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Annuitisation and Mortality: Disentangling Selection from Behaviour*

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Abstract

We re-examine the widely documented positive correlation between annuitisation and longevity by cleanly separating selection from causal effects—an empirical distinction that the literature has acknowledged but has not been able to identify credibly. Using administrative micro–data from Chile's centralized pension quote system, we exploit monthly variation in the relative generosity of annuities versus programmed withdrawals generated by regulated PW formulas and market-based annuity pricing. These shocks serve as plausibly exogenous instruments for annuitisation in an IV bivariate probit model of post-retirement survival. Across horizons up to fifteen years, we find no statistically significant causal effect of annuitisation on survival for either men or women. The results imply that the observed longevity advantage of annuitants in Chile reflects selection rather than behavioral responses. By isolating the causal channel, the paper contributes to ongoing discussions on decumulation design by showing that moral-hazard-driven survival effects are unlikely to be a relevant policy concern in this setting.

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1 Introduction

In Chile's pension system, individuals who retire with sufficient balances to finance at least the minimum pension must choose how to decumulate their savings. The two main options are a life annuity—in which the retiree transfers her accumulated balance to an insurance company in exchange for a fixed, inflation-indexed payment until death—and a programmed withdrawal (PW), where funds remain in a Pension Fund Manager (AFP) and benefits are recalculated annually, generally declining over time. Any remaining balance under PW finances survivor pensions or becomes part of the estate.[1] The central trade-off is familiar: annuities insure longevity risk but forfeit the possibility of leaving a bequest, while PWs preserve ownership of funds but expose the retiree to investment and longevity risk.

Standard theory predicts that life expectancy, risk aversion, and bequest motives should shape the retirement product choice. Individuals who expect to live longer than average or who place little weight on bequeathing savings have stronger incentives to annuitise. Conversely, those valuing liquidity or bequests often prefer PW. These considerations imply that individuals who select annuities may, on average, live longer than those who choose PW. This pattern has been widely documented and interpreted as evidence of adverse selection: individuals hold private information about health or mortality risks and self-select accordingly, as emphasised by Mitchell, Poterba, Warshawsky, and Brown (1999), Finkelstein and Poterba (2004), Fong (2002), and Einav, Finkelstein, and Schrimpf (2010) for developed countries. Recent work further suggests that improved access to information can amplify selection, as shown by Handel, Kolstad, and Spinnewijn (2019), Lester, Shourideh, Venkateswaran, and Zetlin-Jones (2019), and Fajnzylber, Gabrielli, and Willington (2023).

A separate line of research highlights the potential role of moral hazard. If annuitisation raises the marginal value of survival, retirees may adjust their behaviour—for instance, by investing more in preventive healthcare—in ways that increase longevity. This possibility dates back to Davies and Kuhn (1992) and Philipson and Becker (1998), who argue that guaranteed lifetime income may distort health and consumption choices toward "excessive" longevity. Kuhn, Wrzaczek, Prskawetz, and Feichtinger (2015) show similar mechanisms in a life cycle model with endogenous health and labour supply. Nevertheless, the empirical relevance of this channel remains controversial: Finkelstein and Poterba (2004) that the presence of moral hazard on UK annuity markets has, if any, small effects, and Beauchamp and Wagner (2020) reject its presence in the US Social Security context.

Whether annuitisation causally affects longevity is therefore an empirical question. Two channels could in principle operate. First, an income-effect channel: annuities guarantee

[1] Workers who accumulate insufficient funds may only access the PW option.

a stable real income, while PW payments are initially higher but decline over time. For retirees whose pension is a major share of total income, such differences could matter for access to medicines or medical care. This effect is theoretically ambiguous, as PW is more generous early in retirement while annuities dominate later. Second, a behavioural channel: because annuity payments depend on being alive, they may increase the incentives to invest in health, improve lifestyle choices, or engage in preventive behaviours.

Yet reduced-form correlations between annuitisation and longevity cannot distinguish selection from moral hazard. Retirees differ in unobservable health, preferences, and resources, and both channels—selection and behavioural responses—tend to generate the same sign in survival regressions. Identifying whether annuitisation itself increases longevity requires exogenous variation in the annuity decision.

This paper provides new evidence on this question using twenty years of administrative data from the Chilean SCOMP platform (*Sistema de Consultas y Ofertas de Montos de Pensión*). SCOMP is mandatory for all retirees considering an annuity, and records the complete set of annuity offers available as well as the regulated PW quote at the precise time of the retirement decision. These institutional features generate rich month-level variation in the relative generosity of annuities versus PWs. In particular, while annuity prices react immediately to financial-market conditions, PW calculations depend on a regulated interest rate that historically adjusted infrequently. As a result, short-run macro-financial fluctuations shift the annuity–PW relative price in ways that individual retirees cannot manipulate.

We exploit this institutional structure to estimate the causal effect of annuitisation on survival. First, we show that annuitants in Chile exhibit higher survival probabilities at short and intermediate horizons, consistent with prior work. Then, to separate selection from moral hazard, we implement a recursive instrumental-variable bivariate probit (IVBP), using as an instrument the monthly median of the ratio between the best annuity offer and the PW quote available in SCOMP. This instrument moves the annuitisation margin but is plausibly unrelated to an individual's underlying health or long-run survival prospects, conditional on initial pension, retirement age, and birth cohort. Using this near-universe of retirees between 2004 and 2024, and tracking survival horizons of up to fifteen years, we find no evidence that annuitisation causally increases longevity for either men or women. The correlation between unobservable determinants of annuitisation and survival is small and generally statistically insignificant. Our estimates imply that the positive annuitant–survival correlation in Chile is driven by selection, not by behaviour induced by annuitisation.

These results contribute to the literature in three ways. First, they provide a theoretically grounded rationale for why annuitisation may or may not increase health investment, clarifying that the sign of the response is not predetermined. Second, they introduce new instruments based on administrative micro quotes that exploit institutional price rigidities. Third, they offer, to our knowledge, the most comprehensive causal test of moral hazard in a large annuity market in a middle-income country.

The rest of the paper is organised as follows. Section 2 provides background on the Chilean retirement system. Section 3 develops a simple theoretical framework that illustrates how annuity pricing affects incentives for health investment. Section 4 presents the empirical strategy. Section 5 describes the dataset. Section 6 reports the results. Robustness checks are collected in the Appendix.

2 The Chilean Institutional Context

Chile's pension system underwent a pioneering reform in 1980, replacing the traditional pay-as-you-go (PAYG) structure with a fully-funded, individual capitalization model. This reform positioned Chile as a global pioneer in pension privatization and set the foundation for a market-based approach to retirement savings and income. Among its distinctive features is the design of the decumulation phase, which has led to the emergence of one of the world's largest annuity markets relative to GDP (see OECD (2023)).

At retirement, individuals who have accumulated sufficient funds to finance at least the legal minimum pension may choose among three options for receiving their benefits: a programmed withdrawal (PW), a life annuity, or a combination of both. Those with insufficient balances are automatically placed into the PW scheme. These options differ significantly in terms of ownership of funds, income predictability, and intergenerational transfers.

Under the PW scheme, the retiree retains ownership of their funds, which remain invested in a Pension Fund Administrator (AFP). The AFP is responsible for making monthly payments, calculated annually by the regulator to reflect an actuarially fair annuity based on the retiree's remaining balance, life expectancy, and the official discount rate. Since these recalculations generally reflect decreasing balances and advancing age, the monthly pension typically declines over time. Upon the retiree's death, the remaining funds are used to pay survivor pensions, or, if there are no eligible beneficiaries, are passed on to legal heirs. Retirees who select PW retain the option of switching to an annuity later, provided they meet the minimum pension funding requirement.

In contrast, selecting a life annuity entails transferring the full balance of pension savings to a Life Insurance Company (LIC). In return, the LIC guarantees a fixed monthly payment for life, indexed to inflation through the use of *Unidades de Fomento* (UF), a widely used unit of account in Chile. Ownership of the funds fully relinquished at the moment of annuitization.

Several optional features are available, including guaranteed periods (where benefits are paid to survivors for a fixed number of years after death) and deferred annuities (in which the retiree receives a temporary pension from the AFP before the annuity begins).[2]

The choice between PW and annuity thus reflects a core trade-off: while annuities offer protection against longevity and investment risk, PWs provide greater flexibility and the possibility of leaving a bequest. The structure of the system, however, may also create incentives for strategic behavior, particularly in how retirees weigh current liquidity, intertemporal smoothing, and family-related considerations. Moreover, retirees may also be influenced by sales agents and advisors in this process, who may have their own interests.

In order to improve retiree decision-making and foster competition among annuity providers, a major institutional innovation was introduced in 2004: the Electronic Pension Consultation and Offers System (SCOMP, *Sistema de Consultas y Ofertas de Montos de Pensión*). This digital platform is mandatory for all individuals eligible to purchase an annuity and acts as a centralized marketplace for comparing retirement income options.

