein and Poterba (2002) who also find evidence of adverse selection in annuity markets. Individuals with mental health issues and smokers are less likely to purchase annuities. Since, on average, smokers do not live as long as non-smokers it is rational for them to have less of an interest in annuities.

Table 5.2: Health variables

Variable	Coefficient
<i>Heart disease</i>	3.913** (1.420)
<i>Stroke</i>	-6.066 (3.166)
<i>Lung disease</i>	5.227** (1.695)
<i>Diabetes</i>	-2.629 (1.003)
<i>HIBP</i>	-1.017 (0.869)
<i>Mental</i>	-4.523*** (1.243)
<i>Cancer</i>	3.825*** (1.128)
<i>Smoker</i>	-2.521*** (0.741)
<i>Pr. to live to 85 >50%</i>	4.266*** (0.838)
<i>N</i>	15005
Standard errors in parentheses	
* p<0.05 ** p<0.01 *** p<0.001	

Notes. This table presents results from estimating equation 4.1. Specifically, it presents the effect of an individual's health on the stated probability of purchasing an annuity.

Table 5.3 shows results on the remaining variables in our model. First, the coefficient

associated with the load is -7.632. Applying equation 4.3, we obtain a price elasticity of demand of -0.58. This estimate is significant at the 0.001% level. This confirms the finding from chapter 3 that the price elasticity of demand for annuities is relatively inelastic, and the demand curve is downward sloping. Indeed, for every 10% increase in the load factor, the probability of buying an annuity decreases by 5.8%. As we have seen earlier, annuity pricing is very close to fair, and since the elasticity estimate we obtain shows that small price changes do not greatly affect demand, it is unlikely that the dearth of annuity demand is caused exclusively by unfair pricing.

Once again, we see that merely seeing the word "trusted" significantly increases annuity demand. Those most likely to leave bequests are less likely to purchase annuities, consistent with theory. Financially risk averse people are less likely to purchase annuities, contrary to theoretical predictions. Those with little to no annuity knowledge are 4 to 8 percentage points less likely, respectively, to buy one. Furthermore, owning an annuity is associated with a 7 percentage point increase in the propensity to buy annuities. This underlines the importance of knowledge of annuities, or lack thereof. Indeed, apart from the load, these are the variables that have the greatest effect on annuity demand.

Table 5.4 presents the elasticity estimates obtained from estimating equation 4.4. The overall price elasticity of demand for annuities is -0.58. This is consistent with previous literature and falls within the range of estimates in Brown (2007), whose methodology is closest to ours. Individuals in all the sub-categories studied have more elastic demand than the overall population. Those with no annuity knowledge are especially elastic, with elasticity double that of the overall population. Less financially literate, less educated, those with less savings and more risk averse individuals also tend to have more elastic demand. Unweighted estimates are generally slightly larger, in absolute terms, than weighted estimates. This implies that individuals who are more price inelastic seem somewhat underrepresented in our survey. The constant terms obtained from estimating equations 4.1 and 4.4 are large and positive, meaning that an individual without any of the characteristics

Table 5.3: Other

Variable	Coefficient
<i>Load</i>	-7.632*** (0.315)
<i>Scenario 1</i>	0.212 (0.423)
<i>Scenario 2</i>	0.0939 (0.423)
<i>Scenario 4</i>	-0.450 (0.423)
<i>Scenario 5</i>	-1.066* (0.423)
<i>Trusted</i>	2.359*** (0.697)
<i>Bequest pr. > 90%</i>	-2.110** (0.805)
<i>Risk averse</i>	-2.497** (0.815)
<i>False intrate</i>	1.236 (0.780)
<i>False stocks</i>	3.611*** (1.024)
<i>False realint</i>	-1.107 (0.902)
<i>False prage</i>	3.468*** (0.959)
<i>Little annuity knowledge</i>	-4.206*** (1.106)
<i>No annuity knowledge</i>	-7.756*** (1.357)
<i>Own annuity</i>	6.631*** (1.162)
<i>Constant</i>	28.93*** (4.821)
<i>N</i>	15005
Standard errors in parentheses	
* p<0.05 ** p<0.01 *** p<0.001	

Notes. This table presents results from estimating equation 4.1. Specifically, it presents the effect of the above variables on the stated probability of purchasing an annuity.

studied would have a positive elasticity, on average. Much of the heterogeneity in elasticity and, specifically, the source of positive elasticities remains unexplained by this model and merits further research.

Table 5.4: Elasticity estimates

Group	Estimate	Estimate (unweighted)
<i>Overall</i>	-0.58***	-0.73***
<i>Individuals outside the sub-groups below</i>	-0.81***	-0.89***
<i>HS or less</i>	-1.01***	-1.15***
<i>Savings <50k</i>	-1.02***	-1.02***
<i>Income >100k</i>	-1.04***	-1.02***
<i>False intrate</i>	-0.79***	-0.96***
<i>False stocks</i>	-0.81***	-1.08***
<i>False realint</i>	-1.15***	-0.95***
<i>False prage</i>	-1.00***	-1.03***
<i>No annuity knowledge</i>	-1.18***	-1.38***
<i>Risk averse</i>	-0.98***	-1.16***

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

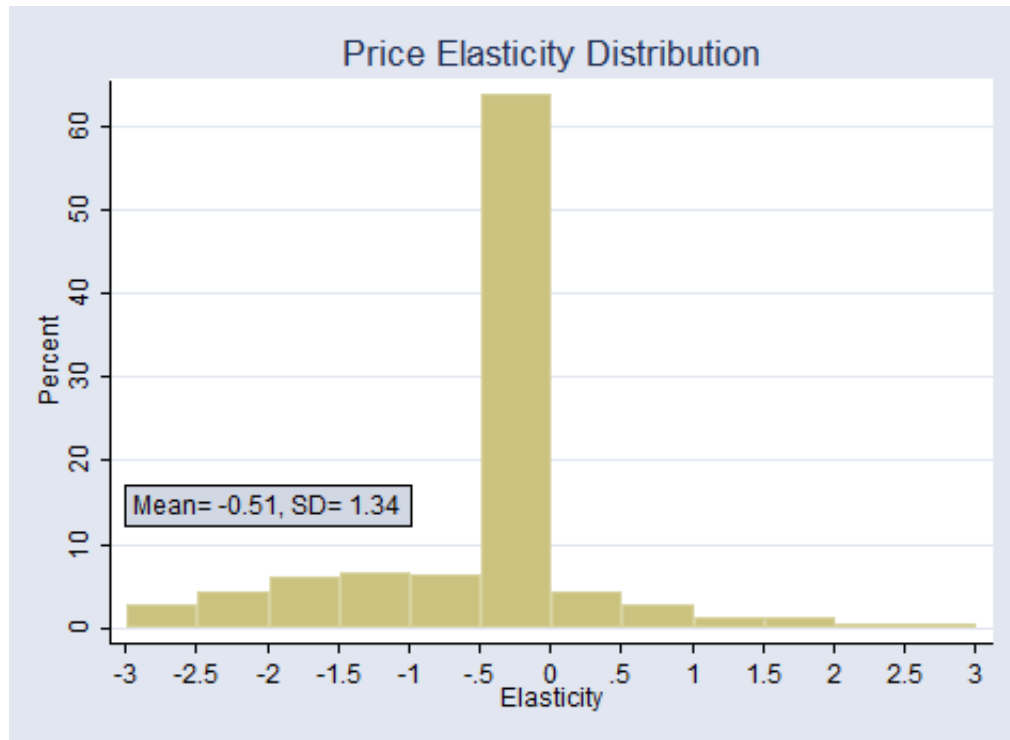
Notes. This table presents elasticity estimates for different population sub-groups obtained after estimating 4.4. Selected coefficients.

The distribution of individual elasticities is presented in figure 5.1. One observes over 60% of elasticities are situated between 0 and -0.5. Around 10% of individuals have positive elasticities and the remaining 30% have elasticities lower than -0.5. Once again, this shows price elasticity for annuities is inelastic.

