

An Investigation of Time Preferences, Life Expectancy, and Annuity Versus Lump-Sum Choices: Can Smoking Harm Long-Term Saving Decisions?

Abigail Hurwitz¹, Orly Sade²

ABSTRACT

We used proprietary data from an Israeli insurance corporation and exploited the fact that Israeli pension insurance policies do not take health conditions or smoking status into account in annuity pricing to investigate the potential effect of being a smoker on long-term savings disbursement choices at retirement. We found that contrary to the theory suggesting that smokers have higher discount rates (and thus should prefer the lump-sum option), and even though the pension insurance policy-pricing mechanism means that (all else being equal) smokers would be offered the same annuity as nonsmokers, smokers did not prefer the lump-sum option. In a survey of life expectancy perceptions, we found support for the conjecture that smokers experience a certain degree of self-illusion regarding their own life expectancy and do not perceive themselves as having a shorter-than-average life-span.

Keywords: Self-assessed life expectancy, smoking, financial decisions, time preferences

¹Department of Finance, The Wharton School of the University of Pennsylvania (visiting); Department of Finance, The College of Management Academic Studies, Israel, hurwitza@wharton.upenn.edu

²Department of Finance, The Jerusalem School of Business Administration, The Hebrew University of Jerusalem, Israel, orlysade@huji.ac.il

Significance statement

We investigated the results of financial decisions made by 1,556 individuals upon retirement using data from an Israeli insurance corporation. To optimize the results of such decisions, one should consider one's expected longevity. In our sample, smokers did not behave as expected in contrast to people with a major disease, when we controlled for other related variables.

We examined smokers' life perception by administering a questionnaire to a representative sample of 963 participants aged 50–70 years. We documented that smokers were optimistic regarding their life expectancy. Their optimism affected not only their expectations about physical health but also other aspects of life for which decisions are based on life expectancy, such as their financial situation.

1. Introduction

Cigarette smoking is a popular behavior but also the leading preventable cause of death in the Western world (Wang, 2014). For instance, it is estimated to be responsible for roughly 20% of the total mortality in the United States since the 1990s (Mokdad et al., 2004). Yet if smoking is a clearly unhealthy behavior and a significant determinant of early mortality, why do people smoke? The economics literature suggests that differences in personal characteristics such as time preference, self-control, and risk preference are involved.

Cigarette smokers are predictably reluctant to give up the pleasure of smoking in the present in favor of health and longevity in the future. In the language of time preference theory, smokers are thought to have higher discount rates, meaning that they would demand higher compensation (than nonsmokers) to postpone any consumption from the present to the future. Thus, some empirical papers have used smoking as a proxy for present preferences in different contexts (e.g., Lusardi et al., 2010; Munasinghe and Sicherman, 2006; Scharff and Viscusi, 2011). Still, there is ongoing debate regarding the exact relationship between smoking and time preference (e.g., Adams and Nettle, 2009; Fuchs, 1982; Harrison et al., 2010). Empirical studies (mostly based on surveys) have documented a low correlation between smoking and different measures of time preference (some found a relation for male participants only) or have found the opposite relation, showing that smokers actually have lower discount rates than nonsmokers (e.g., Chabris et al., 2008; Reynolds et al., 2003).¹ Concerns related to time preference and individual choice are also involved in long-term saving decisions. Yaari's (1965) theoretical work suggests that annuities have substantial value and that under a certain set of assumptions, retirees should generally use annuities on retirement, in contrast to empirical findings

¹ Time preference is not the only explanation suggested in the literature for smoking behavior. Lipkus et al. (1994) reviewed characteristics of smokers and demonstrated that smokers differ from the general population in traits such as impulsiveness, rebelliousness, sensation seeking, gregariousness, self-presentational concerns, and hostility. Keough et al. (1999) also reviewed many previous explanations for substance use such as anxiety, neuroticism, lower impulse control, and novelty seeking, among others, and concluded that time preference is an important variable to be considered in relation to health-related behaviors, including cigarette smoking. Ert et al. (2013) related smoking behavior to a tendency to take risks.

that many retirees prefer the lump-sum choice, for behavioral reasons, among others (e.g., Benartzi et al., 2011).

In this paper, we focus on the annuitization decision of smokers in Israel who were insured by pension insurance policies. We exploit a special feature of such products—their pricing—that considers only gender, actuarial life expectancy, and the expected rate of return. Pension insurance policy pricing in Israel does not take any health conditions (or smoking status) into account (this means that with all other variables remaining equal, smoking and nonsmoking retirees will be offered the exact same amount of annuity). This makes an interesting test case for smokers' financial decisions. If the decision to smoke is explained by time preference, then smokers should be more likely than nonsmokers (all other variables remaining equal) to prefer a lump sum. Moreover, the significantly lower life expectancy for smokers compared to nonsmokers, combined with being offered the exact same annuity (same payment per month) as a nonsmoker (all else being equal), reinforces the hypothesis that smokers should have a lower preference for annuities than nonsmokers. To clarify, a smoker should receive the same amount of annuity payment per month as the nonsmoker, for the rest of her or his life, despite being expected to live fewer years and as a result to receive fewer payments overall. If smoking is correlated with risky behavior then based on advantageous selection (De Meza, et al. (2001)), again smokers should have a lower preference for annuities (less longevity insurance) as suggested by Cutler et al. (2008).

Our investigation relied on unique proprietary data from an insurance corporation in Israel that contained detailed information regarding the decisions of retirees as well as a rich set of parameters relating to these retirees, including information on smoking behavior. This data set gave us the opportunity to investigate real annuitization decisions. Our sample consisted of 1,556 retirees during the years 2009–2013 who had cumulative savings exceeding NIS 500,000.² Each client from our

² Israeli new shekels, close to USD 142,000 as of 2017. Further explanation of our choice of sample is provided in Section 4.

sample could choose to withdraw a lump sum, an annuity, or both, subject to the minimal mandatory annuity law³ (only applying to funds accumulated after 2008). Surprisingly, in our sample, smokers did not have a stronger preference for the lump-sum option than nonsmokers. Yet, those with other health issues, such as people with diabetes, did prefer the lump-sum option, as expected. This finding contradicts the smokers' time preference theory, discussed above. It is also puzzling to find that the smokers' behavior was different from that of people who have impaired health, since both conditions are, on average, correlated with a shorter life expectancy.

We examined two possible explanations for the findings. First, it could be that even though research has found a close relationship between smoking and medical conditions, smokers do not perceive themselves as having a shorter life-span and experience certain self-illusions regarding their own life expectancy. To investigate life expectancy perceptions of individuals in Israel, we obtained the results of an online survey of a representative sample of 963 Israeli residents aged 50–70 years. The results support the conjecture that smokers experience self-illusions regarding health and life expectancy. We provide several robustness tests to support these findings, and in particular we show that smoking (controlling for a current medical condition) does not significantly affect health perceptions.

The second possible explanation is related to self-control awareness. O'Donoghue and Rabin (1999) defined sophisticated people as those who are fully aware of issues related to their self-control. In our context, if smokers are at least partially aware of problems with their self-control, they may use different mechanisms, including annuities, to pace their spending. We assumed that if they used annuities to overcome their self-control problems (a costly mechanism), we would observe them using other mechanisms as well. We conducted several tests and found no support for this possible explanation.

³ The minimal annuity set by law in Israel is approximately NIS 4,405 in 2017 monetary values.

In summary, we found evidence that is consistent with the life expectancy self-illusion explanation for smokers' behavior but no evidence to support the self-control awareness explanation. Our project relates and contributes to the literature on time preference, life expectancy, smoking, and long-term saving decisions.

This paper is structured as follows: We first review the setting in which our investigation took place and describe the annuity choices. We then present the data and report the empirical results. Thereafter we present the additional survey and its results.

2. The setting

2.1 Smoking in Israel and around the globe

According to the analysis of the U.S. Centers for Disease Control and Prevention, as of 2014, the percentage of American adults aged 18 years and over who were defined as “current cigarette smokers” (i.e., those who had smoked more than 100 cigarettes in their lifetime and now smoked every day or some days) was 16.8%. The percentage was higher for men (18.9%) than for women (14.8%).⁴ According to a report on smoking conducted by the Israeli Ministry of Health in 2014, the percentage of Israeli adults aged 21 years and over who were “current cigarette smokers” (i.e., those who smoke every day or some days) was 19.8%, with the percentage being higher for men (27.3%) than for women (12.6%).⁵ There is a vast body of research that indicates smoking is an unhealthy behavior. Thus, many countries around the world require tobacco companies to warn consumers about the harmful effects of smoking.

Data from the Israeli Ministry of Health⁶ demonstrate the mortality difference between smokers and nonsmokers in selected countries. It is evident that there is a gap of more than 9 years in life expectancy between the two groups, and that the gap is even wider in the United States (12 years for

⁴ Early release of selected estimates based on data from the National Health Interview Survey, 2014, based on data from the National Health Interview Survey, 1997–2014, sample adult core component.

⁵ Ministry of Health report on smoking in Israel 2014, published May 2015.

⁶ Ministry of Health report on smoking in Israel 2013, published May 2014.

men and 11 years for women).⁷ As further evidence, the price gap for life insurance policies for smokers versus nonsmokers in Israel rises with age.

The literature suggests that smokers are different in their personal characteristics such as time preference, risk preference, and impulsivity. Lipkus et al. (1994) concluded that indicators of impulsiveness, rebelliousness, sensation seeking, gregariousness, self-presentational concerns, and hostility, measured in college-age students, best predicted people who were likely to begin smoking. People who continued smoking were more hostile and engaged in more sensation-seeking behaviors.