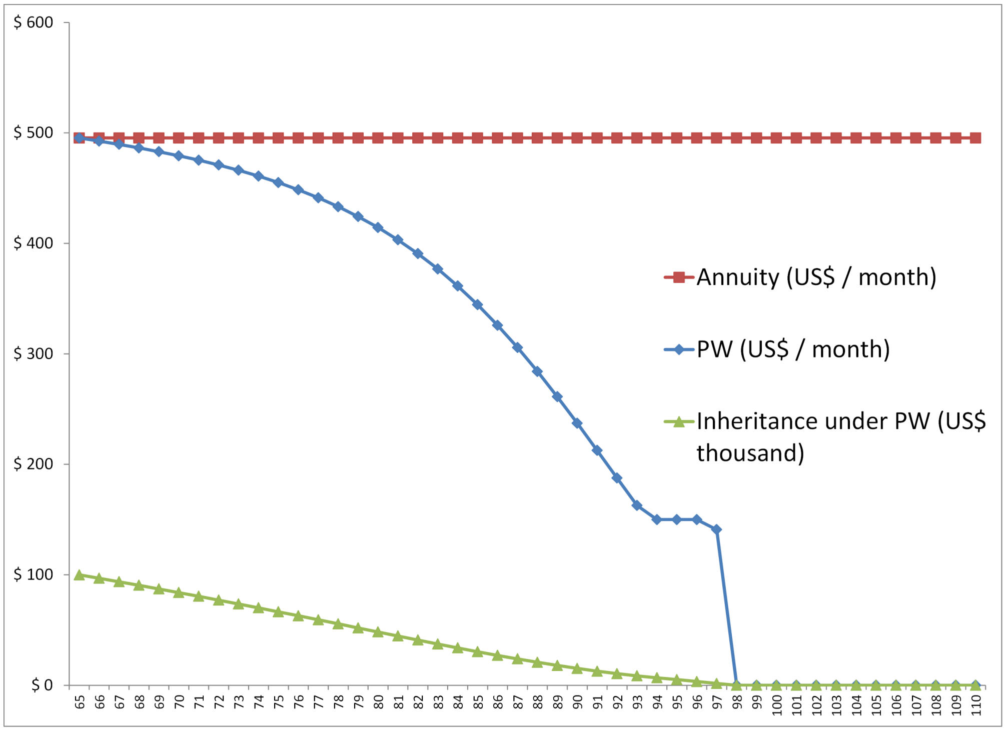
Through SCOMP, retirees receive standardized information on the key attributes of PWs and annuities, personalized pension projections, and a ranked list of annuity offers from all participating insurance companies. By reducing search costs and limiting the influence of commission-based sales agents, SCOMP marked a structural improvement in transparency and market efficiency.[3] The SCOMP report also presents a chart illustrating the projected income under the PW option.

In Figure 1 we simulate and compare the income streams that a single 65 year-old man with 100,000 USD savings would receive under the annuity and PW options. Under the PW option, once the funds reach a minimum, the pension is constant at the minimum level (150USD in the chart) until funds are depleted. After that, the retiree may be eligible for a government sponsored minimum pension. The figure also portrays, in thousands of dollars, the inheritance that the retiree leaves to his heirs as a function of his age of death.)

[2] An additional element is the Free Disposal Surplus (FDS), which allows retirees to withdraw a portion of their funds before annuitization, reducing the premium transferred to the LIC.

[3] Prior to SCOMP, the market suffered from asymmetric information, excessive commissions, and conflicts of interest, as retirees typically relied on insurance agents whose compensation depended on annuity selection. See Stewart and Reyes (2008), Morales and Zucal (????), Miranda and Halcartegaray (2011), Ferreiro (2015), and Morales and Larraín (2017).

Figure 1: Pension Schedule and Inheritance under PW and Annuity



Source: Own calculations for a single 65 year-old man who pays a premium of 100,000USD, assuming an interest rate of 3%, a minimum pension of 150USD (relevant for the PW case), and no load for the annuity. *Note:* Annuities are not linked to a regulated interest rate, so the monthly pension may not coincide with the initial PW pension.

3 Theoretical Model

We study a two–period retirement model in which a retiree chooses first a payout arrangement for her pension wealth, W, either a *life annuity* (AN) or a *programmed withdrawal*, (PW), and then, in the first period, consumption c_1 and health investment h (e.g., preventive care, effort, or medical expenditures) that increases the probability of being alive in period 2. Preferences place value on consumption when alive. For simplicity, we assume there is no bequest motive.[4]

The key mechanism is simple. Under AN, if the retiree is alive in period 2 she receives (again) the annuity income, so survival increases the chance to enjoy a second stream of consumption at level a. Under PW, the second–period cash flow is scheduled independently of survival, but it turns into consumption only if the retiree is alive. In the baseline model

[4]The bequest motive is certainly relevant for the choice between annuity and PW, but, as we discuss below, it is less relevant for the incentives to invest in heath. We also discuss how the model could be extended and how the results would adjust.

without additional frictions, this typically implies a higher marginal return to health under AN, hence $h^{AN} > h^{PW}$.

However, this ranking can reverse once we allow an annuity load $\phi \in (0,1)$ that could be related to administrative costs or markups (i.e., annuity income equals $(1-\phi)$ times the actuarially fair level). A positive ϕ reduces second-period consumption under AN, reducing the private return to h. Moreover, ϕ also affects negatively first-period income, potentially reducing both consumption and health investment. For sufficiently large—but empirically plausible—loads, one can obtain $h^{PW} > h^{AN}$, implying that annuitants may have lower life expectancy.

General Setup. The individual lives at most two periods, $t \in \{1, 2\}$. Let $u(\cdot)$ denote period utility when alive, with $u' > 0$, $u'' < 0$, and $u(c) \to -\infty$ as $c \downarrow 0$. Health investment $h \geq 0$ increases the probability of being alive in period 2 from a baseline to $p(h) \in (p_0, 1)$, where $p'(h) > 0$ and $p''(h) < 0$. The price of health care is $q > 0$.

The retiree initial wealth is $W > 0$, and his pension choice determines his budget constraints:

- **Annuity (AN).** The contract pays a in $t = 1$ and again a in $t = 2$ if alive. We allow for a load $\phi \in [0, 1)$, so that the retiree receives

$$a \;=\; (1-\phi)\,\frac{W}{1+\bar{p}_{an}},$$

  where $\bar{p}_{an} \in (0,1)$ is the equilibrium probability of survival for annuitants. If $\phi = 0$, the annuity is actuarially fair.

- **Programmed Withdrawal (PW).** This arrangement pays w_1 in $t = 1$ and w_2 in $t = 2$, regardless of survival:

$$w_1 \;=\; \frac{W}{1+\bar{p}_{pw}}, \qquad w_2 \;=\; \frac{\bar{p}_{pw}\,W}{1+\bar{p}_{pw}},$$

  where $\bar{p}_{pw}$ is the period-2 survival probability induced by the optimal h of PW choosers. This calculation mirrors the Chilean system, where programmed withdrawal payments are recalculated each year to remain actuarially fair.

In $t = 1$ the retiree chooses consumption $c_1 \geq 0$ and health $h \geq 0$ subject to the period-1 budget, with saving allowed but borrowing prohibited. Since there is no bequest and no third period, if alive in $t = 2$, the individual consumes her period-2 income plus any first-period savings.

Fixed points: Note that for each arrangement we impose $\bar{p}_j = p(h_j^*)$, $j \in \{an, pw\}$. I.e., the parameters used in the payout rules coincide with the survival probabilities induced by optimal behavior. This ensures consistency between payouts and choices.

Optimization Problems and First-Order Conditions.

Annuity (AN). For an individual who chooses an annuity, the optimization problem is

$$\max_{c_1, h \geq 0} \quad u(c_1) + p(h)\, u(2a - c_1 - q\, h) \qquad \text{s.t.} \quad a - c_1 - q\, h \geq 0 \text{ and } h \geq 0. \tag{P1}$$

In Claim 1 we characterize the solution to this problem. We show that the individual chooses not to save in the first period and that, if the solution is interior, the optimal h equals its marginal cost (in terms of first-period consumption) and its marginal benefit (in terms of expected second-period consumption).

Claim 1. If $\lim_{h \to 0} p'(h)\, u(a) \geq q\, u'(a)$, the solution to P1 is characterized by the equations

$$c_1 + q\, h = a \tag{A1}$$

$$p'(h)\, u(a) = q\, u'(c_1), \tag{A2}$$

else, by $c_1 = a$ and $h = 0$.

The intuition for zero saving in period 1 is simple: any dollar saved yields marginal utility $p(h)\, u'(a + s_1)$ in period 2, which is strictly smaller than $u'(c_1)$ because $p(h) < 1$ and $c_1 \leq a$. Likewise, (A2) equates the marginal benefit of health investment, $p'(h)u(a)$, with its marginal cost, $q\, u'(c_1)$ (if the parameters of the problem are such that the solution is interior).

Programmed Withdrawal (PW). The optimization problem is

$$\max_{c_1, h \geq 0} \quad u(c_1) + p(h)\, u(w_1 + w_2 - c_1 - q\, h) \qquad \text{s.t.} \quad w_1 - c_1 - q\, h \geq 0 \text{ and } h \geq 0. \tag{P2}$$

Here, because period-2 income is lower than period-1 income, the retiree may save in period 1. Claim 2 formalizes the solution to problem P2.

Claim 2. If the first period budget constraint is binding, then the solution to (P2) is given by the pair of equations

$$u'(c_1) = p'(h)u(w_2)/q$$
$$w_1 = c_1 + qh.$$

Else, if the first period budget constraint is not binding, then the solution is given by equations

$$u'(c_1) = p(h)u'(w_1 + w_2 - c_1 - qh)$$
$$p'(h)u(w_1 + w_2 - c_1 - qh) = qp(h)u'(w_1 + w_2 - c_1 - qh).$$

The proofs of the claims are omitted as they follow from standard first-order conditions.

Functional Forms, Parameters, and Results. The purpose of this simple setup is to show that the causal effect of the pension product choice on longevity can go in either direction. To illustrate this point, we consider the following functional forms and parameters:

$$\begin{aligned} u(c) =& 2\sqrt{c} \\ p(h) =& (1-\alpha) + \alpha h/(1+h) \\ W =& 10 \\ \alpha =& 0.25 \\ q =& 1 \\ \phi \in& \{0; 0.1\}. \end{aligned}$$

Table 1 summarizes the results for the two annuity scenarios ($\phi = 0$ and $\phi = 0.1$) and for the PW scenario. The first rows report the relevant parameters, and the last rows report the optimal choices.[5]

While the annuity payment is constant across periods, programmed withdrawal payments decline over time. Moreover, the PW payment is higher than the annuity in period 1 but lower in period 2, consistent with Chilean data. Most importantly, the optimal health investment h differs across the three scenarios, and in particular the PW value can be higher or lower than the annuity value.