We are also able to study the impact of individual characteristics on elasticity by constructing individual-specific price elasticities and regressing these on a vector of individual characteristics. The results from the estimation of equation 4.9 are presented in tables 5.5 to 5.7.

Out of all socio-demographic variables, only the age, couple, child and employer pension variables have a significant impact on elasticity. The older the individual, the more negative is their elasticity. Elasticity is also more negative for individuals who have children. Individuals with employer provided pension plans or who live in a couple have generally more positive elasticities. However, the magnitude of these effects is very low. For health variables, only the coefficient on mental illness is significant. Those with a mental illness have generally more negative elasticities. The results presented in table 5.7 show that risk averse individuals as well as those who struggle with the notion of interest

Figure 5.1: Distribution of individual-specific elasticity



Notes. This figure shows the distribution of individual-specific price elasticities resulting from the estimation of equation 4.7.

rates and portfolio diversification all have more positive elasticities, with risk aversion being the characteristic which has the greatest impact on price elasticity. Specifically, a risk averse individual is expected to have an elasticity 0.26 units lower than a non risk averse person. These estimates, as well as those presented in table 5.4 cannot be compared to the literature as, to our knowledge, no other study has performed such an analysis of heterogeneity in the price elasticity of demand for annuities. Further research on the subject would be useful in order to build a consensus on factors affecting price elasticity of demand.

Table 5.5: Individual elasticities: Socio-demographic variables

Variable	Coefficient
<i>Age</i>	-0.0143** (0.00484)
<i>Female</i>	0.0485 (0.0485)
<i>ON</i>	-0.0916 (0.0627)
<i>QC</i>	0.0844 (0.707)
<i>HS or less</i>	0.0940 (0.0514)
<i>Couple</i>	0.120* (0.0526)
<i>Has Child</i>	-0.110* (0.0547)
<i>Retired</i>	-0.0697 (0.0556)
<i>Income >100k</i>	0.0740 (0.0567)
<i>Savings <50k</i>	-0.00969 (0.0532)
<i>Employer pension</i>	0.0936* (0.0474)
<i>N</i>	3001
Standard errors in parentheses	
* p<0.05 ** p<0.01 *** p<0.001	

Notes. This table presents results from estimating equation 4.9. Specifically, it presents the effect of socio-demographic characteristics on price elasticity.

Table 5.6: Individual elasticities: Health variables

Variable	Coefficient
<i>Heart disease</i>	0.107 (0.0925)
<i>Stroke</i>	0.0589 (0.206)
<i>Lung disease</i>	-0.0275 (0.111)
<i>Diabetes</i>	-0.0646 (0.0654)
<i>HIBP</i>	0.106 (0.0654)
<i>Mental</i>	-0.217** (0.0810)
<i>Cancer</i>	-0.0437 (0.0735)
<i>Smoker</i>	0.0474 (0.0483)
<i>Pr. to live to 85 >50%</i>	-0.0499 (0.0546)
<i>N</i>	3001
Standard errors in parentheses	
* p<0.05 ** p<0.01 *** p<0.001	

Notes. This table presents results from estimating equation 4.9. Specifically, it presents the effect of health variables on price elasticity.

Table 5.7: Individual elasticities: Other

Variable	Coefficient
<i>Trusted</i>	0.00155 (0.0454)
<i>Bequest pr. > 90%</i>	0.0185 (0.0525)
<i>Risk averse</i>	0.264** (0.0532)
<i>False intrate</i>	0.135* (0.0509)
<i>False stocks</i>	0.0558* (0.0667)
<i>False realint</i>	0.0823 (0.0588)
<i>False prage</i>	0.0553 (0.0629)
<i>Little annuity knowledge</i>	0.0215 (0.0720)
<i>No annuity knowledge</i>	0.0448 (0.0885)
<i>Own annuity</i>	-0.0976 (0.0757)
<i>Average benefit</i>	-0.0000 (0.0002)
<i>Constant</i>	0.0792 (0.324)
<i>N</i>	3001
Standard errors in parentheses	
* p<0.05 ** p<0.01 *** p<0.001	

Notes. This table presents results from estimating equation 4.9. Specifically, it presents the effect of the above variables on price elasticity.

5.2 Discussion

The main result of this paper is that price elasticity of demand for annuities is -0.58. This estimate is consistent with most previous studies, finding demand to be relatively inelastic (Brown, 2007; Cappelletti et al., 2011; Chalmers and Reuter, 2009). This fact, combined with evidence on close to fair annuity pricing, indicates lack of annuity demand cannot be explained primarily by unfair pricing. For this to be the case, either annuity pricing would have to be much less fair or demand much more elastic. Further research on the subject is thus necessary.

Seeing as a large proportion of individuals have very limited knowledge of annuities, exploring supply-side factors such as why these products are not marketed more aggressively might be an interesting avenue for further studies. One possible explanation explored in this paper is that margins on annuity products are too low for insurance companies to market them aggressively. This result implies a rather competitive market structure, which could explain why, given relatively inelastic demand, insurers do not impose higher loads on annuities. Indeed, to do so they would need to possess a greater degree of market power than they seem to possess presently.

The other intriguing result that emerges from this paper is that there is significant heterogeneity in price elasticity. Knowing this, insurers could practice price discrimination and take advantage of more inelastic demand among certain groups of consumers if they were somehow able to identify them. They could also focus their marketing on more inelastic consumers, for example older, wealthier and more educated individuals.

Consistent with Cappelletti et al. (2011) and Brown et al. (2017), these findings suggest there is a need for much greater financial education in order to increase annuity demand. Indeed, since having little or no annuity knowledge is associated with a large reduction in annuity demand, a relatively simple and inexpensive way of stimulating annuity demand

would be to promote education about these types of products. Having shown that pricing is not the main reason for the dearth in annuity demand, subsidizing annuities would most likely not be the most efficient measure to stimulate annuity demand. Although governments could consider subsidizing annuities for groups who are characterized by relatively elastic demand, such as those with lower savings levels. However, this would most likely not be the most cost-effective way to stimulate annuity demand. Instead, public ad campaigns or more financial education in school might be avenues to consider in order to increase annuity demand. Behavioral "nudges" could also be useful, as this paper confirms framing has a significant effect on annuity demand. Indeed, it has been found that ad campaigns are effective ways of encouraging individuals to adopt certain behaviors, from quitting smoking (McVey and Stapleton, 2000; Warner, 1977) to visiting doctors more regularly (Iizuka and Jin, 2005).

Conclusion

According to economic theory, annuities are of great value to the average consumer. It is therefore puzzling that only a small proportion of Canadians choose to purchase them on the private market. One possible explanation for such low annuity take-up is elastic demand. We provide new evidence on the price elasticity of demand for annuities as well as other determinants of annuity demand that does not support this explanation. In addition, we model heterogeneity in price elasticity. This is accomplished using a stated-choice experiment with exogenous price variation across various scenarios.

Our main findings are as follows. We find price elasticity of demand for annuities in Canada to be relatively inelastic and pricing to be close to fair. This is consistent with previous literature on annuity pricing (Mitchell, 1999) and price elasticity (Brown, 2007; Cappelletti et al., 2011; Chalmers and Reuter, 2009). Thus, it is unlikely that pricing is the main culprit in the Canadian annuity puzzle. Lack of knowledge regarding annuities is pervasive among respondents and is an important factor in explaining low annuity take-up. Framing also has an impact on annuity demand as consumers who saw the word "trusted" in scenario preambles reported significantly higher purchase probabilities. Price elasticity differs among certain groups of respondents, specifically, those who have little annuity knowledge and struggle with certain measures of financial literacy are significantly more price sensitive than respondents without these characteristics. To our knowledge, this is the first paper to establish a link between observable characteristics and price elasticity for annuities, as well as the first paper to estimate price elasticity of demand for annuities using the stated-preference method.

These findings are important for Canadian policymakers, such as provincial and national finance and education ministries. If increased annuitization of savings in Canada is desired, inelastic demand would imply subsidizing such products would have little effect on demand. Educating Canadians as to the possible benefits of annuitization, and more generally improving financial literacy, seems like a more efficient way to stimulate demand for annuities. Regulators should also keep an eye on annuity loads, as annuity providers could eventually be tempted to increase loads on certain inelastic consumers, if they were able to be identified.