Other researchers have argued that self-control is at the heart of time preference theory (Lahav et al., 2015; O'Donoghue and Rabin, 1999; Thaler and Shefrin, 1981). Theoretical work has suggested that smoking and time preference are closely linked (e.g., Becker and Murphy, 1988) and that self-control problems can be modeled as present-biased preferences (O'Donoghue and Rabin, 1999).

Yet the empirical results regarding smoking and time preferences are inconsistent. Some empirical and experimental studies found direct support for the relationship between smoking and time preference (e.g., Bickel et al., 1999; Fuchs, 1982; Munasinghe and Sicherman, 2006; Scharff and Viscusi, 2011; Harrison, Hofmayer, Ross and Swarthout, 2017). Others found vague or only partial support for the relationship between smoking and time preference. For instance, one study (Khwaja et al., 2007) found no significant difference between smokers and nonsmokers in discount rates but did find a difference in other measures of time preference, such as impulsivity and financial planning. Another (Adams and Nettle, 2009) documented that only one time preference measure tested was associated with smoking, and one study (Harrison et al., 2010) found a significant correlation between individual discount rates and smoking only among men.

⁷ Similar results were reported by, among others, Jha et al. (2013), who noted that “life expectancy was increased 4 to 10 years among smokers who quit, depending on their age at the time of smoking cessation”; Taylor et al. (2002), who concluded that “life expectancy among smokers who quit at the age of 35 exceeded that of continuing smokers by 6.9 to 8.5 years for men and 6.1 to 7.7 years for women”; and Streppel et al. (2007), who mentioned that “average cigarette smoking reduced the total life expectancy by 6.8 years, whereas heavy cigarette smoking reduced the total life expectancy by 8.8 years.”

In the economics literature, smoking has been associated with risky behavior (e.g. Anderson and Mellor, 2008), and it has been argued that smoking status contains precise information about individuals that is not captured by economic and psychological data alone (e.g., Viscusi, 1991). It has also been suggested that there might be some personal characteristics, as yet unrevealed, that are expressed in smoking and ultimately affect financial behavior (Adams et al., 2014).

2.2 Structure of the Israeli pension system

The Israeli pension system consists of two layers, one public and the other private. The private layer is a complex pension system that consists of five types of pensions/long-term savings products: (a) “old” pension funds,⁸ (b) “new” pension funds,⁹ (c) “new” general pension funds, (d) provident funds, and (e) pension insurance policies.¹⁰ The focus of this project is on choices in the private layer that are related to the pension insurance policies. These policies, some of which provide the saver with tax benefits, are managed by insurance companies that provide both operational management and investment of the funds.

It is important to emphasize that Israeli pension insurance policies differ in form from similar products worldwide. In Israel, savers with a pension insurance policy that was bought prior to 2013 received a contractual guarantee of the conversion factor used to convert a lump sum to an annuity, according to the terms that existed in the market at the time the policy was issued.¹¹ Twenty-three percent of the funds under management in Israel in 2013 were in pension insurance policies.¹²

⁸ Defined benefit pension funds that were closed to new clients by January 1, 1995.

⁹ Defined contribution pension funds that were first established on January 1, 1995, and must preserve actuarial balance.

¹⁰ Also known in Israel as management insurance, the trade name of pension insurance products designed for employees. They sets the terms of termination of the policy and include pension rights and other financial rights. These policies include both a saving component and an insurance component (for different kind of risks such as death and disability).

¹¹ For example, the insured could purchase this guarantee at the age of, say, 25 years. No such guarantee is given in the United States. In Germany, a client can buy a guaranteed annuity before retirement but the insurance company is allowed to change the guaranteed conversion factor up to 30%.

¹² Source of data: Israeli Ministry of Finance, annual report, 2013.

3. Annuity versus lump-sum choices

3.1 Literature review

Theoretical work starting with Yaari (1965) has claimed that annuities have substantial value, and that retirees should generally use annuities for retirement. Yet more recent empirical studies have found little evidence that retirees follow this advice (e.g., Beshears et al., 2014; Ganegoda and Bateman, 2008). The different explanations of retirees' choices generally follow one of three trends: market imperfections, product features, or customer characteristics (socioeconomic or behavioral). In our literature review, we focus on the last: the individual characteristics.

Variables such as gender, marital status, children, and risk aversion have been discussed with no definitive conclusions (Agnew et al., 2008; Büttler and Teppa, 2007; Cappelletti et al., 2013; Chalmers and Reuter, 2012). Research has highlighted other personal characteristics in an attempt to explain the puzzle, such as medical conditions (Sinclair and Smetters, 2004; Turra and Mitchell, 2008), prior existence of a social security annuity (Benartzi et al., 2011; Chalmers and Reuter, 2012), and the subjective discount rate (Büttler and Teppa, 2007; Warner and Pleeter, 2001).

Additional studies have revealed several psychological and irrational behavioral barriers to annuitization, such as complexity of the decision (Brown et al., 2013, 2017), default biases (Agnew et al., 2008; Büttler and Teppa, 2007), difficulty in making irreversible decisions (Brown and Warshawsky, 2001), different biases that arise from framing (Benartzi et al., 2011; Beshears et al., 2014; Goldstein, Hal, Hershfield and Benartzi, 2016), difficulty parting with accumulated money (Benartzi et al., 2011), mental accounting (Benartzi et al., 2011), availability errors (Hu and Scott, 2007), ambiguity regarding self-rated life expectancy (Smith et al., 2001), and the belief that annuities have a “smell of death” (Statman, 2014).

3.2 Annuity versus lump-sum savings products in Israel

The extensive process of reforming the Israeli pension system created a diverse market for annuities. Unlike annuities in many other countries, all savings products in Israel are linked to inflation. We describe the annuities available in Israel below.

Since 2000, pension insurance policies can be divided into two categories: those designated for a lump sum and those designated for an annuity. Prior to 2008, lump-sum policies allowed a lump-sum payment according to current law¹³; after 2008, such policies allowed a lump-sum payment only for retirees who had saved a sufficient amount of money to withdraw a minimal annuity as set by the revised law.

4. The data

We obtained proprietary data from an insurance corporation in Israel regarding retirees with pension insurance policies. Our data set contained information on retirees' withdrawal schemes between the years 2009 and 2013. We initially received information on 18,860 retirees, including 1,556 retirees with accumulations of at least NIS 500,000. Each client could choose a withdrawal of a lump sum, an annuity, or both, subject to the minimal mandatory annuity law (applying only to funds accumulated after 2008, as explained above).

Individuals in Israel can invest their long-term savings in several plans, simultaneously or over time, to reflect, for example, changes that occur in the workplace over the course of a lifetime. The initial data set we received showed very large differences in the amounts accumulated, possibly indicating that it did not necessarily reflect people's main long-term saving plan. To avoid the potential mental accounting effects related to small amounts on our analysis, we chose to focus our investigation on individuals' choices concerning meaningful sums of money.¹⁴ However, since we lacked

¹³ The law changed in 2005, after which one could withdraw a lump sum only after the age of 60 years, whereas previously it could be withdrawn even at a younger age if the criteria set by the law were satisfied.

¹⁴ For accumulations lower than NIS 500,000, almost 80% of the population chose the full lump-sum option, in contrast to 15.87% percent for the higher amounts.

information regarding the income level of the retirees in this data set, we analyzed only accounts with accumulated funds of at least NIS 500,000. We based this threshold on an investigation of characteristics of long-term savers in Israel.¹⁵

The administrative data set contained socioeconomic and demographic data for each retiree, such as date of birth, date of purchase of the policy, date of disbursement, gender, marital status, smoking status, annuity factor (an annuity factor is the value that determines how much annuity a retiree will receive from a certain amount of lump sum; it is generally specified in terms of either years or months), investment management method, medical and profession supplements to the policies, residence, last occupation, and other insurance additions to the policy (risk, work disability, long-term care insurance, and health insurance).

For clients with accumulated funds of at least NIS 500,000, the mean age was 67.2 years (74% men, 26% women; 75.5% married, 9.64% divorced and 4.82% widowed). The insurance corporation classified 9.64% of these participants as cigarette smokers.¹⁶

The majority of retirees in our sample chose to receive at least some portion of the money via an annuity. This can be explained by the Israeli legislation described earlier and by the fact that in the past, owners of pension insurance policies have had preferred conversion factors that made annuities very attractive. Nevertheless, our aim was not to focus on patterns in annuity withdrawal in general in Israel, or to solve the “annuity puzzle.” Rather, we wanted to focus on long-term saving choices of

¹⁵This threshold was chosen because we aimed to address decisions of retirees whose savings in this insurance corporation were relatively substantial (some retirees might have several insurance policies in different insurance companies, started by different employers). We compared our data to public information published by Old Mivtachim, the largest Israeli “old pension fund” (historically, members of these funds usually did not have other pension accounts). We can see that in our data the average accumulated fund designated for an annuity (rather than a lump sum) was NIS 794,000 with standard deviation of NIS 533,000 (whereas in the public data published by Old Mivtachim, the average accumulation for clients between the ages of 60 and 64 was NIS 728,000). The average annuity of clients in our data was NIS 3,816 monthly (also similar to the average annuity reported by Old Mivtachim, NIS 4,177). Moreover, the average (client level) accumulation in a lump-sum product in our data was NIS 449,000, with a standard deviation of NIS 583,000, and the maximum lump-sum accumulation was NIS 8 million.

¹⁶ “Smokers” could be current or former cigarette smokers because we do not know how frequently the insurance companies update the socioeconomic data.

smokers versus nonsmokers and of savers with documented impaired health. Table 1 presents the distribution of annuity choices by gender, marital status, and smoking status.