Intuitively, two forces interact: annuitants have stronger incentives to invest in health because, if alive, they enjoy higher income than PW choosers in period 2, but loads tighten the period-1 budget constraint, which may reduce h relative to PW. Thus, the direction of the effect is ambiguous.

The model demonstrates that either ranking $h^{AN} \gtrless h^{PW}$ can arise. Without loads

[5] Note that the parameter $\bar{p}_j$, $j \in \{pw, an\}$, that determines each budget constraint, is different across scenarios. In each case it is chosen so that the optimal h yields a survival probability equal to $\bar{p}_j$.

one typically finds $h^{AN} > h^{PW}$, but with modest loads (around 8% in our calibration) the inequality reverses. This motivates our empirical strategy: assessing whether annuitization causally affects longevity (moral hazard) once selection is addressed, rather than simply assuming that the observed annuitant survival correlation reflects selection.

Table 1: Optimal health and consumption choices under different pension product regimes

	Annuity $\phi = 0$	**Annuity** $\phi = 0.10$	**Programmed Withdrawal**
ϕ	0.00	0.10	–
$\bar{p}$	0.843681	0.835763	0.837402
First-period income (a_1)	5.423932	4.902594	5.442467
Second-period income (a_2)	5.423932	4.902594	4.557533
First-period consumption (c_1)	4.824632	4.380399	4.904929
Health investment (h)	0.599299	0.522194	0.537537
Second-period consumption (c_2)	4.575821	4.392152	4.557534
Survival probability $p(h)$	0.843681	0.835763	0.837402

Notes: The table reports key variables for three scenarios: annuity without load ($\phi = 0$), annuity with a 10% load ($\phi = 0.10$), and programmed withdrawal. In all cases, $W = 10$, $q = 1$, and $\alpha = 0.25$. For annuities, $a_1 = a_2 = (1 - \phi)W/(1 + \bar{p})$; for programmed withdrawal, $w_1 = W/(1 + \bar{p})$ and $w_2 = \bar{p}W/(1 + \bar{p})$. Survival probability is computed as $p(h) = (1 - \alpha) + \alpha\, h/(1 + h)$.

The model demonstrates that either ranking $h^{AN} \gtrless h^{PW}$ can arise. Without loads one typically finds $h^{AN} > h^{PW}$, but with modest loads (around 8% in our calibration) the inequality reverses. This motivates our empirical strategy: assessing whether annuitization causally affects longevity (moral hazard) once selection is addressed, rather than simply assuming that the observed annuitant survival correlation reflects selection.

4 Methodology

The annuitization decision presents characteristics that create conditions for adverse selection: individuals may self-select into annuities based on private information about health and expected longevity (adverse selection). Also, as discussed in the previous section, securing a lifetime income may alter health investment incentives (moral hazard). These effects are different in nature, but distinguishing them is challenging since both may operate in the same direction in terms of longevity and, also, individual decisions such as healthcare spending or lifestyle choices that can affect expected longevity are generally not observable.

We first estimate a probit model for the probability of surviving that also includes the decision to buy an annuity (as opposed to a PW) to assess the positive correlation between longevity and annuitization. This correlation has been usually interpreted as evidence of adverse selection in the annuity literature, but, as explained earlier, it may also be capturing a causal effect from annuitization to longevity.

In order to disentangle adverse selection from moral hazard, we then implement an instrumental variable strategy applied to a model that explains survival probabilities (e.g., five years after retirement, seven years after retirement, etc.) as a function of the annuitization choice, controlling for cohort, age, and initial pension. This allows us to study whether annuitization causally affects post-retirement survival. Our instrument is a month-level measure of the relative generosity of annuities versus PWs constructed from SCOMP quotes.

We compute for each individual the ratio between the best life-annuity offer (restricted to annuity offers with no deferred period and no guaranteed period) and the PW quote. Our instrument is the median of the distribution of this ratio for individuals who retired in month t, denoted Z_t. Therefore, the instrument exploits decision-month movements in the relative prices of annuities vs. PWs, and it is identical for all individuals who retired in the same month.

The variation in our instrument stems from the nature of the two options (PW and annuities). Annuity offers are defined in a competitive market, reflecting both future expected long-term structure of interest rates at the moment of retirement and personal characteristics of the retiree that firms observe (age, gender, balance, legal beneficiaries, etc.). In contrast, PW determination entirely regulated: payments for the first year are calculated as an actuarially fair annuity, considering official mortality tables that ignore relevant variables as marital status and savings, and using an interest rate determined by the pension authority. Importantly, this regulated rate was adjusted once a year until 2014 and quarterly since then, so sudden changes in macroeconomic conditions that affect market interest rates are not immediately considered in the PW calculations. This can affect the retirees' decisions, especially if they compare the first-year payments of the two options.[6,7]

Given the aggregate and mostly financial-market nature of our instruments, conditional on other covariates X_i, the instrument is plausibly unrelated to individual long-run survival prospects other than through the annuity decision (exclusion restriction). Monotonicity is also natural in this setting: higher relative annuity payouts weakly increase the probability

[6] Historically, the regulated interest rate was a combination of past pension funds returns and the implicit rate on annuities sold in the previous six months to the date the rate was determined. From 2009 onwards, the calculation methodology changed, becoming a methodology based on a 20-year risk-free rate profile calculated by two consultancies, to which is added a return on AA-, AA, and AA+ corporate bonds in excess of the risk-free rate. Beginning in 2014, the rates were calculated every quarter. More details can be found at https://www.spensiones.cl/apps/tasas/tasdescto.php.

[7] The PW amount is recalculated every year using the same formula. Since the expected longevity of the retirees that survive increases, her pension decreases every year.

of annuitization for all individuals (no defiers). Since the identifying variation is primarily common to month t, inference is based on standard errors clustered at the retirement-month level (results are robust to alternative specifications; see Appendix A).

Let S_i^N denote an indicator equal to one if individual i is alive N years after retirement ($N \in \{5, 7, \ldots, 15\}$ in our baseline set of horizons), and zero otherwise.[8] Let $A_i \in \{0, 1\}$ indicate the retirement product choice (A_i=1 for life annuity, A_i=0 for programmed withdrawal). The vector X_i includes age at retirement, birth cohort, and the initial monthly pension. As our base strategy, we implement a simultaneous equations approach, estimating an instrumental-variable bivariate probit model (IVBP) for the survival and annuitization probabilities.[9] Although qualitatively similar to the Chiappori and Salanie (2000) bivariate probit strategy, here the annuitization decision is one of the regressors in the survival model. Our main specification is a recursive bivariate probit estimated by maximum likelihood:

$$S_i^N = \mathbb{1}\left\{\alpha_N A_i + X_i'\beta_N^S + \varepsilon_{iN}^S > 0\right\},$$
$$A_i = \mathbb{1}\left\{\gamma Z_{it} + X_i'\beta^A + \varepsilon_i^A > 0\right\},$$

where $(\varepsilon_{iN}^S, \varepsilon_i^A)$ are standard normal with correlation ρ_N.[10] Identification of α_N relies on the exclusion of Z_t from the survival equation. We report the average of marginal effects of annuitization on S_i^N for each individual, and, separately, the average of marginal effects of all covariates, included the instrument, on the decision to annuitize.

For each N, survival is defined relative to the retirement date recorded in SCOMP. Individuals who die before N years have S_i^N=0; those observed alive at or beyond N years have S_i^N=1. Individuals whose potential follow-up is shorter than N years at the censoring date are excluded from that horizon to avoid misclassification due to right-censoring. All models are estimated separately for men and women.

All specifications include X_i (retirement age, birth cohort, and initial pension). The initial pension absorbs mechanical channels through which relative pricing at retirement could affect early survival only via the starting benefit level. In robustness checks (reported in Appendix A), we re-estimate using an alternative instrument defined as the exogenous (leave-one-out) monthly mean of the ratio between the best annuity offer and the PW (excluding individual i), $\overline{R}_{it}$, an alternative linear estimation strategy (2SLS, see below), and an alternative subsample, including only people retiring at normal ages (65 for men and 60 for women). In all cases, estimates are quantitatively and qualitatively similar to the main

[8] For each horizon N we restrict the sample to retirees with potential follow-up of at least N years before the censoring date (January 1, 2024); hence the estimation sample naturally shrinks as N increases.

[9] This approach was first introduced by Heckman (1978).

[10] The correlation parameter is reported as `/athrho` in tables. A statistically significant $\rho_N \neq 0$ is informative about selection on unobservables.

exercise that considers the whole sample, the IVBP methodology, and the monthly median instrument Z_t.

Alternative estimator (reported in Appendix A). As a robustness check, we estimate a linear probability model by two-stage least squares (2SLS):

$$S_i^N = \alpha_N^{\text{LPM}} A_i + X_i' \pi_N + u_{iN},$$
$$A_i = \gamma Z_t + X_i' \delta + v_i,$$

with standard errors clustered by retirement month.

5 Data

We build our dataset from the micro records of the SCOMP, the centralized platform through which retirees obtain comparable quotes for life annuities and programmed withdrawals. The database is published by the Chilean insurance regulator and covers all retirement quote processes conducted through SCOMP. Our observation window spans from August 2004—when SCOMP became operational—through January 2024.

The unit of analysis is an individual who completes the retirement quote process in SCOMP and subsequently chooses either a life annuity or a PW. For each person, we observe gender, date of birth, retirement (decision) date, the chosen product, and all quotes for different annuity products and PW. We also observe mortality status during the window and define censoring on January 1, 2024 for individuals who are not observed deceased by that date.

We restrict the sample to old-age retirees at or up to 5 years above the statutory retirement ages (from 60 to 65 for women and from 65 to 70 for men), and we exclude records with internal inconsistencies (e.g., death dated before retirement) or missing key variables. The final sample comprises 282,580 individuals (165,947 men and 116,633 women).