Further research as to why consumers know so little about annuities is necessary. Possible explanations include a competitive market structure, disincentivising insurers from marketing such products, or inadequate financial literacy among Canadians. Another avenue for research would be to further investigate heterogeneity in price elasticity using different data or methods.

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Appendix A – Full Questionnaire

INSTRUCTIONS INCLUDED WITH THIS ANONYMOUS QUESTIONNAIRE

FINANCIAL PRODUCTS FOR RETIREMENT

The following pages contain an anonymous questionnaire, which we invite you to complete. This questionnaire was developed as part of a research project at HEC Montréal.

Since your first impressions best reflect your true opinions, we would ask that you please answer the questions included in this questionnaire without any hesitation. We ask, however, that you take the time needed to consider certain questions on knowledge, which might involve concepts with which you are less familiar. There is no time limit for completing the questionnaire, although we have estimated that it should take approximately 15 minutes.

The information collected will be anonymous and will remain strictly confidential. It will be used solely for the advancement of knowledge and the dissemination of the overall results in academic or professional forums.

The online data collection provider agrees to refrain from disclosing any personal information (or any other information concerning participants in this study) to any other users or to any third party, unless the respondent expressly agrees to such disclosure or unless such disclosure is required by law.

You are free to refuse to participate in this project and you may decide to stop answering the questions at any time. By completing this questionnaire, you will be considered as having given your consent to participate in our research project and to the potential use of data collected from this questionnaire in future research. Since the questionnaire is anonymous, you will no longer be able to withdraw from the research project once you have completed the questionnaire because it will be impossible to determine which of the answers are yours.

If you have any questions about this research, please contact the principal investigator, Pierre-Carl Michaud, at the telephone number or email address indicated below.

HEC Montréal's Research Ethics Board has determined that the data collection related to this study meets the ethics standards for research involving humans. If you have any questions related to ethics, please contact the REB secretariat at (514) 340-6051 or by email at cer@hec.ca.

Thank you for your valuable cooperation!

Pierre-Carl Michaud
Professor
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HEC Montréal
514-340-6466
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Section 1: Background

A Are you...?

- 1.1. Male
- 1.2. Female

B How old are you?

- 2.1. *Please Enter (terminate if not 55-75 INCLUSIVELY)*

[PN: MUST ENTER THE 2 CHARACTERS]

QC. Which province or territory do you live in?

- 1.1. British Columbia
- 1.2. Alberta [Screen Out]
- 1.3. Saskatchewan [Screen Out]
- 1.4. Manitoba [Screen Out]
- 1.5. Ontario
- 1.6. Quebec
- 1.7. New Brunswick [Screen Out]
- 1.8. Nova Scotia [Screen Out]
- 1.9. Prince Edward Island [Screen Out]
- 1.10. Newfoundland [Screen Out]
- 1.11. Northwest Territories [Screen Out]
- 1.12. Nunavut [Screen Out]
- 1.13. Yukon [Screen Out]
- 1.14. None of the above [Screen Out]

Q0 Can you please enter the first 3 characters of your postal code? Please type in below [PN: MUST ENTER FIRST 3 CHARACTERS]

Q1 What is the highest degree, certificate or diploma you have obtained?

- 1 Less than high school diploma or its equivalent
- 2 High school diploma or a high school equivalency certificate
- 3 Trade certificate or diploma
- 4 College, CEGEP or other non-university certificate or diploma (other than trades certificates or diplomas)
- 5 University certificate or diploma below the bachelor's level
- 6 Bachelor's degree (e.g. B.A., B.Sc., LL.B.)
- 7 University degree above the bachelor's level

Q2 What is your marital status?

- 1 married
- 2 living common-law
- 3 widowed
- 4 separated

5 divorced
 6 single, never married
 IF Q2 ==1,2
 Q2a How old is your partner (spouse)?
 Numeric (>0)
 END IF

Q3 Do you have children?
 1 Yes
 2 No
 IF Q3==1
 Q3a How many of your children are alive today?
 Numeric (>=0)
 END IF

Q4 For 2016, what is your best estimate of the total income received by all members of your household, from all sources, before taxes and deductions?
 Numeric (>0)
 9999999 Don't know or prefer not to say
 IF Q4==9999999
 Q4a Is it more than \$60,000? 1 Yes 2 No 8888888 Refuse to answer 7777777 Don't know
 IF Q4a==1
 Q4b Is it less than \$120,000? 1 Yes 2 No 8888888 Refuse to answer 7777777 Don't know
 IF Q4b == 1
 Q4c Is it more than \$90,000? 1 Yes 2 No 8888888 Refuse to answer 7777777 Don't know
 END IF
 ELSE IF Q4a==2
 Q4d Is it more than \$30,000? 1 Yes 2 No 8888888 Refuse to answer 7777777 Don't know
 END IF
 END IF

Q5 Do you consider yourself retired?
 1 Yes
 2 No
 IF Q5==2
 Q5a What is your best estimate of what total income received by all members of your household will be once you are fully retired, as a fraction of your current income?
 Numeric (0%-200%)
 9999999 Don't know
 IF Q5a==9999999
 Q5b Is it more than 50%? 1 Yes 2 No 8888888 Refuse to answer 7777777 Don't know
 IF Q5b==1
 Q5c Is it less than 75%? 1 Yes 2 No 8888888 Refuse to answer 7777777 Don't know
 IF Q5c == 1


```

        Q5d Is it more than 62.5%? 1 Yes 2 No 8888888 Refuse to answer
        7777777 Don't know
    ELSE IF Q5c == 2
        Q5e Is it less than 87.5%? 1 Yes 2 No 8888888 Refuse to answer
        7777777 Don't know
    END IF
ELSE IF Q5b==2
    Q5f Is it more than 25%? 1 Yes 2 No 8888888 Refuse to answer 7777777 Don't
    know
    IF Q5f == 1
        Q5d Is it more than 37.5%? 1 Yes 2 No 8888888 Refuse to answer
        7777777 Don't know
    ELSE IF Q5f == 2
        Q5e Is it less than 12.5%? 1 Yes 2 No 8888888 Refuse to answer
        7777777 Don't know
    END IF
END IF
END IF
END IF

```

Q6 Do you own your primary residence?

1 Yes

2 No

IF Q6==1

Q6a Which set of property type best fits your primary residence?

1 Single Family Dwelling / Detached Duplex, Triplex or Quadruplex / Link home / Semi-Detached.

2 Townhouse, Rowhouse / Fiveplex and Sixplex / Attached Duplex, Triplex or Quadruplex / Stratified SFD, Bare Land Strata / Semi-Detached Strata Condo / Modular Home

3 Condo-Townhouse / Mobile Home / Condo – Apartment Style

7777777 Don't know

Q7 What is the current market value of your residence?

Numeric (>0)

9999999 Don't know or prefer not to say

IF Q7==9999999

Q7a Is it more than \$300,000? 1 Yes 2 No 8888888 Refuse to answer 7777777 Don't know

IF Q7a==1

Q7b Is it less than \$600,000? 1 Yes 2 No 8888888 Refuse to answer 7777777 Don't know

IF Q7b == 1

Q7c Is it more than \$450,000? 1 Yes 2 No 8888888 Refuse to answer 7777777 Don't know

ELSE IF Q7b ==2

Q7d Is it less than \$750,000? 1 Yes 2 No 8888888 Refuse to answer 7777777 Don't know

IF Q7d == 2

Q7e Is it more than \$900,000? 1 Yes 2 No 8888888 Refuse to answer 7777777 Don't know

END IF

END IF

ELSE IF Q7a==2

Q7f Is it more than \$150,000? 1 Yes 2 No 8888888 Refuse to answer 7777777 Don't know

END IF

END IF

Q8 What proportion of the current market value of your residence do you still owe on your mortgage?