[TABLE 1]

Women were significantly more likely to choose a full annuity than men (92.1% vs. 81.3%), although in Israeli pension insurance policies, gender is taken into account in the pricing of the policies (hence from the perspective of pricing we did not expect any gender differences). Single people were most likely to choose an annuity, consistent with previous literature (e.g., Büttler and Teppa, 2007). Regarding smokers in our data, 76% were male and their average accumulation was NIS 770,000, while the average accumulation of nonsmokers was NIS 945,000.

5. Interesting setting for investigating the time preference argument about smokers: Do smokers choose fewer annuities?

5.1 Why is it an interesting setting?

The calculation of a specific retiree's monthly payment usually uses an annuity factor, which generally considers variables that affect life expectancy, such as gender. In Israel, health conditions are not part of the annuity pricing mechanism. As a result, two people with exactly the same traits other than their health status will be offered the same annuity by the insurance companies. Thus, we expected that smokers (and other less healthy people, either actually or in expectation) would realize that their life expectancy is somewhat lower than (healthy) nonsmokers, and that this realization would ultimately affect their annuity versus lump-sum choice.

Our conjecture was based on literature (e.g., Cappelletti et al., 2013) that demonstrated that impaired health reduces the preference for an annuity. This result is consistent with two different explanations: First, retirees wish to avoid financial shocks, which are often caused by unexpected medical expenses (Sinclair and Smetters, 2004), and therefore retirees with impaired health will prefer the lump-sum choice. Alternatively, retirees who are ill should anticipate a lower life expectancy, and as a result they might be more sensitive to bequest motives.

Advantageous selection suggests that individuals with a higher tolerance for risk may not only demand less insurance but may also invest in activities that increase their expected claims, leading to the higher risk having less coverage (De Meza, David, and David C. Webb 2001). As empirical evidence relates smoking to risky behavior, according to the advantages selection theory one would expect smokers to buy less annuity, (less longevity insurance), as they engage in smoking, which is a risky activity.

Since the literature suggests that smoking status is a good proxy for impaired health, for risky behavior, and that smokers may have a higher present preference (reflected in a higher subjective discount rate), we hypothesized that smokers would choose fewer annuities than nonsmokers, all else being equal.¹⁷

5.2 Smoking and annuity choices—the empirical investigation

We divided our sample into three groups based on disbursement choice: An individual was categorized as *full annuity* if all accumulations were converted into an annuity (regardless of the annuity value), as *partial annuity* if some of the accumulated savings were converted into an annuity, and as *full lump sum* if none of the accumulated savings were converted into an annuity. We found that smokers significantly preferred annuities. As shown in Fig. 1, 61% of smokers chose full annuities, whereas only 47% of nonsmokers chose this option. This decision was not due to a difference in conversion factors between smokers and nonsmokers (comparison of the conversion factors revealed no significant difference between those for smokers and nonsmokers).

[FIGURE 1]

Next, we conducted a series of descriptive regressions to examine the characteristics of retirees who chose to annuitize. Our characteristics were divided into three main groups: (a) personal, (b) pension policy, and (c) macroeconomic fixed effects (FE).

¹⁷ Unless they use annuity as a mechanism for self-control issues, which we discuss later.

5.2.1 Choosing an annuity

In our first examination, Equation 1 ignores smoking and impaired health and investigates the potential main characteristics that can affect the decision to choose an annuity:

[1]

$$y_{\text{ann}} = \alpha + \beta_1 \text{male} + \beta_2 \text{retirement age} + \beta_3 \text{GDP} + \beta_4 \text{RF} + \beta_5 \text{total amount} + \beta_6 \text{divorced} \\ + \beta_7 \text{widowed} + \beta_8 \text{married} + \beta_9 \text{unknown marital status} + \beta_{10} \text{purchase}_{\text{age}} \\ + \beta_{11} \text{no. of policies} + \beta_{12} \text{percent post 2008} + \epsilon_i$$

where y_{ann} is a dummy variable for annuitization ($y_{\text{ann}} = 1$ if the retiree chooses any portion of the whole as an annuity; as a robustness check we also looked at the propensity to annuitize and the choice of full annuity, described below); retirement age is the retiree's age at the time of decision; GDP is the Israeli gross domestic product in the retirement year in fixed prices¹⁸; RF is the risk-free rate in the retirement year¹⁹; total amount is the total accumulation at retirement; divorced, widowed, married, and unknown marital status are dummy variables for marital status (the category "single" was omitted)²⁰; $\text{purchase}_{\text{age}}$ is the average age of the retiree (over all of the retiree's policies) when the policies were purchased (this variable is correlated with the client conversion factor and hence can serve as a proxy for it; we do not have information about the conversion factor for clients who chose the full lump-sum option); no. of policies is the number of different policies for each client with this particular insurance corporation; and percent post 2008 is the proportion of money accumulated after 2008 that therefore must be withdrawn as an annuity to satisfy the mandatory monthly annuity.

¹⁸ Data from the Israeli Central Bureau of Statistics (CBS).

¹⁹ The Bank of Israel's declared effective rate of return.

²⁰ In addition to controlling for marital status, we checked the policies themselves and found that the default option in these policies was a "single life annuity." For robustness, we also investigated the choices of single individuals separately. Admittedly, there were very few singles in our sample (only 35: 8 smokers and 27 nonsmokers). In this sample, too, 75% of the smokers and 74% of the nonsmokers chose to annuitize.

The results for probit and logit models are displayed in columns 1–4 in Table 2. Overall, all models are significant with pseudo R^2 equal to around 25%.

[Table 2]

We found that purchase age and macroeconomic status were related to the annuity choice, but most of the individual socioeconomic characteristics did not significantly affect individual preferences. This is consistent with previous literature (e.g., Bütler and Teppa, 2007).

To understand both the impact of seniority in the fund and conversion factors, we included “purchase age” in the regression. Its coefficient is negative and significant in all the specifications, meaning that a 1-year delay in the purchase of a pension tool will reduce the likelihood of choosing an annuity (this could result from the increase in the conversion factor). With respect to the specification of the year dummies (column 2 in Table 2), holding all other variables at their mean, an increase of 1 year in the purchase age reduced the probability of purchasing an annuity by 1.6%.

In contrast to previous literature (e.g., Bütler and Teppa, 2007), the stock of capital at retirement did not play an important role in any of the specifications. Nevertheless, all regressions refer to accumulations of at least NIS 500,000. Age at retirement and number of policies were not significant.

Some may argue that using GDP and rate of return to capture macroeconomic FE is problematic because we investigated only a short period of time. Hence we used a year FE method as a robustness test, as indicated in Equation 2:

[2]

$$y_{\text{ann}} = \alpha + \beta_1 \text{male} + \beta_2 \text{retirement age} + \beta_3 \text{year dummies}' + \beta_4 \text{total amount} + \beta_5 \text{divorced} \\ + \beta_6 \text{widowed} + \beta_7 \text{married} + \beta_8 \text{unknown marital status} + \beta_9 \text{purchase age} \\ + \beta_{10} \text{no. of policies} + \beta_{11} \text{percent 2008} + \epsilon_i$$

where year dummies are dummy variables for the years 2009–2012, indicating the year in which the retiree made the choice between an annuity and a lump sum as defined above (2013 was omitted).

For most variables, the modification from Equation 1 did not make a difference. The 2009 dummy (the year in which the annuitization decisions were made) is positive and significant, implying that a year after the financial crisis, the likelihood of annuitizing increased. For robustness, we also checked the impact of including the yield on market portfolio (TA-100 Index), and the results remained similar. Next we omitted the GDP, rate of return, and TA-100 variables and used the year dummies.

5.2.2 Smoking and medical condition

Following the analysis above, we examined the impact of smoking and medical condition on the decision to annuitize, while controlling for the other variables that were previously discussed. Three variables were chosen as proxies for impaired health: if the individual was a smoker; if the individual had a surcharge required by the insurance company for impaired health; and if the individual had a surcharge required by the insurance company for a risky profession. The variables were added to our previous specifications (Equation 2). The results of the estimation of Equation 3 are reported in Table 3.

[3]

$$\begin{aligned}
 y_{\text{ann}} = & \alpha + \beta_1 \text{male} + \beta_2 \text{retirement age} + \beta_3 \text{year dummies} + \beta_4 \text{total amount} + \beta_5 \text{divorced} \\
 & + \beta_6 \text{widowed} + \beta_7 \text{married} + \beta_8 \text{unknown marital status} + \beta_9 \text{purchase age} \\
 & + \beta_{10} \text{no. of policies} + \beta_{11} \text{percent post 2008} + \beta_{12} \text{smoker} \\
 & + \beta_{13} \text{mortality surcharge} + \beta_{14} \text{professional surcharge} + \epsilon_i
 \end{aligned}$$

where smoker is a categorical variable with the value of 1 for smoker and 0 for nonsmoker, mortality increase is a dummy variable for having a surcharge required by an insurance company for impaired health (=1; note that the increased premium is for the risk insurance and not for the annuity because health factors are not taken into account when pricing annuities. We expected that retirees with a mortality surcharge would be less likely to annuitize because of lower life expectancy), and professional increase is a dummy variable for a surcharge required by an insurance company for having

a risky profession (=1; the increased premium is for the risk insurance and not for the annuity. We expected that retirees with a professional surcharge would be less likely to annuitize because of lower life expectancy, because of damaged health caused by the risky profession).