The main outcome variables are indicators for survival at different post-retirement horizons and the associated exposure time (years between retirement and death or censoring). The treatment variable is an indicator for annuitization (life annuity vs. PW). Initial pensions are recorded in *Unidades de Fomento* (UF) and expressed in U.S. dollars for reporting.[11]

A distinctive feature of SCOMP is that it reports, at the time of decision, (i) all life-annuity offers and (ii) the PW quote that the individual would obtain under the regulated

[11] UF is a unit of account widely used in Chile for real estate contracts, loans, annuities, etc.; it is adjusted following the CPI.

formula. Leveraging these micro quotes, we construct two month-level instruments for annuitization that are exogenous with respect to individual survival, conditional on covariates:

(a) the **monthly median** of the ratio between the best life annuity offer and the PW quote, computed using only annuity offers without deferred period and without guaranteed period, denoted Z_t:

$$Z_t \ = \ \text{median}_{j \in N_t} \ R_{jt}, \qquad R_{jt} = \frac{\text{best annuity offer (no deferred, no guarantee)}}{\text{PW quote}}.$$

(b) the **exogenous (leave-one-out) monthly mean** of the same ratio, defined for person i retiring in month t as

$$\overline{R}_{it} \ = \ \frac{1}{|N_t| - 1} \sum_{j \in N_t, j \neq i} R_{jt}, \quad \text{with } R_{jt} = \frac{\text{best annuity offer (no deferred, no guarantee)}}{\text{PW quote}}.$$

Here, $|N_t|$ denotes the number (cardinality) of individuals who retire in month t.

Both aggregators capture month-to-month movements in relative pricing between annuities and PWs that influence the intensive margin of the retirement product choice but are plausibly unrelated to individual long-run survival prospects, beyond their effect on annuitization.

In all specifications we control for birth cohort, retirement age, and initial pension. For expositional clarity, the main text reports estimates using the monthly median of the annuity-to-PW offer ratio as instrument. Results using the exogenous (leave-one-out) monthly mean are quantitatively and qualitatively similar across all horizons and subsamples, so we provide them in Appendix A.

Table 2 summarizes the main features of the sample that includes all individuals who retired between August 2004 and December 2018. Annuitization rates are 72% for men and 77% for women. Average retirement occurs close to the statutory age (65.72 for men; 61.34 for women). Exposure time—i.e., the time between retirement and death or January 2024, whichever occurs first—averages 8.82 years for men and 10.35 years for women, consistent with lower observed mortality among women within the window (17% deceased among men; 7% among women). The large difference in mortality shares (17% for men vs. 7% for women) is explained by pur our windows definitions (women observed from ages 60–65; men from 65–70) and the fact that women live longer.

Figure 2 overlays the monthly median of the annuity-to-PW offer ratio (our main instrument) with the observed monthly annuitization share. Two facts stand out. First, the instrument displays substantial month-to-month variation over 2004-2024 (roughly within

Table 2: Descriptive Statistics (August 2004 – January 2019)

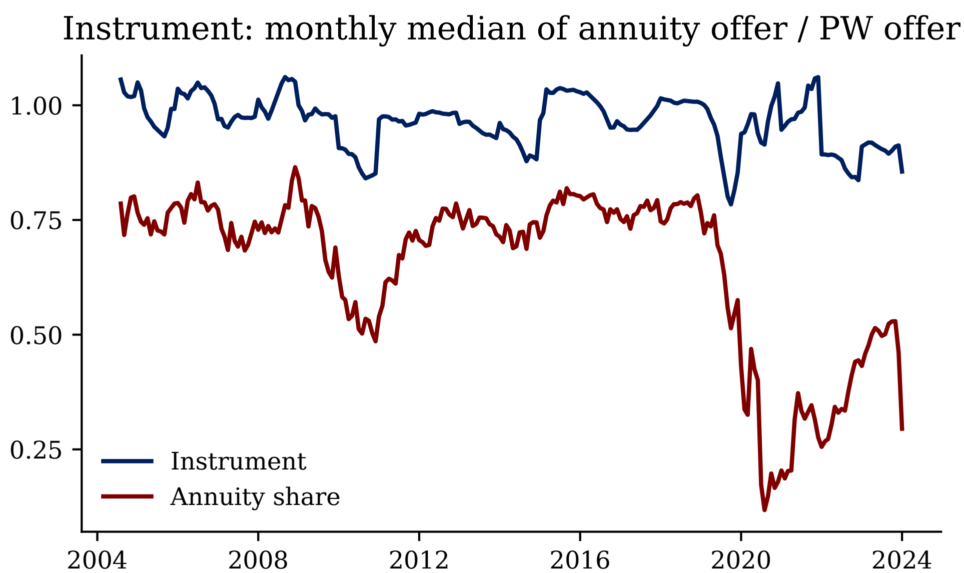
	Men	Women
Annuitized	0.72	0.77
	(0.45)	(0.42)
Birth year	1,948.08	1,951.41
	(3.79)	(4.12)
Deceased	0.17	0.07
	(0.37)	(0.25)
Age at retirement	65.72	61.34
	(1.06)	(1.40)
Age at death (or last obs.)*	66.88	61.88
	(3.32)	(2.79)
Age at death**	72.70	69.71
	(4.38)	(4.85)
Initial pension USD (All)	566.32	443.02
	(595.44)	(275.87)
Initial pension USD (Annuitants)	536.88	441.21
	(481.19)	(255.36)
Initial pension USD (PW)	641.08	449.01
	(811.91)	(335.00)
Years of exposure	8.82	10.35
	(3.59)	(3.75)
Observations	165,947	116,633

Source: Own calculations. Mean values; standard deviations in parentheses. (*) End of observation window: January 1, 2024. (**) Only individuals who died within the window.

the 0.85-1.05 range). Second, there is clear co-movement: months in which annuities are relatively more generous (a higher ratio) tend to exhibit a larger fraction of retirees choosing annuities. This pattern supports the instrument relevance. Also, there are episodes of partial decoupling (notably between late-2019 and 2021), where the annuitization share falls sharply while the ratio remains within its historical band.[12]

Figure 3 plots the distribution of the monthly median ratio. The series is tightly clustered between 0.90 and 1.00 with thin tails below 0.85 and above 1.03, indicating meaningful variation without pathological mass points. This distributional shape is consistent with a stable and informative first stage and mitigates concerns about weak identification driven by a few extreme months.

Figure 2: Instrument and annuitization share



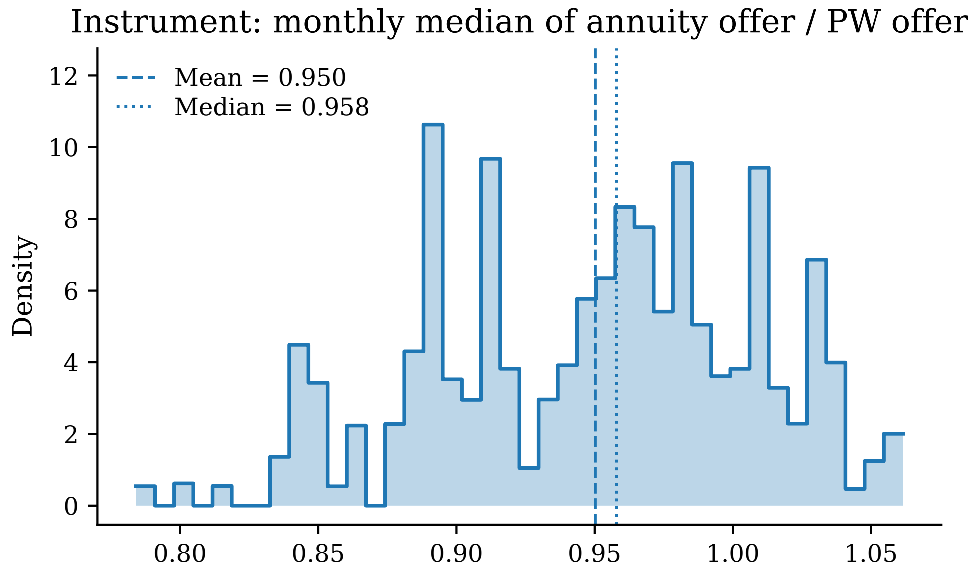
Notes: Monthly median of the best life-annuity offer to PW quote (no deferred, no guaranteed period) and the monthly fraction of SCOMP decisions that annuitize.

6 Results

This section presents the results of our estimations. As mentioned above, we start by conducting an empirical exercise to quantify the correlation between the survival probability and

[12]This decoupling is likely explained by the social unrest episode of October 2019 and the subsequent COVID-19 pandemic. During this period there was growing uncertainty about the stability of the pension system, and people choosing PW had the opportunity to withdraw up to 30% of their funds, while conditions for individuals who chose annuities were more restrictive. In any case, since the smallest survival period we consider in our estimations is 5 years, all retirees included in our sample retired before these episodes.

Figure 3: Distribution of the instrument



Notes: Kernel density of the month-level median of the annuity-to-PW offer ratio across 2004m8 - 2024m1.

the annuitization decision, using a simple probit for the survival probabilities as a function of the annuitization dummy, without instrumenting the annuitizaty indicator.

Table 3 contains the results. As can be seen, the annuity indicator is significant for men surviving up to 9 years after retirement and for women surviving up to 11 years. This is consistent with previous empirical literature on the annuity market in Chile that, albeit with different empirical strategies, finds a positive correlation between annuitization and longevity (James, Martinez, and Iglesias, 2006; Illanes and Padi, 2019; Fajnzylber, Gabrielli, and Willington, 2023). In particular, James, Martinez, and Iglesias (2006) find evidence of lower mortality for annuitants in the first years after retirement, which they interpret as asymmetric information about short-run mortality prospects.