Numeric (0%-200%)

9999999 Don't know or prefer not to say

IF Q8 == 9999999

Q8a Is it more than 50%? 1 Yes 2 No 8888888 Refuse to answer 7777777 Don't know

IF Q8a == 1

Q8b Is it less than 75 %? 1 Yes 2 No 8888888 Refuse to answer 7777777 Don't know

IF Q8b == 1

Q8c Is it more than 62.5%? 1 Yes 2 No 8888888 Refuse to answer 7777777 Don't know

ELSE IF Q8b == 2

Q8d Is it more than 87.5%? 1 Yes 2 No 8888888 Refuse to answer 7777777 Don't know

END IF

END IF

ELSE IF Q8a == 2

Q8e Is it less than 25 % 1 Yes 2 No 8888888 Refuse to answer 7777777 Don't know

IF Q8e == 1

Q8f Is it more than 12.5%? 1 Yes 2 No 8888888 Refuse to answer 7777777 Don't know

IF Q8f == 2

Q8g Is it less than 5%? 1 Yes 2 No 8888888 Refuse to answer 7777777 Don't know

END IF

ELSE IF Q8e == 2

Q8h Is it more than 37.5%? 1 Yes 2 No 8888888 Refuse to answer 7777777 Don't know

END IF

END IF

END IF

END IF

Q9 We are interested in your pension plan and its nature, if you have one. Do you currently contribute to, or receive benefits from (in the form of regular payments), an employer-provided pension plan?

1 Yes

2 No

3 Don't Know

IF Q9==1

Q9a Do you agree with the following statement: "I have/expect to have sufficient pension income"?

1 Completely disagree

2 Disagree

3 Somewhat disagree

4 Neither agree nor disagree

5 Somewhat agree

6 Agree

7 Completely agree

END IF

Q10 What is your best estimate of how much you have accumulated in Registered Retirement Savings Plans (RRSPs), Tax-Free Savings Accounts (TFSAs) and other non-employer provided savings accounts?

Numeric

9999999 Don't know or prefer not to say

IF Q10==9999999

Q10a Is it more than \$50,000? 1 Yes 2 No 8888888 Refuse to answer 7777777 Don't know

IF Q10a==1

Q10b Is it less than \$200,000? 1 Yes 2 No 8888888 Refuse to answer 7777777 Don't know

ELSE IF Q10a==2

Q10c Is it more than \$10,000? 1 Yes 2 No 8888888 Refuse to answer 7777777 Don't know

END IF

END IF

Q11 Looking at the following list of health conditions, has a doctor ever said you suffered from:

[Check any of:]

1 Heart disease

2 Stroke

3 Lung disease

4 Diabetes

5 Hypertension

6 Depression or other mental health problems

7 Cancer

8 None of the above

Q12 At the present time, do you smoke cigarettes daily, occasionally or not at all?

1 Daily

2 Occasionally

3 Not at all

```

    IF Q12==1 GOTO Q13
ELSE IF Q12==2,3
    Q12a Have you ever smoked cigarettes daily?
    1 Yes
    2 No
    IF Q12a==1 GOTO Q13
    ELSE IF Q12a==2
        Q12b Have you smoked 100 cigarettes or more in your life?
        1 Yes
        2 No
        IF Q12b==1 GOTO Q13
        ELSE IF Q12b==2
            Q12c Have you ever smoked a whole cigarette?
            1 Yes
            2 No
        END IF
    END IF
END IF
END IF

```

Section 2: Risk Perception

Q13 On a scale of 0 to 100, where 0 is absolutely no chance and 100 is absolutely certain, what do you believe is the percent chance you will live to age 85 or more?

Numeric (0-100)

9999999 Don't know

```

    IF Q2==1,2 & Q2a < 85

```

Q13a On a scale of 0 to 100, where 0 is absolutely no chance and 100 is absolutely certain, what do you believe is the percent chance your partner (spouse) will live to age 85 or more?

Numeric (0-100)

9999999 Don't know

```

    END IF

```

Q14 On a scale of 0 to 100, where 0 is absolutely no chance and 100 is absolutely certain, what do you believe is the percent chance you will leave a bequest of more than \$10,000?

Numeric (0-100)

9999999 Don't know

```

    IF Q14 >0 & Q6 ==1

```

Q14a How likely is it that your primary residence will play a role in the bequest you plan to leave?

1 Not likely at all

2 Not very likely

3 Somewhat likely

4 Very likely

5 Extremely likely

```

    END IF

```

Q15 On a scale of 0 to 100, where 0 is absolutely no chance and 100 is absolutely certain, what do you believe is the percent chance that your family would take up the responsibility of taking care of you if you had important limitations in activities of daily living such as bathing, eating, cleaning?

Numeric (0-100)
9999999 Don't know

Q16 On a scale of 0 to 100, where 0 is absolutely no chance and 100 is absolutely certain, what do you believe is the percent chance that your family would take care of you financially if you needed financial support?

Numeric (0-100)
9999999 Don't know

IF Q6==1

Q17 Here are three possibilities concerning your future expected residence. On a scale of 0 to 100, where 0 is absolutely no chance and 100 is absolutely certain, what is the percent chance that each of these possibilities comes true. Given that only one of these possibilities can occur, the sum of the three probabilities must equal 100.

Q17a I'm going to stay in my current home until I die.

Numeric (0-100)

Q17b I will eventually move from my current home to live in another house or apartment.

Numeric (0 to (100 – Answer Q17a))

Q17c I will eventually move from my current home to live in a long-term care home.

Numeric (0 to (100 – Answer Q17a – Answer Q17b))

[NOTE: SUM OF ANSWERS TO Q17a, Q17b AND Q17c MUST EQUAL 100.]

[NOTE: MAKE SURE THE QUESTION IS PROPERLY NUMBERED ON THE SCREEN.]

[NOTE: WOULD IT BE POSSIBLE TO INCLUDE A COUNTER TO LET THE RESPONDENT KNOW HOW MANY % LEFT TO FILL IN?]

Q18 Over the **next** five years, do you think the value of your home will:

- 1 Increase a lot (greater than 20 %)
- 2 Increase moderately (between 5% and 20%)
- 3 remain rather stable (between +5% and -5%)
- 4 decrease moderately (between -5% and -20%)
- 5 decrease a lot (less than -20%)

Q19 Do you agree with the following statement: "House prices can fluctuate a lot"?

- 1 Completely disagree
- 2 Disagree
- 3 Somewhat disagree
- 4 Neither agree nor disagree
- 5 Somewhat agree
- 6 Agree
- 7 Completely agree

END IF

Q20 Do you agree with the following statements? (Answers: 1 Strongly Agree; 2 Agree; 3 Disagree; 4 Strongly Disagree; 5 Don't know)

Q20a It is the responsibility of the family, when feasible, to take care of elderly parents

Q20b Parents should set aside money to leave to their children or heirs once they die, even when it means somewhat sacrificing their own comfort in retirement

Q20c Children should inherit their parents' family home

Q20d A house is an asset that should only be sold in case of financial hardship

Q20e Being in debt is never a good thing

[NOTE: Make sure the question is properly numbered on the screen.]

[NOTE: Might the scale for each statement be inverted (i.e. "increasing" from left to right)? We leave this with your expertise.]

Q21 Which of the following statements comes closest to describing the amount of financial risk that you are willing to take when you save or make investments?

1 I am willing to take substantial financial risks expecting to earn substantial returns

2 I am willing to take above average financial risks expecting to earn above-average returns

3 I am willing to take average financial risks expecting to earn average returns

4 I am willing to take below average financial risks expecting to earn below-average returns

5 I am not willing to take any risk, knowing I will earn a small but certain return

Section 3: Literacy and Knowledge

Now we would like to ask some questions about your familiarity and comfort with financial concepts. Please answer these questions the best you can.

Q22 Suppose you have \$100 in a savings account, the interest rate is 2% per year and you never withdraw money. After 5 years, how much will you have in this account in total?

1 More than \$110

2 Exactly \$110

3 Less than \$110

4 Don't know

Q23 True or false? You should invest most of your money in a single stock that you select rather than in lots of stocks or in mutual funds.

1 True

2 False

3 Don't know

Q24 Imagine leaving \$1,000 in a savings account that pays 1% interest and has no charges. Imagine that inflation is running at 2%. Do you think that if you withdraw the money in a year's time you will be able to buy more than, exactly the same as, or less than today with the money in this account?