[TABLE 3]

For robustness, to investigate the relationship between smoking and the other health proxies that can affect the estimation, we estimated the same regression without the insurance tariff add-ons:

[4]

$$y_{\text{ann}} = \alpha + \beta_1 \text{male} + \beta_2 \text{retirement age} + \beta_3 \text{year dummies} + \beta_4 \text{total amount} + \beta_5 \text{divorced} \\ + \beta_6 \text{widowed} + \beta_7 \text{married} + \beta_8 \text{unknown marital status} + \beta_9 \text{purchase age} \\ + \beta_{10} \text{no. of policies} + \beta_{11} \text{percent 2008} + \beta_{12} \text{smoker} + \epsilon_i$$

In Table 3, we present the estimated effect of medical condition on the annuity decision. Our results are qualitatively similar when using either logit or probit models. In particular, our main coefficients of interest (capturing the effect of medical condition) have the same sign and similar levels of statistical significance when using either of the estimation techniques. The precise magnitudes of the estimated marginal effects from probit or logit estimations are sensitive to the point in the distribution at which marginal effects are evaluated and are calculated and reported at the mean. Overall, all models are significant with pseudo R^2 equaling around 25%.

When examining both mortality and professional surcharges, it is clear that both coefficients are negative in the logit and the probit specification, but only the mortality surcharge is significant. Retirees who were required to pay more for their life insurance (meaning that they were considered less healthy or at higher risk of being so) were less likely to purchase annuities at retirement. For instance, we can see that in the probit specification (Table 4, columns 1 and 2), holding all other variables at their mean, being in the group required to pay extra for the risk insurance reduced the probability (marginal effect at means) of annuitizing by 13.6% (logit results are very similar). This

result is consistent with the pricing mechanism theory and implies that ill people are indeed less likely to purchase annuities.

Surprisingly, cigarette smoking did not have a negative significant effect on the demand for annuities. Rather, the coefficient is positive (statistically nonsignificant), in contrast to the prediction of standard neoclassical economic theory. This fits neither our predictions regarding smokers' time preferences, as presented above,²¹ nor the assumption that because health condition is not a part of the pricing mechanism in these pension insurance policies, smokers would prefer the lump-sum option. Our results hold whether we do or do not include other variables for health condition as described above. In particular, columns 13–16 in Table 3 show that whether we used smoking status alone as a representation of medical condition or added mortality increases, smoking did not significantly affect annuitization.

To further show that for smokers there is, if anything, a surprising positive relation with choosing an annuity and clearly not a significant negative relation, and yet for mortality surcharge, the relation is negative (whereas they should both have been negative according to the theory presented above), we conducted the following exercise, presented in Fig. 2, which shows both smoking and mortality surcharge coefficients from Equation 3 (β_{12} and β_{13}) and 75% and 95% confidence intervals. It is clear that while all of the range for the mortality surcharge variable is negative, the smoker coefficient and a substantial part of the confidence intervals are in the positive range, implying a clear effect of being a smoker in the opposite direction.

[FIGURE 2]

What would the effect be if the cutoff to be included in our sample had been NIS 300,000 rather than NIS 500,000? For an additional robustness test, we implemented the same analysis reported in Table 3. However, this time we included all clients with accumulated funds of NIS 300,000

²¹ Regarding the entire population in our data set, 11.46% were smokers. Only 9.64% of individuals in the data set had high accumulation (over NIS 500,000).

(approximately USD 85,000). Our main results are even stronger. In a probit specification with 2,533 observations (reported in Table 4), the smoking coefficient was positive and significant ($t = 2.94$), whereas the impaired health coefficients remained negative, implying that being a smoker significantly increased the propensity to annuitize, in contrast to our prior conjectures.

Table 4 presents the other robustness tests. It could be that the requirement to purchase a minimal mandatory annuity legislated in Israel as of 2008 (applying only to savings accumulated after this period) would affect the results. To address this concern, we added a probit specification in which the dependent variable was choosing the full-annuity option, and two specifications (ordinary least squares and tobit) in which the dependent variable was the percentage of accumulation designated for annuity. We show that our results hold in these different specifications.

[TABLE 4]

A possible reason for our results might be related to differences in the annuity factors (annuity pricing) between smokers and nonsmokers, as the lower the factor, the more attractive an annuity is in relative terms. In particular, it could be that smokers who chose to purchase an annuity at retirement did so because of the better annuity factors they had in their policy (the annuity factor determines the payment per period) that had compensated them for their shorter life expectancy (the number of periods). As smoking is not priced by law in the obtained factor, these differences may have occurred because of other issues unrelated to smoking, such as better bargaining power at purchase. While we do not think that there is a good reason to prematurely assume that smokers on average were offered better terms, it is still worthwhile to investigate the pricing conditional on choosing an annuity. To test this potential concern, we examined if indeed the annuity factor of smokers, conditional on the fact that they chose the annuity option, was significantly lower (i.e., better) than the annuity factor of nonsmokers. We found no significant difference between the mean annuity factors of smokers and nonsmokers (161.62 and 160.78, respectively). Further, we regressed the annuity factor (for policies in which the retiree had chosen any portion as annuity) over smoking condition and found that the

relation was, again, not statistically significant even when we added the control variables that we previously used, such as gender, total accumulated amount, marital status, percentage of money accumulated after the Israeli minimal mandatory annuity law, choosing full annuity, and the insurance company requirement to pay a premium for impaired health (mortality surcharge, described above). We repeated the exercise using several specifications and estimation methods, yet our results remained consistent. We did not find evidence in our sample that smokers chose annuities because of better terms.

We tested two possible explanations for our findings about smokers' choices. The first was that even though the literature describes a close relationship between smoking and medical condition, smokers do not perceive themselves as having a shorter life-span, meaning that smokers experience self-illusions regarding life expectancy, which is one of the factors affecting the demand for annuities (e.g., Pashchenko, 2013). The second possible explanation is related to self-control. O'Donoghue and Rabin (1999) defined sophisticated people as those who are fully aware of their self-control problems and, in contrast, naïve people as those who are fully unaware of their future self-control issues. In our context, if smokers are at least partially aware of their self-control problems, they may use different mechanisms, including annuities, as self-protection to overcome their bias. We assume that if they use annuities to overcome these self-control problems, we should observe them using other mechanisms as well.

6. Potential explanations: Optimism regarding the consequences of smoking activity for health and life expectancy and/or self-protection

6.1 A survey on life expectancy and long-term savings decisions

6.1.1 Sample characteristics

To investigate life expectancy perceptions of individuals in Israel, we obtained the results of an online survey conducted (for this research) by a research company with 1,000 representative Israeli

residents aged 50–70 years old in March 2015. After missing values were removed, the final sample was 963 respondents.²²

The mean age of the respondents was 58.17 years ($Mdn = 58$, $SD = 5.45$)²³ and 40.6% were male; hence our survey had a higher concentration of females than that of the general population in Israel. The marital status of the respondents was varied: 73.4% were married, 16.9% divorced, and 3.3% widowed.²⁴ On average our sample was more educated than the general population of Israel. Only 0.2% of participants had less than a high school diploma, 22.0% had a high school diploma, and 76.5% had higher education (including college, graduate school, and other higher education, such as rabbinical studies).²⁵ Of the respondents, 88% believed that their health was good or very good, 17.4% reported that they currently smoked, and 31.5% reported that they had smoked in the past (for this survey, a person was defined as a “smoker” if she or he smoked more than three cigarettes per day).²⁶ Women made up 58% of the smokers, 53% of the former smokers, and 62.4% of nonsmokers. Of the smokers, 69.05% had a college degree, compared to 78% for former smokers and nonsmokers (the difference is significant with a 0.03 significance level), implying that smokers were less educated than former smokers and nonsmokers. With regards to income, 64.29% of smokers reported that they earned more than the average income in the general population, compared to 65.68% and 55.69% of former smokers and nonsmokers, respectively (these differences are not statistically significant).

²² The survey was conducted by Sarid: Research Services and Training, using an online panel of registered potential participants with a wide distribution age who registered voluntarily. In exchange for participation, respondents earned points that could be converted into money or vouchers.

²³ This is lower than the average age of the retirees in the insurance corporation data, because we deliberately addressed our life expectancy questions to people prior to retirement.

²⁴ According to data from the Israeli CBS for 2012, the family status of Israeli citizens over the age of 50 was 68% married (which is also close to the proportion of married people in the data we received from the insurance company), 13% divorced, and 15% widowed. Please note that the CBS data also include citizens over age 70.

²⁵ According to the CBS social questionnaire, only 26.4% of the population had an academic education, while 3% had studied in a rabbinical school (Yeshiva). The fact that the survey participants had, on average, more education than the general population can be explained by the choice to conduct the survey online for respondents 50 years or older.

²⁶ According to a Ministry of Health report on smoking in Israel 2014, published May 2015, 27.3% of men and 12.6% of women in the adult population smoked.

6.1.2 The survey structure

Our survey consisted of questions related to life expectancy estimations, demographic details, long-term saving decisions, and self-assessments of health. The median time participants took to complete the survey was 6.5 min.

Because the focus of our research was to obtain life expectancy perceptions, we asked the respondents several questions that are well accepted in the academic literature on financial economics. The specific questions and explanations for our choices follow:

- *In your opinion, what is the current life expectancy in Israel (respond for your own gender)?*

This question was not intended to assess subjective life expectancy. Rather, it was designed to explore the perception of life expectancy of others (in the general population). We did not ask about conditional life expectancy at the specific age of the respondent, since we were interested in asking a clear and relatively simple question that would not confuse the respondents.

- *Do you expect your own life expectancy to be lower, identical to, or higher than the average life expectancy you have mentioned above?*

Comparing the respondent's life expectancy to the life expectancy of the general population was used, for example, by Beshears et al. (2014), who asked respondents how much longer they expected to live relative to others their age.