Table 3: Probit Estimation - All retirees

	PANEL A: Men – Marginal effects					
VARIABLES	5 years	7 years	9 years	11 years	13 years	15 years
Age at SCOMP	-0.000437**	-0.000837***	-0.00123***	-0.00215***	0.000575	0.00273
	(0.000170)	(0.000277)	(0.000458)	(0.000764)	(0.00136)	(0.00289)
Retirement age	-0.00551***	-0.00805***	-0.0120***	-0.0147***	-0.0238***	-0.0302***
	(0.000598)	(0.000867)	(0.00123)	(0.00175)	(0.00249)	(0.00406)
Child	0.00427**	0.00406	0.00695*	0.00650	0.00557	0.0264**
	(0.00194)	(0.00275)	(0.00391)	(0.00543)	(0.00775)	(0.0115)
Balance (USD)	1.22e-07***	1.89e-07***	2.44e-07***	3.01e-07***	3.69e-07***	3.98e-07***
	(6.69e-09)	(9.35e-09)	(1.31e-08)	(1.82e-08)	(2.58e-08)	(3.65e-08)
Married	0.0179***	0.0241***	0.0313***	0.0439***	0.0550***	0.0687***
	(0.00147)	(0.00220)	(0.00323)	(0.00461)	(0.00676)	(0.0102)
Annuity dummy	0.00624***	0.00757***	0.00867***	0.00532	-0.00331	0.00154
	(0.00132)	(0.00188)	(0.00262)	(0.00363)	(0.00524)	(0.00815)
Observations	165,947	119,332	80,714	52,850	31,612	16,488
	PANEL B: Women – Marginal effects					
VARIABLES	5 years	7 years	9 years	11 years	13 years	15 years
Age at SCOMP	-0.000758***	-0.00116***	-0.00156***	-0.00166***	-0.00193**	0.000485
	(0.000107)	(0.000170)	(0.000287)	(0.000481)	(0.000879)	(0.00182)
Retirement age	-0.000339	-0.00103**	-0.00258***	-0.00366***	-0.00629***	-0.0141***
	(0.000312)	(0.000443)	(0.000643)	(0.000922)	(0.00138)	(0.00237)
Child	0.00262**	0.00616***	0.00651***	0.00697**	0.00915*	0.00962
	(0.00124)	(0.00178)	(0.00249)	(0.00350)	(0.00510)	(0.00779)
Balance (USD)	3.64e-08***	6.39e-08***	8.96e-08***	1.62e-07***	2.00e-07***	2.64e-07***
	(7.25e-09)	(1.04e-08)	(1.48e-08)	(2.16e-08)	(3.15e-08)	(4.88e-08)
Annuity dummy	0.00360***	0.00571***	0.00534***	0.00574**	0.00315	0.00625
	(0.000909)	(0.00127)	(0.00177)	(0.00246)	(0.00354)	(0.00562)
Observations	116,633	95,197	70,982	50,567	32,879	18,732

Source: Own calculations. Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1).
Note: In the case of women, we do not control for marital status. Before 2008 married women were not allowed to have their spouses as beneficiaries, therefore information on marital status was not recorded.

The second set of results corresponds to the estimation of the effect of annuitization on post-retirement survival using a recursive IVBP model, our main estimation strategy. This framework allows for correlated unobservables between the annuity decision and survival outcomes, providing a structural test for the presence of moral hazard. Results are displayed in Tables 4 and 5. We discuss our findings below.

IV results for men: Table 4 presents the results for men. In Panel B we report the marginal effects of the different covariates on the probability of choosing an annuity, for the different time horizons considered. Importantly, the instrument is highly significant and it helps explain the decision to annuitize—especially in the larger samples (shorter survival windows)—which confirms the robustness of our procedure for identifying an exogenous variation in annuitization.

In columns 1 to 6 of Panel A we report marginal effects of the covariates on the probability of surviving t years ($t \in \{5, 7, ..., 15\}$) after retirement. As expected, the level of savings, being married (for men), and belonging to a younger cohort (captured by the Age at SCOMP variable) have a positive effect on expected longevity, while, logically, retiring older has a negative effect on the probability of surviving t years after retirement.

The marginal effects of annuitization are not statistically significant across all horizons, which indicates a lack of evidence of moral hazard. The estimated `/athrho` coefficients are also not statistically significant in most estimations.

IV results for women: Panel A of Table 5 reports the marginal effects of annuitization on the probability of surviving t years after retirement among women. The estimates are again not statistically significant, except for one horizon (7 years), in which we obtain marginal effects significant at the 10% level. These findings reinforce the pattern observed for men and provide further evidence of a non-causal relationship between annuitization and longevity. The results reported in Panel B, as in the case of men, show that the instrument is relevant to explain the decision to annuitize.

Summary of Findings. We find robust evidence of no causal effect of annuitization on post-retirement survival for both genders. Given this null result, we rigorously test its robustness through several alternative specifications reported in Appendix A: (a) using a different instrumental variable that is completely exogenous, as it excludes the effect of the own individual in its calculation; (b) restricting the sample to retirees at the normal retirement age (60 for women, 65 for men), which could be important if individuals retiring before or after the legal age have different characteristics from those retirng at the legal age, and/or if they have been waiting for specific market conditions to retire; and (c) employing a linear IV (2SLS) model instead of the IV bivariate Probit. The results remain qualitatively unchanged across all specifications, reinforcing our main conclusion.

Table 4: Bivariate IV Probit Estimation on Men (marginal effects) - All retirees

PANEL A: Survival Probability						
VARIABLES	5 years	7 years	9 years	11 years	13 years	15 years
Age at SCOMP	-0.000364	-0.000997***	-0.00122***	-0.00231***	0.000790	0.00225
	(0.000226)	(0.000326)	(0.000459)	(0.000857)	(0.00228)	(0.00307)
Retirement age	-0.00560***	-0.00779***	-0.0116***	-0.0147***	-0.0239***	-0.0299***
	(0.000631)	(0.000908)	(0.00128)	(0.00175)	(0.00285)	(0.00422)
Child	0.00428**	0.00410	0.00697*	0.00648	0.00558	0.0246**
	(0.00194)	(0.00275)	(0.00391)	(0.00543)	(0.00775)	(0.0122)
Balance (USD)	1.24e-07***	1.84e-07***	2.33e-07***	3.05e-07***	3.66e-07***	4.36e-07***
	(8.41e-09)	(1.05e-08)	(1.60e-08)	(2.06e-08)	(3.42e-08)	(8.28e-08)
Married	0.0176***	0.0249***	0.0329***	0.0433***	0.0552***	0.0624***
	(0.00160)	(0.00236)	(0.00350)	(0.00477)	(0.00710)	(0.0181)
Annuity dummy	0.0133	-0.00821	-0.0223	0.0161	-0.00831	0.0816
	(0.0147)	(0.0167)	(0.0265)	(0.0263)	(0.0430)	(0.175)
PANEL B: Annuitization Probability						
VARIABLES	5 years	7 years	9 years	11 years	13 years	15 years
Age at SCOMP	-0.00815***	-0.00860***	-0.00826***	0.00727***	0.0160***	0.00820***
	(0.000315)	(0.000423)	(0.000687)	(0.000956)	(0.00197)	(0.00280)
Retirement age	0.00967***	0.0154***	0.0221***	0.00996***	-0.00636**	-0.00361
	(0.00113)	(0.00136)	(0.00173)	(0.00218)	(0.00303)	(0.00396)
Child	-0.000368	0.00203	-0.000237	0.000810	0.00259	0.0191*
	(0.00345)	(0.00411)	(0.00513)	(0.00638)	(0.00821)	(0.0109)
Balance (USD)	-2.98e-07***	-3.02e-07***	-3.36e-07***	-3.75e-07***	-5.04e-07***	-4.69e-07***
	(9.42e-09)	(1.10e-08)	(1.43e-08)	(1.87e-08)	(2.45e-08)	(3.14e-08)
Married	0.0486***	0.0477***	0.0483***	0.0472***	0.0513***	0.0707***
	(0.00280)	(0.00345)	(0.00443)	(0.00562)	(0.00734)	(0.00974)
Instrument	0.900***	1.005***	1.068***	1.307***	1.109***	0.634***
	(0.0246)	(0.0264)	(0.0389)	(0.0412)	(0.0553)	(0.103)
Athrho	-0.0341	0.0557	0.0852	-0.0246	0.0097	-0.136
	(0.0703)	(0.0587)	(0.0729)	(0.0592)	(0.0827)	(0.3020)
Observations	165,947	119,332	80,714	52,850	31,612	16,488

Source: Own calculations. Standard errors in parentheses. (*** $p<0.01$, ** $p<0.05$, * $p<0.1$).

Note: Instrument is the monthly median of the ratio between the best annuity offer received and the programmed withdrawal offer received.