1 More than today

2 Exactly the same as today

3 Less than today

4 Don't know

Q25 Suppose the chances of someone aged 50 living to age 85 are 60%. What do you think the chances are that this same person will live to age 60?

- 1 Less than 60%
- 2 Greater than 60%
- 3 Don't know

Section 4: Annuities

For the purposes of this section, when we use the term '**annuity**', we are referring to a financial product that guarantees you a regular payment every month or year until death (the "benefit"), in exchange for an initial one-time payment (the "premium").

Q26 This section is going to ask you questions about annuities. Which of the following best describes your current knowledge about this type of product?

- 1 A lot
- 2 A little
- 3 None at all

Q27 Have you purchased an annuity in the private market, for which you are currently receiving or will eventually receive benefits (please exclude all government provided annuities such as your provincial pension plan, the Canada Pension Plan and Old Age Security)?

- 1 Yes, I have purchased an annuity
- 2 Yes, I have purchased more than one annuity
- 3 No
- 4 Don't know

IF Q27==4(Don't know) GOTO Q28

ELSE IF Q27==3 (No)

Q27a Why haven't you bought an annuity? Choose the main reason.

- 1 I never thought about buying one, and I have never been offered one (for instance by a financial advisor).
- 2 I thought about buying one, but I have not (yet) made a decision.
- 3 I do not have sufficient savings to purchase one.
- 4 Such products do not offer good value for money.
- 5 Such products do not cover my needs.
- 6 I do not think I will need such a product.
- 7 I don't know what an annuity is.
- 8 Other, open...

GOTO Q28

ELSE IF Q27==1,2 (Yes)

Q27b How did you come to purchase the annuity? If you have purchased more than one annuity, please think about the one you purchased most recently.

- 1 I was offered an annuity (by my financial advisor, pension plan representative, insurance company, etc.)
- 2 I searched myself for an annuity
- 3 Other, open ...

Q27c What was the premium of the annuity (what did you pay)? If you have purchased more than one annuity, please indicate what you paid for the one you purchased most recently.

Numeric (>\$0)

7777777 Don't know

IF Q27c==7777777

Q27d Was it more than \$250,000? 1 Yes 2 No 8888888 Refuse to answer 7777777

Don't know

IF Q27d==1

Q27e Was it less than \$1,000,000? 1 Yes 2 No 8888888 Refuse to answer

7777777 Don't know

IF Q27e == 1

Q28f Was it more than \$500,000? 1 Yes 2 No 8888888 Refuse to answer

7777777 Don't know

END IF

ELSE IF Q27d ==2

Q27g Was it more than \$150,000? 1 Yes 2 No 8888888 Refuse to answer

7777777 Don't know

IF Q27g == 2

Q27h Was it less than \$100,000? 1 Yes 2 No 8888888 Refuse to answer

7777777 Don't know

IF Q27h==1

Q27i Was it more than \$50,000? 1 Yes 2 No 8888888 Refuse to answer 7777777 Don't know

END IF

END IF

END IF

END IF

Q27j What is the benefit amount the annuity pays out (monthly)? If you have purchased more than one annuity, please indicate the benefit paid by the one you purchased most recently.

Numeric (>\$0)

7777777 Don't know

IF Q27j==7777777

Q27k Is it more than \$1,000? 1 Yes 2 No 8888888 Refuse to answer 7777777 Don't know

IF Q27k==1

Q27l Is it less than \$4,000? 1 Yes 2 No 8888888 Refuse to answer 7777777

Don't know

IF Q27l == 1

Q27m Is it more than \$2,000? 1 Yes 2 No 8888888 Refuse to answer

7777777 Don't know

END IF

ELSE IF Q27k ==2

Q27n Is it more than \$600? 1 Yes 2 No 8888888 Refuse to answer 7777777

Don't know

IF Q27n == 2

Q27o Is it less than \$400? 1 Yes 2 No 8888888 Refuse to answer

7777777 Don't know

IF Q27o==1

Q27p Is it more than \$200? 1 Yes 2 No 8888888 Refuse to answer

7777777 Don't know

END IF


```
                END IF
            END IF
        END IF
    END IF
```

Q28 Do you have life insurance for which you currently pay a premium or that is fully paid and still in force?

- 1 Yes
- 2 No
- 3 Don't Know

IF Q28==1 (Yes)

Q28a What type of life insurance policy do you have?

- 1 Term life insurance
- 2 Whole life insurance or Universal life insurance
- 3 Don't know
- 4 Other, open...

END IF

Section 6: Preferences for Annuities [SCENARIOS]

We are going to show you some simple annuities and ask you to rate them. You can assume that the institution offering the annuity will pay the monthly benefit no matter the circumstances. Once you pay the premium, you receive monthly benefits and have nothing else to pay.

Each product has two attributes:

- a) a premium you have to pay;
- b) a monthly benefit starting at a given age and lasting until death.

The benefit is adjusted for inflation (indexed).

Q30-34

[SCENARIOS]

What are the chances, 0% meaning no chance and 100% meaning for sure, that you would purchase this product if it were offered to you by [a trusted / an] insurance company within the next year?

Numeric (0-100)

Randomize [a trusted / an] across individuals with probability 0.5, and keep constant for each respondent for questions 30-34 (i.e., present all of Q30-34 either with [a trusted] or with [an] for a given individual).

Scenarios randomization scheme

Parameters:

Age_benefit = [(age+1), 75,85] with probability [2/5, 2/5, 1/5]
where (age+1)=the age of the respondent+1

Benefit = [200,600,1000] each with probability 1/3

Load = [0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2.0]
each with probability 1/16

For each combination of Age_benefit and Benefit we provide EPremium, which is the fair premium by age and sex (3 x 3 = 9 data points; see table attached).

The premium for the contract is given by (please round to nearest \$500):

$$\text{prem} = \text{EPremium} \times \text{Load}$$

Randomize Age_benefit, Benefit and Load independently (3 x 3 x 16 possibilities) for 5 draws (i.e., each respondent is presented with 5 combinations of Age_benefit, Benefit, and “prem” according to the above probabilities).

Present each draw following this example:

When you buy the annuity	Starting at age [Age_benefit]
--------------------------	-------------------------------

You pay \$[prem]	You receive \$[Benefit] per month until death, indexed annually for inflation
------------------	---

FAIR PREMIUMS (VALUES FOR "EPremium")

For Age_benefit=age+1

Benefit = 200			Benefit = 600			Benefit = 1000		
Age	Male	Female	Age	Male	Female	Age	Male	Female
55-59	45,111.40	49,890.91	55-59	135,334.20	149,672.72	55-59	225,557.00	249,454.53
60-64	38,942.44	43,719.50	60-64	116,827.32	131,158.51	60-64	194,712.20	218,597.52
65-69	32,755.36	37,352.10	65-69	98,266.07	112,056.30	65-69	163,776.79	186,760.50
70-75	26,135.90	30,292.54	70-75	78,407.71	90,877.61	70-75	130,679.51	151,462.69

For Age_benefit=75

Benefit = 200			Benefit = 600			Benefit = 1000		
Age	Male	Female	Age	Male	Female	Age	Male	Female
55-59	13,691.16	17,442.92	55-59	41,073.47	52,328.77	55-59	68,455.79	87,214.61
60-64	15,677.30	19,700.10	60-64	47,031.89	59,100.30	60-64	78,386.48	98,500.51
65-69	18,361.54	22,559.95	65-69	55,084.62	67,679.85	65-69	91,807.70	112,799.74
70-75	22,467.80	26,560.34	70-75	67,403.40	79,681.01	70-75	112,339.00	132,801.69

For Age_benefit=85

Benefit = 200			Benefit = 600			Benefit = 1000		
Age	Male	Female	Age	Male	Female	Age	Male	Female
55-59	3,912.57	5,959.01	55-59	11,737.70	17,877.03	55-59	19,562.83	29,795.06
60-64	4,480.15	6,730.13	60-64	13,440.45	20,190.39	60-64	22,400.75	33,650.65
65-69	5,247.24	7,707.14	65-69	15,741.71	23,121.41	65-69	26,236.18	38,535.69
70-75	6,535.00	9,210.44	70-75	19,605.01	27,631.32	70-75	32,675.02	46,052.19

IF Q6 == 1

Section 5: Financial product to extract the equity value of a primary residence

For the purposes of this section, when we use the expression “**current home equity**”, we are referring to the current market value of your primary residence after subtracting outstanding mortgage balances. This section is going to ask you questions about financial products on the basis of your current home equity.