6.2 Survey results

6.2.1 Life expectancy

We asked the respondents for their opinion on the life expectancy in the general population for their own gender (Table 5). The proximity of the median value that the respondents gave (81.1 years for men and 82.54 years for women) to the actual life expectancy at birth in Israel according to the CBS in 2013 (80.3 years for men and 83.9 years for women) and to life expectancy at age 58 years²⁷

²⁷ The average age in our survey.

(82.5 years for men and 85.1 years for women) is an indicator that the survey respondents took the survey seriously and devoted attention to answering the questions.

[TABLE 5]

Regarding the expectation of having a longer, shorter, or the same life expectancy as estimated for the general population in the previous question, 34.2% of the respondents believed they would live longer than average, whereas 52.7% thought that they would live the same length as the average person, and 12.9% suspected they would have a shorter life expectancy. The median response from our respondents was the belief that they would live as long as the average person in the general population. Our results are very similar to the results reported by Beshears et al. (2014), who conducted two surveys of U.S. respondents.

Our finding that only 12.9% of respondents thought that they had a shorter than average life expectancy is not necessarily an indication of overoptimism in the sample. Beshears et al. (2014) noted that a proportion of respondents projecting a relatively long life could be a result of the sample being more educated than average in the population, since longevity is positively correlated with education (Cutler et al., 2011).

6.2.2 Smoking status and health condition

We asked respondents to assess their *health condition* by rating their own health on a scale of 1 (*very good health*) to 4 (*poor health*). Eight people refused to answer and were omitted from this analysis.

Smokers, former smokers, and nonsmokers gave highly similar assessments of their health (Mdn = 2 in all categories). Using the nonparametric test for the difference between the medians of the different groups (smoker vs. former smoker; smoker vs. nonsmoker), we failed to reject either of the null hypotheses that the median values are equal.

With regard to self-assessed health, we investigated the relation between smoking and health perception, controlling for both socioeconomic variables (such as age, number of children, gender,

marital status, education, and income) and related health conditions (such as smoking in the present or the past, participation in extreme sports, and the age of parents at death). Smoking was not significantly related to health perception or self-assessed life expectancy, as reported in Table 6. Results hold for different specifications; with all other variables remaining equal, the average smoker in our survey did not perceive her- or himself as any less healthy than a nonsmoker.

[TABLE 6]

6.2.3 Smoking status and life expectancy

Next, we investigated smokers' perceptions regarding their own life expectancy. Smokers and nonsmokers gave similar ratings of their own life expectancy compared to the average life expectancy of the population. Because smoking is negatively correlated with longevity, then on average (life expectancy|smoker) < life expectancy of the population, and (life expectancy|nonsmoker) > life expectancy of the population. Thus, we would expect smokers on average, if they are rational and all else remains equal, to estimate that they would have a shorter life expectancy than people in the general population. We can illustrate this with a numerical example. Assume that in our economy there are only two agents. They are identical with one difference: One is a smoker and the other is a nonsmoker. Statistics have indicated that in this economy in the past, smokers lived 75 years and nonsmokers 85 years. Assuming an equal number of agents of each type (in order to simplify), the average age of this population is 80. If our two agents are rational in respect to their life expectancy predictions, the smoker should expect to live below the average and the nonsmoker should expect to live above the average. Hence, the smoker is considered optimistic if he or she expects to live as long as or above the average.

[FIGURE 3]

Of the smokers, 57% believed they would live as long as the average person, 22% believed they would live longer than the average, and only 21% believed they would have a shorter life than the average person in the population, meaning that 79% of smokers believed they would have the same or

a longer life-span than the general population (Fig. 3). This proportion is significantly higher than the group of smokers who believed that they would have a shorter life expectancy than that of the general population (21%).

We used the percentage of smokers who indicated a life expectancy equal to or greater than average (79%) as an optimism proxy for smokers. Further, we would expect nonsmokers to estimate their life expectancy as greater than the average. Hence, as a conservative optimism proxy estimate, we used a percentage that indicates a life expectancy that is greater than the average (39%). The optimism proxy for smokers was significantly higher than for nonsmokers.

To reinforce these results, we calculated the median projection of self-assessed life expectancy in the different groups. The median projection of life expectancy for both smokers and nonsmokers is exactly 2 (the difference from the value 2 is not statistically significant using a one-sample Wilcoxon median test for both populations), meaning that at least half of the participants believed they would live as long as or longer than the average person in the population.

To test for robustness, and to address the concern that our sample was more educated than the population, we took a subsample from the full survey population in which the proportions of education levels were comparable to the education proportions in the Israeli population, as published in the CBS study. After taking 30 subsamples of 100 observations each from the population, we tested for the median projections of smokers and nonsmokers from the 30 different subsamples. The median of the 30 median projections was 2, for both smokers and nonsmokers. We did this again for other subsamples of the 300 examinees, and found that for each subsample, the projection of smokers was not statistically different from 2, meaning that smokers did in fact believe that, in general, their life expectancy would be similar to the average life expectancy of the population, indicating overoptimism. It could also be claimed that conditional on living to or surpassing an age of 50–70 years, smokers should be optimistic regarding their life expectancy. Nevertheless, as mentioned above, mortality from smoking is higher

at older ages (as reflected in life insurance policies pricing).²⁸ This result is consistent with data from a U.S. health and retirement study²⁹ (Khwaja et al., 2006)³⁰ and other studies that found that heavy smokers were overoptimistic regarding their life expectancy (Schoenbaum, 1997) and more receptive to supportive information about smoking (denial of the smoking–cancer link) than to nonsupportive information (affirmation of the smoking–cancer link; Brock and Balloun, 1967).

In addition, the results are consistent with previous literature regarding smokers’ health perceptions. For instance, only 29% of smokers reported that their own risk of heart attack was higher than average and only 40% thought that their risk of cancer was higher than average (Ayanian and Clearly, 1999). The results are also consistent with a study showing optimism among people at risk for Huntington’s Disease (Oster et al., 2013) and a study showing that older people tend to be optimistic regarding their life expectancy (Heimer, Myrseth and Schoenle, 2017)

As an additional robustness test, in a specification shown in Table 6, we investigated the impact of self-assessed health and smoking on self-assessed life expectancy, controlling for both socioeconomic variables and related health conditions. The results indicate that neither smoking nor past smoking influenced perceived life expectancy.

6.3 Smoking and self-protection

Lack of self-control is a common explanation for smoking behavior. If smokers are at least partially aware of their self-control problems, they might choose an annuity to fight the potential temptation to spend too much of their cash on hand from a lump-sum payment, and hence they might choose an annuity more often than otherwise expected even though pricing suggests that with all other variables remaining equal, they should do so less often. Although it is tempting to test this argument

²⁸ The gap in prices between smokers and nonsmokers in Israeli insurance policies increases with age.

²⁹ HRS (health and retirement study) was used by many studies (e.g., Koijen et al., 2016).

³⁰ Our findings are consistent with and contribute to the medical and psychological academic literature. McKenna et al. (1993) argued that smokers consider themselves less likely than nonsmokers to be hurt by smoking-related diseases. Masiero et al. (2015) suggested that this bias could result from the illusion of control and from the need to preserve good self-esteem. Slovic (1998) argued that optimism bias is likely to be greater when people think that signs of vulnerability will appear early, and people think that an absence of present symptoms means they are safe from future risks.

directly, we propose an indirect approach. One would expect that smokers who are at least aware of their self-control problem would use not just one (choosing an annuity) but several mechanisms of self-protection. We looked for evidence that smokers employed self-protection mechanisms to a greater extent than nonsmokers.

6.3.1 Evidence from the insurance company data

To protect oneself from trouble caused by a lack of self-control, one possible option is to purchase permanent health insurance (PHI), which provides an income in the case of disability that prevents the insured from being able to work. Given (a) that smoking is associated with many illnesses that are linked to disability, (b) that PHI, paid on a schedule, can prevent impulsive spending of a lump sum, and (c) that smoking is not a factor in the pricing, PHI is a good self-protection option for sophisticated smokers. However, our data revealed that nonsmokers insured themselves against disability with PHI from the investigated insurance company at a higher rate (75.77%) than smokers did (52.67%).

6.3.2 Evidence from the survey

One potential mechanism to deal with self-control problems is to consult with experts who are probably less prone, if at all, to present bias. We asked all participants whether they consulted with objective advisors and whether they consulted with more than one advisor with regard to their financial planning. There was no statistically significant difference between smokers and nonsmokers on either question. Furthermore, we asked the participants the following question: “When you retire, you are entitled to receive social security payments from the National Insurance Institute. If you choose to postpone the pension, in three years you can receive an additional 16% to your allowance. Would you prefer to postpone?” We tested if smokers chose this mechanism to postpone the allowance more than nonsmokers. The survey answers indicated that there was no significant difference between smokers and nonsmokers regarding this decision, as 34.4% of smokers and 33.12% of nonsmokers chose to

postpone. In summary, we did not find evidence that supports the self-control explanation, either in our administrative data or in the survey.

7. Conclusions

In this study we took advantage of the special characteristics of the pricing mechanism for Israeli insurance pension policies to better understand properties of time preferences and long-term savings decisions of smokers. To do so, we used a unique dataset from an Israeli insurance corporation that contained information regarding real annuitization decisions of retirees. Moreover, we focused on the annuitization decisions of smokers in Israel, who are insured by pension insurance policies that consider only gender, actuarial life expectancy, and expected rate of return for pricing purposes, and not health condition (or smoking). Hence, all else being equal, this creates a distinct advantage for the lump-sum option for less healthy retirees. These unusual conditions allow for an interesting case study. Smokers should realize that health is not factored into pricing of annuities. In addition, time preference can play an important role as well. Lastly, smoking is associated with risky behavior that may correlate with less longevity insurance. Hence, a reasonable initial hypothesis is that smokers should have a greater preference for withdrawing their accumulated pension funds as a lump sum rather than as an annuity, compared to nonsmokers. Our findings suggest that, surprisingly, smokers were not less likely to annuitize. Individuals with other health impairments in our sample, however, acted in a manner consistent with the pricing argument and were less likely to annuitize.