Table 5: Bivariate IV Probit Estimation on Women (marginal effects) - All retirees

PANEL A: Survival Probability						
VARIABLES	5 years	7 years	9 years	11 years	13 years	15 years
Age at SCOMP	-0.000889***	-0.00137***	-0.00160***	-0.00152***	-0.000340	0.000435
	(0.000143)	(0.000208)	(0.000291)	(0.000491)	(0.00128)	(0.00184)
Retirement age	-0.000283	-0.000884*	-0.00256***	-0.00379***	-0.00810***	-0.0139***
	(0.000324)	(0.000461)	(0.000649)	(0.000933)	(0.00178)	(0.00243)
Child	0.00248*	0.00598***	0.00624**	0.00661*	0.00825	0.0100
	(0.00129)	(0.00184)	(0.00252)	(0.00352)	(0.00518)	(0.00790)
Balance (USD)	3.73e-08***	6.48e-08***	8.82e-08***	1.60e-07***	1.86e-07***	2.81e-07***
	(7.62e-09)	(1.08e-08)	(1.49e-08)	(2.17e-08)	(3.27e-08)	(7.05e-08)
Annuity dummy	-0.00961	-0.0161*	-0.0120	-0.0134	-0.0381	0.0372
	(0.00703)	(0.00911)	(0.0117)	(0.0140)	(0.0236)	(0.0918)
PANEL B: Annuitization Probability						
VARIABLES	5 years	7 years	9 years	11 years	13 years	15 years
Age at SCOMP	-0.00628***	-0.00736***	-0.0124***	-0.00411***	0.00704***	0.00210
	(0.000336)	(0.000427)	(0.000660)	(0.000914)	(0.00185)	(0.00238)
Retirement age	0.00356***	0.00721***	0.0129***	0.00532***	-0.0116***	-0.00835***
	(0.000986)	(0.00112)	(0.00139)	(0.00169)	(0.00248)	(0.00311)
Child	-0.0143***	-0.0147***	-0.0172***	-0.0187***	-0.0228***	-0.0120
	(0.00362)	(0.00406)	(0.00485)	(0.00589)	(0.00751)	(0.00969)
Balance (USD)	-3.03e-08	-6.36e-08***	-1.10e-07***	-1.82e-07***	-3.44e-07***	-4.65e-07***
	(1.96e-08)	(2.20e-08)	(2.68e-08)	(3.31e-08)	(4.29e-08)	(5.61e-08)
Instrument	1.043***	1.116***	1.422***	1.516***	1.300***	0.800***
	(0.0261)	(0.0273)	(0.0369)	(0.0384)	(0.0525)	(0.0939)
Athrho	0.172**	0.191**	0.109	0.0920	0.155*	-0.0898
	(0.0874)	(0.0759)	(0.0728)	(0.0665)	(0.0879)	(0.263)
Observations	116,633	95,197	70,982	50,567	32,879	18,732

Source: Own calculations. Standard errors in parentheses. (*** $p<0.01$, ** $p<0.05$, * $p<0.1$).

Note: Instrument is the monthly median of the ratio between the best annuity offer received and the programmed withdrawal offer received. In the case of women, we do not control for marital status. Before 2008 married women were not allowed to have their spouses as beneficiaries, therefore information on marital status was not recorded.

7 Conclusions

This paper revisits the widely documented association between annuitisation and longevity using comprehensive administrative data and institutional features from Chile that are exceptionally well-suited for identification. We begin by asking a fundamental question: does annuitisation cause longer survival through behaviour (moral hazard), or is the correlation primarily the result of selection? Although we present a simple theoretical framework showing that annuitisation could, in principle, affect health investment, our empirical evidence does not support such behavioural responses. The higher survival of annuitants is therefore best interpreted as selection rather than moral hazard.

Empirically, we exploit decision-month variation in the relative generosity of annuities versus PWs generated by the combination of market-determined annuity offers and a regulated PW formula that adjusts with delay. Using the monthly median of the annuity-to-PW ratio from SCOMP micro quotes as an instrument in a recursive IV bivariate probit, we find no statistically significant effect of annuitisation on survival across horizons up to fifteen years for both men and women (with one marginally significant exception). The correlation between unobserved determinants of annuitisation and survival is small and imprecise. In short, once selection is addressed, the data provide no evidence that annuitisation causally improves survival in this context.

These findings have several implications. First, they temper the view that annuitisation systematically induces survival-enhancing behaviour through moral hazard. In this setting, the longevity advantage of annuitants reflects selection. Second, they imply that policy debates over decumulation design—whether centred on transparency, competition, or information provision—can be evaluated on welfare and market-performance grounds, without the need to account for behavioural survival distortions. Third, our approach shows that administrative quote data can generate credible instruments for studying retirement product choice, a strategy potentially portable to other systems that combine regulated and market components.

Our analysis has limitations that suggest directions for future work. First, although the decision-month instruments are plausibly exogenous conditional on observables, they are aggregate by construction. Exploring individual-level shocks to relative prices or quasi-experiments arising from regulatory discontinuities could further sharpen identification. Second, we focus on horizons up to fifteen years; very long-run effects beyond our window may differ, especially if health behaviours adjust slowly. Third, survival is a coarse outcome measure. If moral hazard operated primarily through quality-of-life or morbidity rather than mortality—for instance, affecting hospitalisation rates or out-of-pocket medical expenditure—our design may understate behavioural margins relevant for welfare. Finally, while Chile provides an ideal test-bed because of SCOMP, the external validity to systems with different pricing, advice, or healthcare environments is an open question.

Notwithstanding these caveats, our results are clear: in a setting with robust competition, transparent information provision, and regulated PW rules, annuitisation does not appear to causally increase survival. The welfare case for annuities should therefore emphasise their insurance value against longevity and investment risk, distributional considerations, and market efficiency—rather than presumed survival gains. Future research linking administrative pension records to medical and utilisation data could illuminate whether behavioural responses manifest along non-mortality margins, and whether incremental design changes to platforms like SCOMP can further improve retirees' choices without unintended consequences.

References

Beauchamp, A., and M. Wagner (2020): "Is there adverse selection in the U.S. social security system?," Economics Letters, 189, 108995.

Chiappori, P., and B. Salanie (2000): "Testing for Asymmetric Information in Insurance Markets," Journal of Political Economy, 108(1), 56–78.

Davies, J. B., and P. Kuhn (1992): "Social security, longevity, and moral hazard," Journal of Public Economics, 49(1), 91–106.

Einav, L., A. Finkelstein, and P. Schrimpf (2010): "Optimal Mandates and the Welfare Cost of Asymmetric Information: Evidence from the U.K. Market," Econometrica, 78(3), 1031–1092.

Fajnzylber, E., M. F. Gabrielli, and M. Willington (2023): "Can transparency increase adverse selection? Evidence from an electronic platform for annuities," Economics Letters, 228, 111135.

Ferreiro, A. (2015): "A una década de la reforma al sistema de rentas vitalicias: aprendizajes, avances y desafíos pendientes," in Escáner a las Rentas Vitalicias. Aach edn.

Finkelstein, A., and J. Poterba (2004): "Adverse Selection in Insurance Markets: Policyholder Evidence from the U.K. Annuity Market," Journal of Political Economy, 112(1), 183–208.

Fong, W. M. (2002): "On the Cost of Adverse Selection in Individual Annuity Markets: Evidence From Singapore," Journal of Risk and Insurance, 69(2), 193–208.

Handel, B. R., J. T. Kolstad, and J. Spinnewijn (2019): "Information Frictions and Adverse Selection: Policy Interventions in Health Insurance Markets," The Review of Economics and Statistics, 101(2), 326–340.

Heckman, J. J. (1978): "Dummy Endogenous Variables in a Simultaneous Equation System," Econometrica, 46(4), 931–959.

Illanes, G., and M. Padi (2019): "Retirement Policy and Annuity Market Equilibria: Evidence from Chile," Working Paper 26285, National Bureau of Economic Research.

James, E., G. Martinez, and A. Iglesias (2006): "The payout stage in Chile: who annuitizes and why?," Journal of Pension Economics and Finance, 5(2), 121–154.

Kuhn, M., S. Wrzaczek, A. Prskawetz, and G. Feichtinger (2015): "Optimal choice of health and retirement in a life-cycle model," Journal of Economic Theory, 158, 186–212.

Lester, B., A. Shourideh, V. Venkateswaran, and A. Zetlin-Jones (2019): "Screening and Adverse Selection in Frictional Markets," Journal of Political Economy, 127(1), 338–377.

Miranda, J., and J. Halcartegaray (2011): "Efectos del SCOMP sobre la elección individual de modalidad de pensió," Working Paper N.52.

Mitchell, O. S., J. Poterba, M. Warshawsky, and J. R. Brown (1999): "New Evidence on the Money's Worth of Individual Annuities," American Economic Review, 89(5), 1299–1318.

Morales, M., and G. Larraín (2017): "The Chilean Electronic Market for Annuities (SCOMP): Reducing Information Asymmetries and Improving Competition," The Geneva Papers on Risk and Insurance, 42(3), 389–405.

Morales, M., and J. I. Zucal (????): "Efectos del SCOMP sobre el Mercado de Rentas Vitalicias en Chile," .

OECD (2023): "OECD Insurance Statistics 2022," .

Philipson, T. J., and G. S. Becker (1998): "Old-Age Longevity and Mortality-Contingent Claims," Journal of Political Economy, 106(3), 551–573.

Stewart, F., and G. Reyes (2008): "Transparency and Competition in the Choice of Pension Products: The Chilean and UK Experience," SSRN Scholarly Paper ID 1809825, Social Science Research Network, Rochester, NY.