Imagine a financial product that lets you turn part of your current home equity into cash. You’re not obligated to make any payments until you move, you sell your home, or you die. You have the certainty that once your residence will be sold, the required amount to repay the loan will not exceed the selling price of the residence.

Q29 Have you ever heard of the existence of this type of financial product in Canada?

1 Yes

2 No

IF Q29 == 1

Q29a Can you name that product?

1 Yes

2 No

IF Q29a==1

[DROP-DOWN]

Q29b What is it called?

1 Annuity

2 Reverse mortgage

3 Life insurance

4 Line of credit

5 None of the above

END IF

END IF

Section 7: Preferences for Reverse Mortgages [SCENARIOS]

We will refer to a **reverse mortgage** as a financial product that lets you turn part of your current home equity into cash. Unlike many mortgage-based financial products, you're not obligated to make any payments until you move, you sell your home, or you die. Importantly, you have the certainty that once your residence will be sold, the amount required to repay the loan will not exceed the selling price of the residence.

When we use the expression "**current home equity**", we are referring to the current market value of your primary residence after subtracting outstanding mortgage balances. For the rest of this section, try to have your current home equity in mind.

We are going to show you some simple reverse mortgage products and ask you to rate them.

Each reverse mortgage has three attributes:

- a) The percentage of your current home equity that you can borrow. The amount borrowed must be a minimum of \$25,000.
- b) A fixed annual interest rate on the balance of the loan, generating interests that you do not need to pay before you move, sell or die.
- c) A fixed fee of \$2,245 that you only have to pay once. The money you obtain from the reverse mortgage will be used to pay this fee.

[Suppose you have the certainty that you will never be put under pressure to sell your residence and that the contract terms will be respected.]

Randomize the presence of the sentence above for each respondent with probability 0.5 and keep constant for questions 35-39.

Q35-Q39
[SCENARIOS]

What are the chances, 0% meaning no chance and 100% for sure, that you would buy this reverse mortgage if a trusted financial institution offered it to you within the next year?

Numeric (0-100)

IF Q35>0

Q35a In the event you purchased this reverse mortgage, considering you must borrow a minimum of \$25,000 and taking into account the maximum amount that can be borrowed (« Reverse Mortgage » of your current home equity), what amount of money do you think you would borrow?

Numeric (>=\$25,000)

END IF

[NOTE: REPEAT THE ABOVE SUB-QUESTION AFTER EACH OF Q35 TO Q39, USING THE EXACT SAME LOOP, WORDING AND CRITERIA]

END IF

Scenarios randomization scheme

Parameters:

Interest_rates = [3.8%, 4.1%, 4.4%, 4.7%, 5%, 5.3%, 5.59%, 6%, 6.5%, 7%] each with probability 1/10

Load = [0.5, 0.75, 1, 1.25, 1.5] each with probability 1/5

With these products we provide Borrow (see tables attached), which is the proportion that can be borrowed by city, marital status, age and sex.

The contract of the reverse mortgage is given by (please round to nearest percentage point):

$$\text{Reverse Mortgage} = \text{Borrow} \times \text{Load}$$

Randomize both Interest_rates and Load independently (10 x 5 possibilities) for 5 draws (i.e., each respondent is presented with 5 combinations of Interest_rates and “Reverse Mortgage” according to the above probabilities).

Present each draw following this example:

You can borrow a minimum of \$25,000 and up to [Reverse Mortgage] of your current home equity.
You will be charged a fixed annual interest rate of [Interest_rates] on the balance of the loan for as long as you hold the loan. <i>Reminder: You're not obligated to make any payments until you move, you sell your home, or you die; and you have the certainty that once your residence will be sold, the amount required to repay the loan will not exceed the selling price of the residence.</i>
There is a fixed fee of \$2,245 that you only have to pay once. The money you obtain from the reverse mortgage will be used to pay this fee.

VALUES FOR “Borrow”

[FOR COUPLES, PLEASE USE THE AVERAGE AGE OF THE COUPLE : $\frac{age+Q2a}{2}$, WHERE *age* IS THE RESPONDENT’S AGE GATHERED FROM THE SAMPLING/TARGETING. PLEASE ROUND THE RESULT TO THE NEAREST INTEGER AND SET THE AGE OF THE COUPLE AS 55 IF $\frac{age+Q2a}{2} < 55$ AND AS 79 IF $\frac{age+Q2a}{2} > 79$.]

If Q0 begins with H1, H2, H3, H4, H5, H8, H9 & Q2==1,2

(Island of Montreal, Couple)

Age	55-59	60-64	65-69	70-74	75-79
IF Q6a == 1, 7777777 (Single Family Dwelling / Detached Duplex, Triplex or Quadruplex / Link Home / Semi-Detached)	16.10%	23.10%	31.90%	39.10%	46.70%
IF Q6a == 2 (ownhouse, Rowhouse / Fiveplex and Sixplex / Attached Duplex. Triplex, or Quadruplex / Stratified SFD, Bare Land Strata / Semi-Detached Strata Condo / Modular Home)	15.30%	21.90%	30.30%	37.10%	44.50%
IF Q6a == 3 (Condo - Townhouse / Mobile Home / Condo – Townhouse)	12.90%	18.50%	25.50%	31.30%	37.50%

If Q0 begins with H1, H2, H3, H4, H5, H8, H9 & Q2==3,4,5,6 and sex is Male

(Island of Montreal, Single Male)

Age	55-59	60-64	65-69	70-74	75-79
IF Q6a == 1, 7777777 (Single Family Dwelling / Detached Duplex, Triplex or Quadruplex / Link Home / Semi-Detached)	25.10%	33.10%	39.10%	43.30%	49.90%
IF Q6a == 2 (Townhouse, Rowhouse / Fiveplex and Sixplex / Attached Duplex. Triplex, or Quadruplex / Stratified SFD, Bare Land Strata / Semi-Detached Strata Condo / Modular Home)	23.90%	31.50%	37.30%	41.10%	47.30%
IF Q6a == 3 (Condo - Townhouse / Mobile Home / Condo – Townhouse)	20.10%	26.50%	31.30%	34.70%	39.90%

If Q0 begins with H1, H2, H3, H4, H5, H8, H9 & Q2==3,4,5,6 & sex is Female

(Island of Montreal, Single Female)

Age	55-59	60-64	65-69	70-74	75-79
IF Q6a == 1, 7777777 (Single Family Dwelling / Detached Duplex, Triplex or Quadruplex / Link Home / Semi-Detached)	26.70%	33.10%	37.90%	39.90%	44.90%
IF Q6a == 2 (Townhouse, Rowhouse / Fiveplex and Sixplex / Attached Duplex. Triplex, or Quadruplex / Stratified SFD, Bare Land Strata / Semi-Detached Strata Condo / Modular Home)	25.50%	31.50%	36.10%	37.90%	42.70%
IF Q6a == 3 (Condo - Townhouse / Mobile Home / Condo – Townhouse)	21.50%	26.50%	30.30%	31.90%	36.10%

If Q0 is from Quebec and DOES NOT begin with H1, H2, H3, H4, H5, H8, H9 & Q2==1,2
(Rest of Quebec, Couple)

Age	55-59	60-64	65-69	70-74	75-79
IF Q6a == 1, 7777777 (Single Family Dwelling / Detached Duplex, Triplex or Quadruplex / Link Home / Semi-Detached)	15.03%	21.57%	29.77%	36.50%	43.63%
IF Q6a == 2 (Townhouse, Rowhouse / Fiveplex and Sixplex / Attached Duplex, Triplex, or Quadruplex / Stratified SFD, Bare Land Strata / Semi-Detached Strata Condo / Modular Home)	14.30%	20.50%	28.30%	34.70%	41.50%
IF Q6a == 3 (Condo - Townhouse / Mobile Home / Condo – Townhouse)	12.03%	17.30%	23.83%	29.23%	34.97%