We tested two possible explanations for our findings about smokers' choices. The first was that even though studies have found a close relationship between smoking and medical conditions, smokers do not perceive themselves as having a shorter life-span, meaning that smokers experience self-illusions regarding their own life expectancy. This observation led us to a further investigation of the self-perception of life expectancy of smokers and its effect on financial decisions. We found that on average smokers believed they would live the average life-span.

The second was related to self-control awareness. If smokers are at least partially aware of their self-control problems, we reasoned that they might use several mechanisms, including annuities, to overcome their temptation to spend too much of their cash on hand. We found that smokers did not purchase more PHI. They did not seek more advice from professionals, which might have mitigated any financial self-control problems, and they also were not willing to postpone payments even for a substantially higher future payments.

To conclude, our results suggest that smokers might be overoptimistic regarding their subjective life expectancy, a fact that is expected to influence the decision-making process in general and financial decisions in particular. Our results do not provide additional support for the conjecture of awareness of self-control issues. Our unique natural experiment sheds light on the influence of unrealistic subjective life expectancy assessments on the annuitization (longevity insurance) decisions of smokers.

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Figure captions

Fig. 1. Proportion of 1,556 retirees with savings accumulations \geq NIS 500,000 who made each disbursement choice, separately for smokers and nonsmokers.

Fig. 2. Smoking and mortality surcharge coefficient 75% and 95% confidence intervals.

Fig. 3. Proportion of smokers who rated their own life expectancy as above, the same as, or below the life expectancy they judged as average for the population.

Table 1. Distribution of annuity choices by gender, marital status, and smoking status for individuals who had accumulated at least NIS 500,000

Characteristic	Annuity included ^a	Lump sum ^b
Gender		
Female	373	32
(<i>n</i> = 405)	92.10%	7.90%
Male	936	215
(<i>n</i> = 1,151)	81.32%	18.68%
Total	1,309	247
(<i>N</i> = 1,556)	84.13%	15.87%
Marital status		
Divorced	136	14
(<i>n</i> = 150)	90.67%	9.33%
Married	1,029	146
(<i>n</i> = 1,175)	87.57%	12.43%
Widowed	66	9
(<i>n</i> = 75)	88.00%	12.00%
Single	41	1
(<i>n</i> = 42)	97.62%	2.38%
Unknown	37	77
(<i>n</i> = 114)	32.46%	67.54%
Total	1,309	247
(<i>N</i> = 1,556)	84.13%	15.87%
Smoking status		
Smoker	135	15

Characteristic	Annuity included ^a	Lump sum ^b
(<i>n</i> = 150)	90.00%	10.00%
Nonsmoker	1,012	197
(<i>n</i> = 1,209)	83.71%	16.29%
Unknown	162	35
(<i>n</i> = 197)	82.23%	17.77%
Total	1,309	247
(<i>N</i> = 1,556)	84.13%	15.87%

Note. Clients with unknown smoking status were excluded from analysis.

^a Clients who chose some portion of disbursement as annuity.

^b Clients who chose the full lump-sum option (no annuity at all).

Table 2. Annuity-decision regression. Dependent variable: choosing any part as annuity (rather than the full lump-sum choice)

Variable	Basic regression with macroeconomic fixed effects				Basic regression with year fixed effects			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Probit coefficient	Marginal effects at mean	Logit coefficient	Marginal effects at mean	Probit coefficient	Marginal effects at mean	Logit coefficient	Marginal effects at mean
Gender	-0.199 (0.122)	-0.0380 (0.0232)	-0.377 (0.238)	-0.0358 (0.0224)	-0.203* (0.123)	-0.0386* (0.0232)	-0.386 (0.239)	-0.0365 (0.0224)
Retirement age	0.00567 (0.0163)	0.00108 (0.00310)	0.0130 (0.0294)	0.00123 (0.00278)	0.00524 (0.0163)	0.000997 (0.00310)	0.0128 (0.0294)	0.00121 (0.00277)
Total amount	1.69e-08 (6.32e-08)	3.22e-09 (1.20e-08)	1.20e-08 (1.09e-07)	1.14e-09 (1.03e-08)	-1.97e-08 (6.32e-08)	-3.74e-09 (1.20e-08)	-1.86e-08 (1.09e-07)	-1.76e-09 (1.03e-08)
Marital status								
Divorced	-0.547 (0.476)	-0.104 (0.0902)	-1.275 (1.092)	-0.121 (0.102)	-0.523 (0.474)	-0.0995 (0.0896)	-1.264 (1.094)	-0.119 (0.102)
Widowed	-0.508 (0.497)	-0.0968 (0.0942)	-1.250 (1.121)	-0.118 (0.105)	-0.487 (0.495)	-0.0927 (0.0937)	-1.243 (1.123)	-0.118 (0.105)
Married	-0.543 (0.456)	-0.103 (0.0863)	-1.300 (1.057)	-0.123 (0.0986)	-0.528 (0.453)	-0.101 (0.0856)	-1.304 (1.059)	-0.123 (0.0985)
Unknown	-2.104*** (0.471)	-0.401*** (0.0887)	-3.965*** (1.075)	-0.376*** (0.0987)	-2.080*** (0.468)	-0.396*** (0.0881)	-3.956*** (1.076)	-0.374*** (0.0985)

Variable	Basic regression with macroeconomic fixed effects				Basic regression with year fixed effects			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Probit coefficient	Marginal effects	Logit coefficient	Marginal effects	Probit coefficient	Marginal effects	Logit coefficient	Marginal effects
		at mean		at mean		at mean		at mean
Purchase age	-0.0848*** (0.0114)	-0.0162*** (0.00213)	-0.154*** (0.0214)	-0.0146*** (0.00197)	-0.0836*** (0.0115)	-0.0159*** (0.00214)	-0.152*** (0.0215)	-0.0144*** (0.00197)
No. of policies	0.0146 (0.0131)	0.00279 (0.00249)	0.0434 (0.0272)	0.00411 (0.00257)	0.0146 (0.0131)	0.00277 (0.00250)	0.0425 (0.0273)	0.00402 (0.00257)
Percent post-2008	2.613*** (0.438)	0.498*** (0.0817)	4.747*** (0.823)	0.450*** (0.0758)	2.597*** (0.440)	0.494*** (0.0817)	4.722*** (0.826)	0.446*** (0.0758)
GDP	-2.48e-06** (1.18e-06)	-4.74e-07** (2.25e-07)	-4.85e-06** (2.17e-06)	-4.59e-07** (2.05e-07)				
RF	-5.905 (6.248)	-1.126 (1.189)	-7.340 (11.57)	-0.696 (1.097)				
Year 2009					0.460*** (0.173)	0.0875*** (0.0329)	0.871*** (0.320)	0.0823*** (0.0301)
Year 2010					0.180 (0.148)	0.0343 (0.0282)	0.354 (0.271)	0.0335 (0.0256)
Year 2011					0.0438 (0.131)	0.00833 (0.0250)	0.155 (0.243)	0.0146 (0.0229)
Year 2012					0.137	0.0261	0.288	0.0272

Variable	Basic regression with macroeconomic fixed effects				Basic regression with year fixed effects			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Probit coefficient	Marginal effects at mean	Logit coefficient	Marginal effects at mean	Probit coefficient	Marginal effects at mean	Logit coefficient	Marginal effects at mean
Constant	7.679*** (1.375)		14.17*** (2.610)		5.129*** (0.944)		9.275*** (1.820)	
Observations	1,556	1,556	1,556	1,556	1,556	1,556	1,556	1,556
Pseudo R^2	0.2425	0.2425	0.2423	0.2423	0.2438	0.2438	0.2436	0.2436

Note. Standard errors in parentheses. Dependent variable, y_{ann} , is an indicator variable for choosing any part of disbursement as annuity (rather than the full lump-sum choice). Main explanatory variables are gender, retirement age, gross domestic product (GDP) and risk-free rate of return (RF) in specifications 1 and 2, or year dummies in specifications 3 and 4, total accumulation amount (total amount), marital status, purchase age, number of policies, and the percentage of accumulation saved after 2008. Specifications are for retirees with accumulated funds of at least NIS 500,000 in this insurance corporation ($N = 1,556$).