Appendix A Robustness Excercises

Table A1: 2SLS Estimation on Men - All retirees

PANEL B: Survival Equation						
VARIABLES	5 years	7 years	9 years	11 years	13 years	15 years
Age at SCOMP	-0.000439*	-0.00101***	-0.00119**	-0.00232***	0.000412	0.00240
	(0.000234)	(0.000333)	(0.000465)	(0.000865)	(0.00236)	(0.00306)
Retirement age	-0.00549***	-0.00774***	-0.0118***	-0.0152***	-0.0243***	-0.0306***
	(0.000682)	(0.000986)	(0.00137)	(0.00186)	(0.00300)	(0.00420)
Child	0.00442**	0.00438*	0.00724*	0.00670	0.00572	0.0256**
	(0.00183)	(0.00264)	(0.00375)	(0.00527)	(0.00758)	(0.0115)
Balance (USD)	9.51e-08***	1.41e-07***	1.88e-07***	2.61e-07***	3.28e-07***	3.75e-07***
	(6.45e-09)	(8.26e-09)	(1.34e-08)	(1.78e-08)	(3.19e-08)	(9.28e-08)
Married	0.0202***	0.0281***	0.0362***	0.0473***	0.0590***	0.0720***
	(0.00185)	(0.00264)	(0.00385)	(0.00528)	(0.00776)	(0.0163)
Annuity dummy	0.00893	-0.00820	-0.0194	0.0173	0.000213	0.0149
	(0.0147)	(0.0173)	(0.0271)	(0.0267)	(0.0452)	(0.167)
Constant	1.288***	1.434***	1.666***	1.867***	2.234***	2.428***
	(0.0411)	(0.0576)	(0.0802)	(0.111)	(0.149)	(0.221)
R-squared	0.004	0.005	0.006	0.009	0.013	0.016
AR F test of endogenous regressors p-value	0.545	0.636	0.474	0.519	0.996	0.929
PANEL A: Annuitisation Equation						
VARIABLES	5 years	7 years	9 years	11 years	13 years	15 years
Age at SCOMP	-0.00825***	-0.00856***	-0.00871***	0.00655***	0.0158***	0.00799***
	(0.000316)	(0.000414)	(0.000685)	(0.000916)	(0.00186)	(0.00278)
Retirement age	0.00998***	0.0155***	0.0222***	0.0103***	-0.00634**	-0.00338
	(0.00113)	(0.00133)	(0.00166)	(0.00207)	(0.00291)	(0.00393)
Child	-0.000275	0.00206	-0.000359	0.000557	0.00198	0.0189*
	(0.00345)	(0.00409)	(0.00512)	(0.00635)	(0.00811)	(0.0106)
Balance (USD)	-3.22e-07***	-3.22e-07***	-3.51e-07***	-3.85e-07***	-5.21e-07***	-5.07e-07***
	(1.01e-08)	(1.17e-08)	(1.46e-08)	(1.89e-08)	(2.49e-08)	(3.57e-08)
Married	0.0490***	0.0481***	0.0487***	0.0476***	0.0515***	0.0729***
	(0.00291)	(0.00359)	(0.00460)	(0.00585)	(0.00772)	(0.0105)
Instrument	0.937***	1.030***	1.104***	1.353***	1.166***	0.641***
	(0.0259)	(0.0274)	(0.0412)	(0.0438)	(0.0553)	(0.101)
Constant	-0.395***	-0.827***	-1.331***	-1.726***	-1.011***	-0.205
	(0.0739)	(0.0853)	(0.106)	(0.129)	(0.159)	(0.215)
R-squared	0.022	0.023	0.018	0.032	0.053	0.020
SW F test of excluded instruments (first stage)	1309.1***	1417.1***	718.9***	953.8***	444.6***	40.5***
Observations	165,947	119,332	80,714	52,850	31,612	16,488

Source: Own calculations. Robust standard errors in parentheses. (*** $p<0.01$, ** $p<0.05$, * $p<0.1$).

Note: Instrument is the monthly median of the ratio between the best annuity offer received and the programmed withdrawal offer received.

Table A2: 2SLS Estimation on Women - All retirees

PANEL A: Survival Equation						
VARIABLES	5 years	7 years	9 years	11 years	13 years	15 years
Age at SCOMP	-0.000896***	-0.00138***	-0.00161***	-0.00151***	-0.000280	0.000346
	(0.000136)	(0.000202)	(0.000299)	(0.000496)	(0.00134)	(0.00186)
Retirement age	-0.000267	-0.000880*	-0.00270***	-0.00394***	-0.00839***	-0.0145***
	(0.000335)	(0.000479)	(0.000691)	(0.000966)	(0.00183)	(0.00259)
Child	0.00219*	0.00520***	0.00561**	0.00599*	0.00755	0.00917
	(0.00113)	(0.00154)	(0.00224)	(0.00322)	(0.00473)	(0.00730)
Balance (USD)	3.24e-08***	5.47e-08***	7.82e-08***	1.39e-07***	1.61e-07***	2.45e-07***
	(6.58e-09)	(8.40e-09)	(1.29e-08)	(1.74e-08)	(2.71e-08)	(6.30e-08)
Annuity dummy	-0.0108	-0.0185*	-0.0124	-0.0169	-0.0402	0.0181
	(0.00800)	(0.00989)	(0.0124)	(0.0143)	(0.0255)	(0.0927)
Constant	1.050***	1.105***	1.209***	1.259***	1.454***	1.710***
	(0.0196)	(0.0268)	(0.0381)	(0.0516)	(0.0767)	(0.152)
R-squared	-0.001	-0.002	0.001	0.001	-0.001	0.006
AR F test of endogenous regressors p-value	0.175	0.0617	0.315	0.236	0.114	0.845
PANEL B: Annuitisation Equation						
VARIABLES	5 years	7 years	9 years	11 years	13 years	15 years
Age at SCOMP	-0.00628***	-0.00719***	-0.0133***	-0.00473***	0.00738***	0.00207
	(0.000330)	(0.000411)	(0.000666)	(0.000854)	(0.00172)	(0.00233)
Retirement age	0.00355***	0.00692***	0.0137***	0.00582***	-0.0120***	-0.00833***
	(0.000996)	(0.00111)	(0.00138)	(0.00163)	(0.00238)	(0.00309)
Child	-0.0145***	-0.0149***	-0.0176***	-0.0192***	-0.0234***	-0.0124
	(0.00370)	(0.00414)	(0.00496)	(0.00603)	(0.00771)	(0.00985)
Balance (USD)	-3.74e-08	-7.21e-08***	-1.19e-07***	-1.93e-07***	-3.62e-07***	-5.02e-07***
	(2.29e-08)	(2.56e-08)	(3.06e-08)	(3.72e-08)	(4.67e-08)	(6.30e-08)
Instrument	1.108***	1.172***	1.526***	1.631***	1.380***	0.789***
	(0.0288)	(0.0300)	(0.0419)	(0.0439)	(0.0530)	(0.0923)
Constant	-0.192***	-0.408***	-0.812***	-0.920***	-0.266**	0.428***
	(0.0618)	(0.0676)	(0.0833)	(0.0953)	(0.116)	(0.157)
R-squared	0.019	0.021	0.021	0.032	0.045	0.009
SW F test of excluded instruments (first stage)	1476.4***	1527.4***	1325.5***	1378.0***	677.3***	73.0***
Observations	116,633	95,197	70,982	50,567	32,879	18,732

Source: Own calculations. Robust standard errors in parentheses. (*** $p<0.01$, ** $p<0.05$, * $p<0.1$).

Note: Instrument is the monthly median of the ratio between the best annuity offer received and the programmed withdrawal offer received. In the case of women, we do not control for marital status. Before 2008 married women were not allowed to have their spouses as beneficiaries, therefore information on marital status was not recorded.

Table A3: Bivariate IV Probit Estimation on Men using Alternative Instrument (marginal effects) - All retirees

			PANEL A: Survival Probability			
VARIABLES	5 years	7 years	9 years	11 years	13 years	15 years
Age at SCOMP	-0.000377*	-0.00100***	-0.00122***	-0.00232***	0.000785	0.00214
	(0.000226)	(0.000325)	(0.000459)	(0.000856)	(0.00229)	(0.00308)
Retirement age	-0.00559***	-0.00778***	-0.0116***	-0.0147***	-0.0239***	-0.0298***
	(0.000630)	(0.000907)	(0.00128)	(0.00175)	(0.00285)	(0.00429)
Child	0.00428**	0.00410	0.00697*	0.00648	0.00558	0.0242**
	(0.00194)	(0.00275)	(0.00391)	(0.00543)	(0.00775)	(0.0122)
Balance (USD)	1.23e-07***	1.84e-07***	2.33e-07***	3.05e-07***	3.66e-07***	4.44e-07***
	(8.34e-09)	(1.05e-08)	(1.59e-08)	(2.06e-08)	(3.43e-08)	(8.06e-08)
Married	0.0176***	0.0249***	0.0329***	0.0433***	0.0552***	0.0608***
	(0.00160)	(0.00236)	(0.00349)	(0.00477)	(0.00711)	(0.0187)
Annuity dummy	0.0120	-0.00860	-0.0232	0.0162	-0.00820	0.0993
	(0.0146)	(0.0165)	(0.0260)	(0.0263)	(0.0431)	(0.178)
			PANEL B: Annuitisation Probability			
VARIABLES	5 years	7 years	9 years	11 years	13 years	15 years
Age at SCOMP	-0.00839***	-0.00899***	-0.00892***	0.00623***	0.0151***	0.00786***
	(0.000313)	(0.000422)	(0.000696)	(0.000966)	(0.00201)	(0.00279)
Retirement age	0.00991***	0.0158***	0.0228***	0.0110***	-0.00550*	-0.00329
	(0.00113)	(0.00136)	(0.00173)	(0.00218)	(0.00305)	(0.00396)
Child	-0.000370	0.00201	-0.000279	0.000762	0.00257	0.0191*
	(0.00345)	(0.00411)	(0.00513)	(0.00638)	(0.00821)	(0.0109)
Balance (USD)	-2.98e-07***	-3.03e-07***	-3.36e-07***	-3.75e-07***	-5.04e-07***	-4.69e-07***
	(9.41e-09)	(1.10e-08)	(1.43e-08)	(1.87e-08)	(2.45e-08)	(3.14e-08)
Married	0.0486***	0.0477***	0.0482***	0.0472***	0.0512***	0.0707***
	(0.00280)	(0.00345)	(0.00443)	(0.00562)	(0.00734)	(0.00974)
Instrument	0.919***	1.028***	1.105***	1.325***	1.122***	0.642***
	(0.0249)	(0.0267)	(0.0395)	(0.0417)	(0.0562)	(0.108)
Athrho	-0.028	0.0571	0.0876	-0.0248	0.00948	-0.167
	(0.0697)	(0.0582)	(0.0716)	(0.0592)	(0.083)	(0.311)
Observations	165,947	119,332	80,714	52,850	31,612	16,488

Source: Own calculations. Standard errors in parentheses. (*** $p<0.01$, ** $p<0.05$, * $p<0.1$).

Note: Instrument is the monthly leave-one-out mean of the ratio between the best annuity offer received and the programmed withdrawal offer received.