If Q0 is from Quebec and DOES NOT begin with H1, H2, H3, H4, H5, H8, H9 & Q2==3,4,5,6 & sex is Male
(Rest of Quebec, Single Male)

Age	55-59	60-64	65-69	70-74	75-79
IF Q6a == 1, 7777777 (Single Family Dwelling / Detached Duplex, Triplex or Quadruplex / Link Home / Semi-Detached)	23.43%	30.90%	36.57%	40.43%	46.50%
IF Q6a == 2 (Townhouse, Rowhouse / Fiveplex and Sixplex / Attached Duplex, Triplex, or Quadruplex / Stratified SFD, Bare Land Strata / Semi-Detached Strata Condo / Modular Home)	22.30%	29.37%	34.77%	38.43%	44.17%
IF Q6a == 3 (Condo - Townhouse / Mobile Home / Condo – Townhouse)	18.77%	24.70%	29.30%	32.37%	37.23%

If Q0 is from Quebec and DOES NOT begin with H1, H2, H3, H4, H5, H8, H9 & Q2==3,4,5,6 & sex is Female
(Rest of Quebec, Single Female)

Age	55-59	60-64	65-69	70-74	75-79
IF Q6a == 1, 7777777 (Single Family Dwelling / Detached Duplex, Triplex or Quadruplex / Link Home / Semi-Detached)	24.97%	30.90%	35.43%	37.23%	41.97%
IF Q6a == 2 (Townhouse, Rowhouse / Fiveplex and Sixplex / Attached Duplex, Triplex, or Quadruplex / Stratified SFD, Bare Land Strata / Semi-Detached Strata Condo / Modular Home)	23.77%	29.37%	33.70%	35.43%	39.90%
IF Q6a == 3 (Condo - Townhouse / Mobile Home / Condo – Townhouse)	20.03%	24.70%	28.37%	29.83%	33.70%

If Q0 begins with M2, M3, M4G, M4H, M4J, M4K, M4M, M4L, M4M, M4N, M4P, M4R, M4S, M4T, M4V, M4W, M4X, M4Y, M5, M6, M7A, M9L, M9M, M9N & Q2==1,2
(City of Toronto, Couple)

Age	55-59	60-64	65-69	70-74	75-79
IF Q6a == 1, 7777777 (Single Family Dwelling / Detached Duplex, Triplex or Quadruplex / Link Home / Semi-Detached)	14.50%	21.10%	29.70%	36.90%	44.50%
IF Q6a == 2 (Townhouse, Rowhouse / Fiveplex and Sixplex / Attached Duplex, Triplex, or Quadruplex / Stratified SFD, Bare Land Strata / Semi-Detached Strata Condo / Modular Home)	13.70%	20.10%	28.30%	35.10%	42.30%
IF Q6a == 3 (Condo - Townhouse / Mobile Home / Condo – Townhouse)	11.50%	16.90%	23.70%	29.50%	35.70%

If Q0 begins with M2, M3, M4G, M4H, M4J, M4K, M4M, M4L, M4M, M4N, M4P, M4R, M4S, M4T, M4V, M4W, M4X, M4Y, M5, M6, M7A, M9L, M9M, M9N & Q2==3,4,5,6 & sex is Male
(City of Toronto, Single Male)

Age	55-59	60-64	65-69	70-74	75-79
IF Q6a == 1, 7777777 (Single Family Dwelling / Detached Duplex, Triplex or Quadruplex / Link Home / Semi-Detached)	23.10%	30.90%	36.90%	41.10%	47.70%
IF Q6a == 2 (Townhouse, Rowhouse / Fiveplex and Sixplex / Attached Duplex, Triplex, or Quadruplex / Stratified SFD, Bare Land Strata / Semi-Detached Strata Condo / Modular Home)	21.90%	29.30%	35.10%	39.10%	45.30%
IF Q6a == 3 (Condo - Townhouse / Mobile Home / Condo – Townhouse)	18.50%	24.70%	29.50%	32.90%	38.10%

If Q0 begins with M2, M3, M4G, M4H, M4J, M4K, M4M, M4L, M4M, M4N, M4P, M4R, M4S, M4T, M4V, M4W, M4X, M4Y, M5, M6, M7A, M9L, M9M, M9N & Q2==3,4,5,6 & sex is Female
(City of Toronto, Single Female)

Age	55-59	60-64	65-69	70-74	75-79
IF Q6a == 1, 7777777 (Single Family Dwelling / Detached Duplex, Triplex or Quadruplex / Link Home / Semi-Detached)	24.70%	30.90%	35.70%	37.70%	42.70%
IF Q6a == 2 (Townhouse, Rowhouse / Fiveplex and Sixplex / Attached Duplex, Triplex, or Quadruplex / Stratified SFD, Bare Land Strata / Semi-Detached Strata Condo / Modular)	23.50%	29.30%	33.90%	35.90%	40.70%
IF Q6a == 3 (Condo - Townhouse / Mobile Home / Condo – Townhouse)	19.70%	24.70%	28.50%	30.10%	34.30%

If Q0 is from Ontario and DOES NOT begin with M2, M3, M4G, M4H, M4J, M4K, M4M, M4L, M4M, M4N, M4P, M4R, M4S, M4T, M4V, M4W, M4X, M4Y, M5, M6, M7A, M9L, M9M, M9N & Q2==1,2
(Rest of Ontario, Couple)

Age	55-59	60-64	65-69	70-74	75-79
IF Q6a == 1, 7777777 (Single Family Dwelling / Detached Duplex, Triplex or Quadruplex / Link Home / Semi-Detached)	15.03%	21.77%	30.43%	37.63%	45.23%
IF Q6a == 2 (Townhouse, Rowhouse / Fiveplex and Sixplex / Attached Duplex, Triplex, or Quadruplex / Stratified SFD, Bare Land Strata / Semi-Detached Strata Condo / Modular Home)	14.23%	20.70%	28.97%	35.77%	43.03%
IF Q6a == 3 (Condo - Townhouse / Mobile Home / Condo – Townhouse)	11.97%	17.43%	24.30%	30.10%	36.30%

If Q0 is from Ontario and DOES NOT begin with M2, M3, M4G, M4H, M4J, M4K, M4M, M4L, M4M, M4N, M4P, M4R, M4S, M4T, M4V, M4W, M4X, M4Y, M5, M6, M7A, M9L, M9M, M9N & Q2==3,4,5,6 & sex is Male
(Rest of Ontario, Single Male)

Age	55-59	60-64	65-69	70-74	75-79
IF Q6a == 1, 7777777 (Single Family Dwelling / Detached Duplex, Triplex or Quadruplex / Link Home / Semi-Detached)	23.77%	31.63%	37.63%	41.83%	48.43%
IF Q6a == 2 (Townhouse, Rowhouse / Fiveplex and Sixplex / Attached Duplex, Triplex, or Quadruplex / Stratified SFD, Bare Land Strata / Semi-Detached Strata Condo / Modular Home)	22.57%	30.03%	35.83%	39.77%	45.97%
IF Q6a == 3 (Condo - Townhouse / Mobile Home / Condo – Townhouse)	19.03%	25.30%	30.10%	33.50%	38.70%

If Q0 is from Ontario and DOES NOT begin with M2, M3, M4G, M4H, M4J, M4K, M4M, M4L, M4M, M4N, M4P, M4R, M4S, M4T, M4V, M4W, M4X, M4Y, M5, M6, M7A, M9L, M9M, M9N & Q2==3,4,5,6 & sex is Female
(Rest of Ontario, Single Female)