*** $p < 0.01$. ** $p < 0.05$. * $p < 0.1$.

Table 3. Medical condition: Probit and logit specifications. Dependent variable: choosing any part of disbursement as an annuity (rather than the full lump sum)

Variable	Medical status regression with year fixed effect (including smoking)				Smoking status regression with year fixed effect			
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	Probit coefficient	Marginal effects at mean	Logit coefficient	Marginal effects at mean	Probit coefficient	Marginal effects at mean	Logit coefficient	Marginal effects at mean
Gender	-0.179 (0.136)	-0.0297 (0.124)	-0.321 (0.262)	-0.0227 (0.337)	-0.203 (0.135)	-0.0340 (0.141)	-0.351 (0.261)	-0.0251 (0.373)
Retirement age	-0.00181 (0.0179)	-0.000301 (0.00323)	-0.00235 (0.0324)	-0.000166 (0.00336)	0.00253 (0.0177)	0.000424 (0.00343)	0.00590 (0.0319)	0.000421 (0.00665)
Total amount	7.68e-08 (7.21e-08)	1.28e-08 (5.38e-08)	1.11e-07 (1.23e-07)	7.86e-09 (1.17e-07)	7.28e-08 (7.41e-08)	1.22e-08 (5.14e-08)	1.02e-07 (1.26e-07)	7.27e-09 (1.08e-07)
Marital status								
Divorced	-3.956 (120.5)	-0.658 (17.35)	-13.88 (680.5)	-0.979 (33.47)	-3.975 (120.5)	-0.667 (17.48)	-13.89 (681.9)	-0.992 (33.97)
Widowed	-3.969 (120.5)	-0.661 (17.34)	-13.95 (680.5)	-0.984 (33.40)	-3.977 (120.5)	-0.667 (17.48)	-13.96 (681.9)	-0.997 (33.90)
Married	-3.917 (120.5)	-0.652 (17.38)	-13.84 (680.5)	-0.977 (33.51)	-3.941 (120.5)	-0.661 (17.51)	-13.89 (681.9)	-0.992 (33.97)

Variable	Medical status regression with year fixed effect (including smoking)				Smoking status regression with year fixed effect			
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	Probit coefficient	Marginal effects at mean	Logit coefficient	Marginal effects at mean	Probit coefficient	Marginal effects at mean	Logit coefficient	Marginal effects at mean
Unknown	-5.494 (120.5)	-0.914 (16.30)	-16.54 (680.5)	-1.167 (30.68)	-5.515 (120.5)	-0.925 (16.43)	-16.58 (681.9)	-1.184 (31.12)
Purchase age	-0.0776*** (0.0128)	-0.0129 (0.0530)	-0.140*** (0.0237)	-0.00985 (0.146)	-0.0792*** (0.0127)	-0.0133 (0.0543)	-0.143*** (0.0235)	-0.0102 (0.152)
No. of policies	0.00754 (0.0140)	0.00126 (0.00566)	0.0295 (0.0293)	0.00208 (0.0310)	0.00761 (0.0140)	0.00128 (0.00572)	0.0285 (0.0291)	0.00204 (0.0303)
Percent post 2008	2.515*** (0.469)	0.418 (1.719)	4.514*** (0.873)	0.318 (4.729)	2.395*** (0.466)	0.402 (1.643)	4.312*** (0.867)	0.308 (4.570)
Year 2009	0.716*** (0.199)	0.119 (0.490)	1.378*** (0.381)	0.0972 (1.444)	0.724*** (0.199)	0.121 (0.497)	1.391*** (0.380)	0.0993 (1.475)
Year 2010	0.131 (0.160)	0.0219 (0.0936)	0.247 (0.290)	0.0174 (0.259)	0.131 (0.159)	0.0220 (0.0936)	0.248 (0.290)	0.0177 (0.264)
Year 2011	-0.00360 (0.143)	-0.000599 (0.0239)	0.0440 (0.261)	0.00311 (0.0497)	-0.0164 (0.142)	-0.00275 (0.0264)	0.0244 (0.261)	0.00174 (0.0318)
Year 2012	0.0975 (0.144)	0.0162 (0.0707)	0.202 (0.267)	0.0142 (0.212)	0.0996 (0.143)	0.0167 (0.0723)	0.196 (0.265)	0.0140 (0.208)

Variable	Medical status regression with year fixed effect (including smoking)				Smoking status regression with year fixed effect			
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	Probit coefficient	Marginal effects at mean	Logit coefficient	Marginal effects at mean	Probit coefficient	Marginal effects at mean	Logit coefficient	Marginal effects at mean
Medical condition								
Smoker	0.173 (0.172)	0.0288 (0.122)	0.306 (0.329)	0.0216 (0.321)	0.152 (0.169)	0.0254 (0.108)	0.296 (0.329)	0.0211 (0.315)
Mortality surcharge	-0.835** (0.338)	-0.139 (0.573)	-1.450** (0.577)	-0.102 (1.520)				
Professional surcharge	-0.254 (0.248)	-0.0422 (0.178)	-0.517 (0.434)	-0.0364 (0.542)				
Constant	9.780 (120.5)		24.19 (680.5)		8.517 (120.5)		21.88 (681.9)	
Observations	1,359	1,359	1,359	1,359	1,359	1,359	1,359	1,359
Pseudo R^2	0.2569	0.2569	0.2563	0.2563	0.2512	0.2512	0.2506	0.2506

Note. Standard errors in parentheses. Dependent variable, y_{ann} , is an indicator variable for choosing any part of disbursement as annuity (rather than the full lump sum). Main explanatory variables are gender, retirement age, year dummies, total accumulation amount (total amount), marital status, purchase age, number of policies, the percentage of accumulation saved after 2008, and medical status (either defined by smoking status

or medical surcharge implying the need to pay a premium for medical problems on insurance policies). Specifications are for retirees with accumulated funds of at least NIS 500,000 in this insurance corporation and information about smoking status ($N=1,339$).

*** $p < 0.01$. ** $p < 0.05$. * $p < 0.1$.

Table 4. Robustness. Dependent variables: choosing full lump sum, choosing partial annuity, and choosing full annuity

Variable	Choosing full lump sum		Choosing partial annuity		Choosing full annuity		Medical status
	(1)	(2)	(3)	(4)	(5)	(6)	regression with year fixed effect (including smoking) – accumulations over NIS 300,000
	Probit coefficient	Marginal effects at mean	OLS coefficient	Tobit coefficient	Probit coefficient	Marginal effects at mean	Probit coefficient
Gender	0.178 (0.136)	0.0296 (0.124)	-0.00332 (0.0226)	-0.000968 (0.0264)	-0.0376 (0.0988)	-0.0149 (0.0393)	-0.0646 (0.0786)
Retirement age	0.00258 (0.0180)	0.000429 (0.00347)	-0.00229 (0.00355)	-0.00458 (0.00425)	0.0268* (0.0158)	0.0107* (0.00628)	0.0151 (0.0119)
Total amount	-7.61e-08 (7.21e-08)	-1.27e-08 (5.33e-08)	4.20e-09 (1.34e-08)	6.05e-09 (1.56e-08)	-3.93e-08 (6.00e-08)	-1.56e-08 (2.39e-08)	2.85e-07*** (8.01e-08)
Marital status							
Divorced	3.957 (120.5)	0.658 (17.34)	-0.0941 (0.0607)	-0.0980 (0.0701)	-0.269 (0.273)	-0.107 (0.108)	-0.266 (0.247)
Widowed	3.969 (120.5)	0.660 (17.33)	-0.131* (0.0673)	-0.136* (0.0779)	-0.173 (0.302)	-0.0688 (0.120)	-0.222 (0.267)
Married	3.915 (120.5)	0.651 (17.37)	-0.101* (0.0559)	-0.105 (0.0645)	-0.245 (0.254)	-0.0975 (0.101)	-0.281 (0.228)
Unknown	5.492 (120.5)	0.913 (16.29)	-0.558*** (0.0638)	-0.721*** (0.0762)	-1.350*** (0.297)	-0.537*** (0.118)	-1.848*** (0.242)

Variable	Choosing full lump sum		Choosing partial annuity		Choosing full annuity		Medical status
	(1)	(2)	(3)	(4)	(5)	(6)	regression with year fixed effect (including smoking) – accumulations over NIS 300,000
	Probit coefficient	Marginal effects at mean	OLS coefficient	Tobit coefficient	Probit coefficient	Marginal effects at mean	Probit coefficient
Purchase age	0.0771*** (0.0128)	0.0128 (0.0527)	-0.0188*** (0.00229)	-0.0215*** (0.00269)	-0.0836*** (0.0101)	-0.0332*** (0.00402)	-0.0707*** (0.00816)
No. of policies	-0.00775 (0.0140)	-0.00129 (0.00578)	-0.0108*** (0.00262)	-0.0108*** (0.00308)	-0.147*** (0.0142)	-0.0584*** (0.00564)	0.00815 (0.0111)
Percent post 2008	-2.525*** (0.470)	-0.420 (1.726)	0.213*** (0.0749)	0.293*** (0.0876)	-1.029*** (0.326)	-0.409*** (0.130)	1.583*** (0.269)
Year 2009	-0.715*** (0.199)	-0.119 (0.490)	0.112*** (0.0339)	0.142*** (0.0395)	-0.130 (0.147)	-0.0519 (0.0586)	0.590*** (0.124)
Year 2010	-0.130 (0.160)	-0.0217 (0.0929)	-0.000921 (0.0295)	0.00405 (0.0346)	-0.256** (0.128)	-0.102** (0.0511)	0.205* (0.105)
Year 2011	0.00178 (0.143)	0.000296 (0.0238)	-0.0368 (0.0266)	-0.0366 (0.0312)	-0.295** (0.115)	-0.117** (0.0456)	0.0391 (0.0964)
Year 2012	-0.0975 (0.144)	-0.0162 (0.0707)	0.00689 (0.0242)	0.0108 (0.0283)	-0.177* (0.104)	-0.0706* (0.0415)	0.0620 (0.0939)
Medical condition							
Smoker	-0.175	-0.0291	0.0370	0.0424	0.160	0.0637	0.343***

Variable	Choosing full lump sum		Choosing partial annuity		Choosing full annuity		Medical status regression with year fixed effect (including smoking) – accumulations over NIS 300,000
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Probit coefficient	Marginal effects at mean	OLS coefficient	Tobit coefficient	Probit coefficient	Marginal effects at mean	Probit coefficient
Mortality surcharge	0.816** (0.172)	0.136 (0.123)	-0.188** (0.0279)	-0.242*** (0.0324)	-0.202 (0.124)	-0.0804 (0.0494)	-0.488* (0.107)
Professional surcharge	0.305 (0.340)	0.0507 (0.560)	-0.0511 (0.0756)	-0.0623 (0.0922)	-0.500** (0.333)	-0.199** (0.133)	-0.213 (0.268)
Constant	-9.843 (120.5)		2.203*** (0.217)	0.364*** (0.00798)	3.598*** (0.853)		3.227*** (0.644)
Observations	1,359	1,359	1,359	1,359	1,359	1,359	2,533
R^2			0.2628				
Pseudo R^2	0.2573	0.2573	0.2535	0.2358	0.1998	0.1998	0.2095