Table A4: Bivariate IV Probit Estimation on Women using Alternative Instrument (marginal effects) - All retirees

			PANEL A: Survival Probability			
VARIABLES	5 years	7 years	9 years	11 years	13 years	15 years
Age at SCOMP	-0.000889***	-0.00136***	-0.00160***	-0.00153***	-0.000341	0.000431
	(0.000142)	(0.000206)	(0.000291)	(0.000491)	(0.00128)	(0.00184)
Retirement age	-0.000283	-0.000887*	-0.00256***	-0.00379***	-0.00810***	-0.0139***
	(0.000324)	(0.000460)	(0.000648)	(0.000932)	(0.00178)	(0.00244)
Child	0.00248*	0.00598***	0.00625**	0.00662*	0.00825	0.0100
	(0.00129)	(0.00183)	(0.00251)	(0.00352)	(0.00518)	(0.00791)
Balance (USD)	3.73e-08***	6.47e-08***	8.82e-08***	1.60e-07***	1.86e-07***	2.82e-07***
	(7.62e-09)	(1.08e-08)	(1.49e-08)	(2.17e-08)	(3.27e-08)	(7.15e-08)
Annuity dummy	-0.00964	-0.0156*	-0.0109	-0.0130	-0.0381	0.0395
	(0.00700)	(0.00903)	(0.0116)	(0.0140)	(0.0237)	(0.0942)
			PANEL B: Annuitisation Probability			
VARIABLES	5 years	7 years	9 years	11 years	13 years	15 years
Age at SCOMP	-0.00665***	-0.00787***	-0.0132***	-0.00543***	0.00578***	0.00162
	(0.000335)	(0.000427)	(0.000668)	(0.000924)	(0.00188)	(0.00238)
Retirement age	0.00394***	0.00773***	0.0138***	0.00663***	-0.0104***	-0.00794**
	(0.000986)	(0.00112)	(0.00140)	(0.00170)	(0.00250)	(0.00311)
Child	-0.0143***	-0.0147***	-0.0173***	-0.0188***	-0.0229***	-0.0121
	(0.00362)	(0.00406)	(0.00485)	(0.00589)	(0.00751)	(0.00969)
Balance (USD)	-3.08e-08	-6.43e-08***	-1.11e-07***	-1.83e-07***	-3.46e-07***	-4.65e-07***
	(1.96e-08)	(2.20e-08)	(2.68e-08)	(3.31e-08)	(4.29e-08)	(5.61e-08)
Instrument	1.059***	1.136***	1.457***	1.541***	1.322***	0.840***
	(0.0263)	(0.0276)	(0.0373)	(0.0389)	(0.0533)	(0.0985)
Athrho	0.173**	0.186**	0.102	0.0903	0.155*	-0.0964
	(0.087)	(0.0756)	(0.0721)	(0.0663)	(0.088)	(0.269)
Observations	116,633	95,197	70,982	50,567	32,879	18,732

Source: Own calculations. Standard errors in parentheses. (*** $p<0.01$, ** $p<0.05$, * $p<0.1$).

Note: Instrument is the monthly leave-one-out mean of the ratio between the best annuity offer received and the programmed withdrawal offer received. In the case of women, we do not control for marital status. Before 2008 married women were not allowed to have their spouses as beneficiaries, therefore information on marital status was not recorded.

Table A5: Bivariate IV Probit Estimation on Men (marginal effects) - NRA retirees

			PANEL A: Survival Probability			
VARIABLES	5 years	7 years	9 years	11 years	13 years	15 years
Age at SCOMP	-0.000396	-0.000962**	-0.00101*	-0.00124	0.00200	0.00577
	(0.000280)	(0.000389)	(0.000538)	(0.00105)	(0.00266)	(0.00515)
Retirement age	-0.0130***	-0.0198***	-0.0268***	-0.0389***	-0.0472***	-0.0644
	(0.00360)	(0.00500)	(0.00720)	(0.00963)	(0.0140)	(0.0391)
Child	0.00274	0.00336	0.00422	0.00386	-0.000282	0.0306
	(0.00214)	(0.00308)	(0.00438)	(0.00614)	(0.00881)	(0.0193)
Balance (USD)	1.41e-07***	2.11e-07***	2.64e-07***	3.18e-07***	4.06e-07***	3.62e-07
	(9.20e-09)	(1.27e-08)	(1.85e-08)	(2.47e-08)	(3.86e-08)	(3.77e-07)
Married	0.0176***	0.0254***	0.0331***	0.0437***	0.0555***	0.0811*
	(0.00189)	(0.00273)	(0.00409)	(0.00557)	(0.00842)	(0.0437)
Annuity dummy	-0.00109	-0.0203	-0.0291	0.00155	-0.0160	-0.106
	(0.0168)	(0.0190)	(0.0324)	(0.0305)	(0.0473)	(0.621)
			PANEL B: Annuitisation Probability			
VARIABLES	5 years	7 years	9 years	11 years	13 years	15 years
Age at SCOMP	-0.00924***	-0.00973***	-0.00799***	0.00946***	0.0145***	0.00957***
	(0.000365)	(0.000498)	(0.000841)	(0.00115)	(0.00241)	(0.00338)
Retirement age	-0.0863***	-0.0755***	-0.0691***	-0.0660***	-0.0782***	-0.0671***
	(0.00595)	(0.00720)	(0.00908)	(0.0113)	(0.0143)	(0.0195)
Child	-0.00125	0.00199	-0.00210	0.00203	0.00752	0.0291**
	(0.00387)	(0.00466)	(0.00590)	(0.00739)	(0.00958)	(0.0129)
Balance (USD)	-1.72e-07***	-1.70e-07***	-1.97e-07***	-2.50e-07***	-4.06e-07***	-4.41e-07***
	(1.24e-08)	(1.47e-08)	(1.90e-08)	(2.44e-08)	(3.13e-08)	(3.98e-08)
Married	0.0502***	0.0492***	0.0492***	0.0485***	0.0558***	0.0793***
	(0.00319)	(0.00399)	(0.00521)	(0.00669)	(0.00886)	(0.0120)
Instrument	0.895***	1.014***	1.032***	1.308***	1.180***	0.635***
	(0.0278)	(0.0300)	(0.0459)	(0.0487)	(0.0653)	(0.131)
Athrho	0.0385	0.0985	0.106	0.00605	0.0376	0.202
	(0.0835)	(0.0683)	(0.0916)	(0.0705)	(0.0939)	(1.154)
Observations	126,846	89,446	59,265	38,196	22,268	11,426

Source: Own calculations. Standard errors in parentheses. (*** $p<0.01$, ** $p<0.05$, * $p<0.1$).

Note: Instrument is the monthly median of the ratio between the best annuity offer received and the programmed withdrawal offer received.

Table A6: Bivariate IV Probit Estimation on Women (marginal effects) - NRA Retirees

PANEL A: Survival Probability						
VARIABLES	5 years	7 years	9 years	11 years	13 years	15 years
Age at SCOMP	-0.000602***	-0.00109***	-0.00161***	-0.000983	-0.000546	-0.000877
	(0.000202)	(0.000287)	(0.000381)	(0.000706)	(0.00170)	(0.00261)
Retirement age	-0.00153	-0.00160	-0.00302	-0.00147	-0.0112	-0.00986
	(0.00226)	(0.00310)	(0.00412)	(0.00607)	(0.00880)	(0.0146)
Child	0.00227	0.00531**	0.00715**	0.00660	0.00484	0.00654
	(0.00156)	(0.00223)	(0.00304)	(0.00439)	(0.00640)	(0.00983)
Balance (USD)	5.57e-08***	8.34e-08***	1.30e-07***	2.06e-07***	1.84e-07***	1.74e-07**
	(1.33e-08)	(1.75e-08)	(2.17e-08)	(3.13e-08)	(4.30e-08)	(7.33e-08)
Annuity dummy	-0.0112	-0.0172	0.00165	-0.00831	-0.0156	-0.0286
	(0.0102)	(0.0131)	(0.0175)	(0.0200)	(0.0301)	(0.0989)
PANEL B: Annuitisation Probability						
VARIABLES	5 years	7 years	9 years	11 years	13 years	15 years
Age at SCOMP	-0.00728***	-0.00756***	-0.0115***	-0.000195	0.00203	-0.000548
	(0.000462)	(0.000605)	(0.000965)	(0.00133)	(0.00273)	(0.00354)
Retirement age	-0.0272***	-0.0136*	-0.00197	-0.00227	-0.00904	-0.0466**
	(0.00667)	(0.00760)	(0.00914)	(0.0112)	(0.0141)	(0.0181)
Child	-0.0150***	-0.0160***	-0.0167***	-0.0188**	-0.0206**	-0.0101
	(0.00451)	(0.00519)	(0.00631)	(0.00778)	(0.00992)	(0.0129)
Balance (USD)	2.83e-07***	2.55e-07***	1.97e-07***	7.30e-08	-1.38e-07**	-3.33e-07***
	(2.86e-08)	(3.26e-08)	(3.95e-08)	(4.81e-08)	(6.03e-08)	(7.68e-08)
Instrument	0.971***	1.057***	1.331***	1.477***	1.427***	1.020***
	(0.0353)	(0.0378)	(0.0532)	(0.0557)	(0.0749)	(0.143)
Athrho	0.206	0.216*	0.0313	0.065	0.0735	0.12
	(0.132)	(0.116)	(0.12)	(0.102)	(0.121)	(0.326)
Observations	62,588	48,994	35,627	24,366	15,439	8,621

Source: Own calculations. Standard errors in parentheses. (*** $p<0.01$, ** $p<0.05$, * $p<0.1$).

Note: Instrument is the monthly median of the ratio between the best annuity offer received and the programmed withdrawal offer received. In the case of women, we do not control for marital status. Before 2008 married women were not allowed to have their spouses as beneficiaries, therefore information on marital status was not recorded.