Age	55-59	60-64	65-69	70-74	75-79
IF Q6a == 1, 7777777 (Single Family Dwelling / Detached Duplex, Triplex or Quadruplex / Link Home / Semi-Detached)	25.37%	31.63%	36.43%	38.43%	43.43%
IF Q6a == 2 (Townhouse, Rowhouse / Fiveplex and Sixplex / Attached Duplex, Triplex, or Quadruplex / Stratified SFD, Bare Land Strata / Semi-Detached Strata Condo / Modular Home)	24.17%	30.03%	34.63%	36.57%	41.37%
IF Q6a == 3 (Condo - Townhouse / Mobile Home / Condo – Townhouse)	20.30%	25.30%	29.10%	30.70%	34.90%

If Q0 begins with V5K, V5L, V5M, V5N, V5P, V5R, V5S, V5T, V5V, V5W, V5Y, V6A, V6B, V6C, V6E, V6G, V6H, V6J, V6K, V6L, V6M, V6N, V6P, V6R, V6S, V6T, V6Z, V7G, V7H, V7J, V7K, V7L, V7M, V7N, V7P, V7R, V7S, V7T, V7V, V7W, V7X, V7T & Q2==1,2

(City of Vancouver, Couple)

Age	55-59	60-64	65-69	70-74	75-79
IF Q6a == 1, 7777777 (Single Family Dwelling / Detached Duplex, Triplex or Quadruplex / Link Home / Semi-Detached)	15.30%	22.10%	30.70%	37.90%	45.70%
IF Q6a == 2 (Townhouse, Rowhouse / Fiveplex and Sixplex / Attached Duplex, Triplex, or Quadruplex / Stratified SFD, Bare Land Strata / Semi-Detached Strata Condo / Modular Home)	14.50%	21.10%	29.30%	36.10%	43.30%
IF Q6a == 3 (Condo - Townhouse / Mobile Home / Condo – Townhouse)	12.30%	17.70%	24.70%	30.50%	36.50%

If Q0 begins with V5K, V5L, V5M, V5N, V5P, V5R, V5S, V5T, V5V, V5W, V5Y, V6A, V6B, V6C, V6E, V6G, V6H, V6J, V6K, V6L, V6M, V6N, V6P, V6R, V6S, V6T, V6Z, V7G, V7H, V7J, V7K, V7L, V7M, V7N, V7P, V7R, V7S, V7T, V7V, V7W, V7X, V7T & Q2==3,4,5,6 & sex is Male

(City of Vancouver, Single Male)

Age	55-59	60-64	65-69	70-74	75-79
IF Q6a == 1, 7777777 (Single Family Dwelling / Detached Duplex, Triplex or Quadruplex / Link Home / Semi-Detached)	24.10%	31.90%	38.10%	42.30%	48.70%
IF Q6a == 2 (Townhouse, Rowhouse / Fiveplex and Sixplex / Attached Duplex, Triplex, or Quadruplex / Stratified SFD, Bare Land Strata / Semi-Detached Strata Condo / Modular Home)	22.90%	30.30%	36.10%	40.10%	46.30%
IF Q6a == 3 (Condo - Townhouse / Mobile Home / Condo – Townhouse)	19.30%	25.70%	30.50%	33.70%	38.90%

If Q0 begins with V5K, V5L, V5M, V5N, V5P, V5R, V5S, V5T, V5V, V5W, V5Y, V6A, V6B, V6C, V6E, V6G, V6H, V6J, V6K, V6L, V6M, V6N, V6P, V6R, V6S, V6T, V6Z, V7G, V7H, V7J, V7K, V7L, V7M, V7N, V7P, V7R, V7S, V7T, V7V, V7W, V7X, V7T & Q2==3,4,5,6 & sex is Female

(City of Vancouver, Single Female)

Age	55-59	60-64	65-69	70-74	75-79
IF Q6a == 1, 7777777 (Single Family Dwelling / Detached Duplex, Triplex or Quadruplex / Link Home / Semi-Detached)	25.70%	31.90%	36.70%	38.90%	43.90%
IF Q6a == 2 (Townhouse, Rowhouse / Fiveplex and Sixplex / Attached Duplex, Triplex, or Quadruplex / Stratified SFD, Bare Land Strata / Semi-Detached Strata Condo / Modular Home)	24.50%	30.30%	34.90%	36.90%	41.70%
IF Q6a == 3 (Condo - Townhouse / Mobile Home / Condo – Townhouse)	20.50%	25.50%	29.50%	31.10%	35.10%

If Q0 is from British Columbia and DOES NOT begin with V5K, V5L, V5M, V5N, V5P, V5R, V5S, V5T, V5V, V5W, V5Y, V6A, V6B, V6C, V6E, V6G, V6H, V6J, V6K, V6L, V6M, V6N, V6P, V6R, V6S, V6T, V6Z, V7G, V7H, V7J, V7K, V7L, V7M, V7N, V7P, V7R, V7S, V7T, V7V, V7W, V7X, V7T & Q2==1,2

(Rest of British Columbia, Couple)

Age	55-59	60-64	65-69	70-74	75-79
IF Q6a == 1, 7777777 (Single Family Dwelling / Detached Duplex, Triplex or Quadruplex / Link Home / Semi-Detached)	14.50%	20.97%	29.03%	35.77%	42.97%
IF Q6a == 2 (Townhouse, Rowhouse / Fiveplex and Sixplex / Attached Duplex. Triplex, or Quadruplex / Stratified SFD, Bare Land Strata / Semi-Detached Strata Condo / Modular Home)	13.77%	19.97%	27.70%	34.03%	40.83%
IF Q6a == 3 (Condo - Townhouse / Mobile Home / Condo – Townhouse)	11.70%	16.83%	23.30%	28.70%	34.37%

If Q0 is from British Columbia and DOES NOT begin with V5K, V5L, V5M, V5N, V5P, V5R, V5S, V5T, V5V, V5W, V5Y, V6A, V6B, V6C, V6E, V6G, V6H, V6J, V6K, V6L, V6M, V6N, V6P, V6R, V6S, V6T, V6Z, V7G, V7H, V7J, V7K, V7L, V7M, V7N, V7P, V7R, V7S, V7T, V7V, V7W, V7X, V7T & Q2==3,4,5,6 & sex is Male

(Rest of British Columbia, Single Male)

Age	55-59	60-64	65-69	70-74	75-79
IF Q6a == 1, 7777777 (Single Family Dwelling / Detached Duplex, Triplex or Quadruplex / Link Home / Semi-Detached)	22.83%	30.17%	35.90%	39.77%	45.83%
IF Q6a == 2 (Townhouse, Rowhouse / Fiveplex and Sixplex / Attached Duplex. Triplex, or Quadruplex / Stratified SFD, Bare Land Strata / Semi-Detached Strata Condo / Modular Home)	21.70%	28.70%	34.03%	37.77%	43.50%
IF Q6a == 3 (Condo - Townhouse / Mobile Home / Condo – Townhouse)	18.23%	24.17%	28.77%	31.77%	36.63%

If Q0 is from British Columbia and DOES NOT begin with V5K, V5L, V5M, V5N, V5P, V5R, V5S, V5T, V5V, V5W, V5Y, V6A, V6B, V6C, V6E, V6G, V6H, V6J, V6K, V6L, V6M, V6N, V6P, V6R, V6S, V6T, V6Z, V7G, V7H, V7J, V7K, V7L, V7M, V7N, V7P, V7R, V7S, V7T, V7V, V7W, V7X, V7T & Q2==3,4,5,6 & sex is Female

(Rest of British Columbia Single Female)

Age	55-59	60-64	65-69	70-74	75-79
IF Q6a == 1, 7777777 (Single Family Dwelling / Detached Duplex, Triplex or Quadruplex / Link Home / Semi-Detached)	24.37%	30.17%	34.70%	36.63%	41.30%
IF Q6a == 2 (Townhouse, Rowhouse / Fiveplex and Sixplex / Attached Duplex. Triplex, or Quadruplex / Stratified SFD, Bare Land Strata / Semi-Detached Strata Condo / Modular Home)	23.10%	28.70%	32.97%	34.77%	39.30%
IF Q6a == 3 (Condo - Townhouse / Mobile Home / Condo – Townhouse)	19.43%	24.10%	27.83%	29.30%	33.10%