Note. OLS = Ordinary least squares. Standard errors in parentheses. Dependent variables, y_{lump} , y_{prop} , and y_{full} are indicator variables for choosing the full lump sum (rather than any part as annuity), choosing a partial annuity, and choosing the full annuity. Main explanatory variables are gender, retirement age, year dummies, total accumulation amount (total amount), marital status, purchase age, number of policies, the percentage of accumulation saved after 2008, and medical condition

(either defined by smoking status or medical surcharge implying the need to pay a premium for medical problems on insurance policies). Specifications (1)-(6) are for retirees with accumulated funds of at least NIS 500,000 in this insurance corporation and information about smoking status ($N = 1,359$); Smoking effect is nonsignificant in all specifications and consistent with our main results. Specification (7) is for retirees with accumulated funds of at least NIS 500,000 in this insurance corporation and information about smoking status ($N = 2,924$); Smoking effect is positive and significant. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 5. Projected life expectancy

Projected life expectancy	<i>N</i>	Life expectancy in years				% same as mean ^a	% longer than mean ^b
		Mean (<i>SD</i>)	Min	Max	Mdn		
In the general population	963	81.96 (4.45)	40	100	82		
In the general population (male)	391	81.11 (3.98)	65	100	81.1		
In the general population (female)	572	82.54 (4.67)	40	96	82.54		
Self	963		1	3	2	52.7	34.2
Self (male)	391		1	3	2	47.5	40.3
Self (female)	572		1	3	2	56.5	29.7

Note. Projected life expectancy in the general population refers to the respondents' perception of life expectancy in the general population measured. Self refers to respondents' beliefs in their own life expectancy being longer (value 3), equal to (value 2), or shorter (value 1) in comparison to the life expectancy they estimated for the general population. *N* = number of participants (total and separately for males and females). Actual life expectancy at birth in Israel, according to the Central Bureau of Statistics, was 80.3 years for men and 83.9 years for women in 2013.

^a Percentage of respondents who thought they would live as long as the average person in the general population.

^b Percentage of respondents who thought they would live longer than the average person in the general population.

Table 6. Life and health perception in the survey. Dependent variables: health perception and life perception

Variable	Health perception		Life perception	
	(1)	(2)	(3)	(4)
	Ordered probit coefficient	Ordered logit coefficient	Ordered probit coefficient	Ordered logit coefficient
Age	0.0188** (0.00814)	0.0336** (0.0141)	0.00169 (0.00793)	0.00277 (0.0135)
Children	-0.0210 (0.0273)	-0.0386 (0.0480)	-0.00692 (0.0267)	-0.0218 (0.0452)
Male	0.0933 (0.0813)	0.159 (0.141)	0.227*** (0.0792)	0.385*** (0.136)
Marital status				
Single	0.892* (0.458)	1.555** (0.771)	-0.0534 (0.405)	-0.261 (0.717)
Married	0.798* (0.427)	1.399* (0.715)	0.176 (0.372)	0.207 (0.655)
Divorced	0.671 (0.434)	1.178 (0.728)	-0.152 (0.380)	-0.365 (0.668)
Widowed	0.971** (0.475)	1.710** (0.795)	0.326 (0.424)	0.377 (0.737)
Smoker	0.162 (0.109)	0.276 (0.189)	-0.130 (0.297)	-0.228 (0.500)
Former smoker	0.0198	0.0354	-0.132	-0.220

Variable	Health perception		Life perception	
	(1)	(2)	(3)	(4)
	Ordered	Ordered	Ordered	Ordered
	probit	logit	probit	logit
	coefficient	coefficient	coefficient	coefficient
	(0.0899)	(0.157)	(0.0867)	(0.149)
Education level				
High school	-0.609	-1.144	-6.276	-16.34
	(0.804)	(2.071)	(93.14)	(639.4)
Postsecondary	-0.825	-1.542	-6.071	-15.98
	(0.802)	(2.069)	(93.14)	(639.4)
Unknown	-0.778	-1.387	-5.941	-15.66
	(0.887)	(2.178)	(93.14)	(639.4)
Extreme sport activities	-0.0700	-0.0604	-0.0699	-0.161
	(0.199)	(0.348)	(0.190)	(0.323)
Age of father at death	-0.00200	-0.00400*	0.000248	0.000679
	(0.00129)	(0.00225)	(0.00124)	(0.00213)
Age of mother at death	0.00130	0.00251	-0.000735	-0.00103
	(0.00116)	(0.00202)	(0.00112)	(0.00193)
High income	-0.291***	-0.497***	0.0342	0.0599
	(0.0834)	(0.145)	(0.0810)	(0.139)
Health perception			-0.504***	-0.881***
			(0.0656)	(0.115)
Health perception and smoking (interaction)			-0.169	-0.300

Variable	Health perception		Life perception	
	(1)	(2)	(3)	(4)
	Ordered	Ordered	Ordered	Ordered
	probit	logit	probit	logit
	coefficient	coefficient	coefficient	coefficient
			(0.153)	(0.260)
Physical problems	1.379*** (0.0899)	2.434*** (0.172)		
Constant cut 1	0.965 (1.038)	1.599 (2.356)	-8.079 (93.14)	-19.56 (639.4)
Constant cut 2	3.077*** (1.044)	5.271** (2.367)	-6.385 (93.14)	-16.68 (639.4)
Constant cut 3	4.252*** (1.045)	7.602*** (2.369)		
Observations	955	955	955	955
Pseudo R^2	0.1714	0.1680	0.0781	0.0785

Note. Standard errors in parentheses. Main explanatory variables are gender, marital status, smoking, education, income, parent's age at death ($N = 955$).

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Figure 1

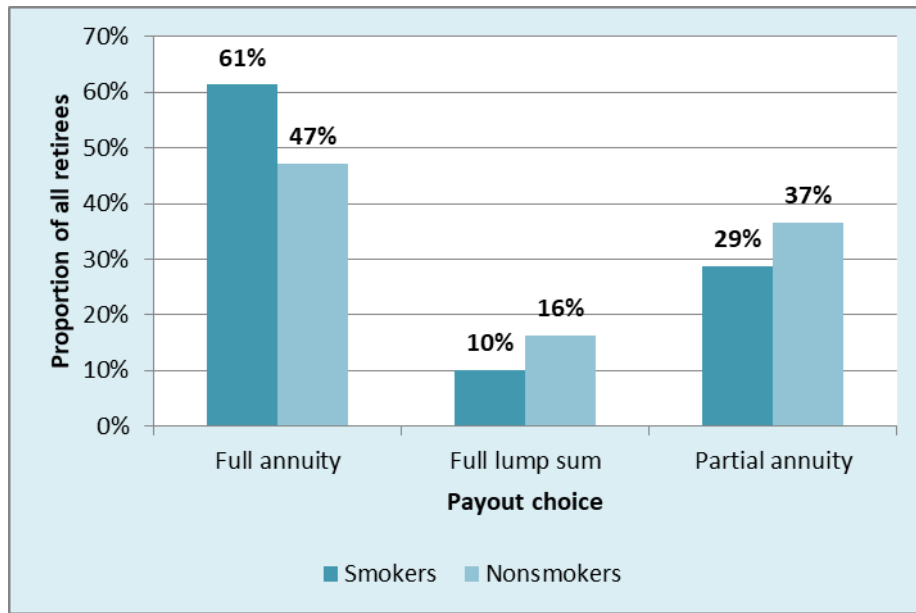


Figure 2

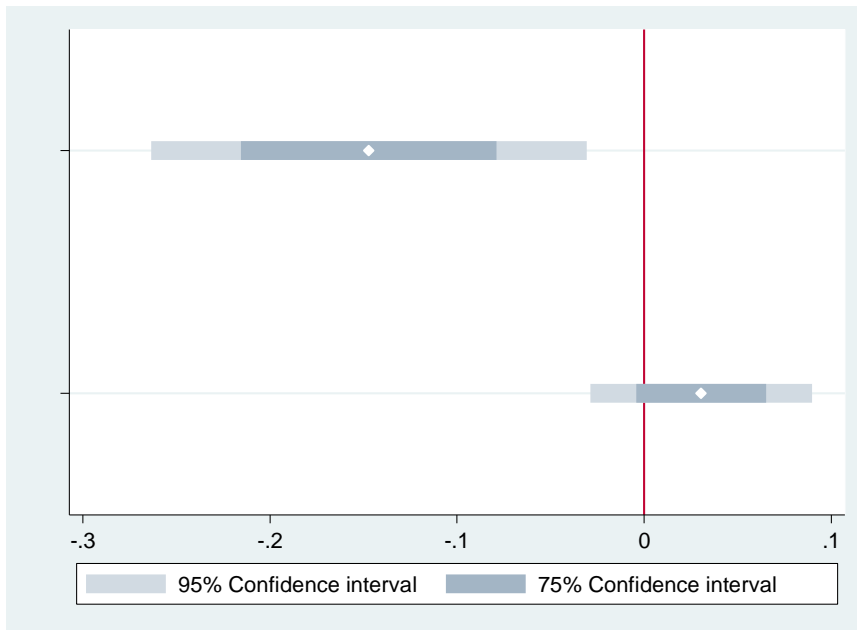


Figure 3

