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Can transparency increase adverse selection? Evidence from an electronic platform for annuities☆

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ABSTRACT

We show that the introduction of an electronic platform in the Chilean annuity market with the objectives of bringing transparency and enhancing competition also exacerbated adverse selection. The longevity gap between male annuitants and non-annuitants increased around 24 months.

1. Introduction

Recent empirical literature points to the relevance of demand frictions (Fang et al., 2008; Abaluck and Gruber, 2011; Handel and Kolstad, 2015). Also, recent theoretical and empirical analyses show the relevance of explicitly considering the market structure (Mahoney and Weyl, 2017; Lester et al., 2019) and the presence of heterogeneous demand frictions (Spinnewijn, 2017; Handel et al., 2019) when designing policies aimed at mitigating the consequences of adverse selection.

In this letter, we study the effect that the introduction of an electronic platform for annuities (SCOMP)[2] had on the degree of adverse selection in the Chilean annuity market.[3] Upon retirement, Chilean workers choose between two main pension products: an annuity or a programmed withdrawal (PW) schedule. In the first case, retirees transfer their funds to an insurance company in exchange for a monthly inflation-adjusted payment until death. Under a PW schedule, funds remain invested in a pension fund and retirees receive decreasing payments until death or fund depletion. The remaining balance upon death is used to finance survivors' benefits or becomes part of the worker's inheritance.

The choice implies a trade-off between insurance against longevity and financial risks versus leaving funds as a bequest in the event of early death. Adverse selection is expected if workers have private information on expected longevity and act upon this information.[4]

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[1] The opinions expressed in this paper are those of the authors and do not necessarily reflect the views of the Inter-American Development Bank (IDB), its Board of Directors, or the countries they represent. Fajnzylber completed the work on this paper before joining the IDB.

[2] SCOMP is the Spanish acronym for System of Inquiries and Quotations of Pension Amounts (*Sistema de Consultas y Ofertas de Montos de Pensión*).

[3] The Chilean pension system has been widely studied as it is one of the first individual capitalization systems. The decumulation phase has attracted special attention, as it is one of the few systems that has diverged from the "annuity puzzle" encountered in other markets, with annuitization rates above 60%.

[4] The degree of adverse selection can be captured by the longevity difference between those who buy the insurance and those who do not, controlling for

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The introduction of the platform pursued two main goals: to increase competition and to help workers make better-informed decisions.[5] Consistent with the theoretical arguments developed by Handel et al. (2019), we show that the introduction of SCOMP also had the unintended effect of exacerbating adverse selection. The electronic platform simplified the decision process for the retirees and, we argue, allowed them to better understand the differences between the two retirement products and which one is more convenient depending on their preferences and expected longevity.

Pre SCOMP, workers were responsible for getting their quotes from insurance companies and they were advised mainly by insurance companies' sales representatives, whose remuneration depended on the worker choosing an annuity. As summarized by the pension authority of the time, before the introduction of SCOMP the decision process and the market for annuities had several important shortcomings: (a) potential retirees did not have enough information about the product they were choosing, (b) intermediary commissions were excessive, and (c) there were obvious conflicts of interests between retirees and the intermediaries who advised them (these arguments are documented in Stewart and Reyes (2008), Morales and Zucal (2009), and Ferreiro (2015)).

Post SCOMP, retirees receive a report where the saliency of the two options is similar. It includes standardized information on the advantages and disadvantages of PW and annuities, a pension projection over time under a PW schedule, and the different annuity offers received from insurance companies, ordered from the highest to the lowest.[6]

As agents make better-informed decisions – partially based on attributes unobserved by insurance companies –, it is expected that adverse selection emerges or exacerbates (Spinnewijn, 2017; Handel et al., 2019). We find empirical support for this hypothesis. Using a dataset on Chilean retirees between 1991 and 2014 we find evidence that adverse selection significantly increased after the introduction of SCOMP. Male annuitants who retired after 2004 live around two years longer than non-annuitants, while before the difference was smaller or statistically non-significant. In the case of women, the gap increased in one year approximately.

Interestingly, the evidence presented by Morales and Larraín (2017) shows that after the introduction of SCOMP, the deals for annuitants improved, and, at the same time, the fraction of retirees that chose to annuitize decreased. These apparently puzzling stylized facts can be reconciled with the simple model adapted from Handel et al. (2019), presented in the Appendix.

It is important to be clear in the interpretation of our results. Neither the introduction of SCOMP nor the decision of buying an annuity should affect longevity. Unlike other insurance markets, moral hazard is not considered to be relevant in annuity markets as it is unlikely that insured individuals, after purchasing an annuity, will change their behavior in a way that would increase their life expectancy (Finkelstein and Poterba, 2004; Cutler et al., 2008). Therefore, the positive correlation between the decision of buying insurance and longevity is attributed to adverse selection. The introduction of the platform, by bringing transparency to the decision process, helps retirees who expect to *live longer* realize the convenience of choosing an annuity and those who expect to *have shorter live span* the convenience of PW.

In the next section, we describe the data, the empirical approach and results. In Section 3 we present the conclusions. In the Appendix, we provide descriptive statistics of our data and explain the transparency mechanism behind the results by adapting Handel et al. (2019)'s model to the annuity market.

2. Data and empirical results

Our dataset includes the pension product choice (PW or annuity), pension amount, birth, retirement and death dates (censored at June 2014) on all workers who retired at normal age between 1991 and 2013 and had to choose between annuity and PW.[7]

We compare the mortality of annuitants and those who choose PW to evaluate the extent of adverse selection; i.e., if controlling by observable characteristics, annuitants live longer than non-annuitants.

In the vein of Chiappori and Salanie (2000), we look at the correlation between the decision to buy insurance and the ex-post realization of loss. For this purpose, we estimate a parametric continuous-time duration model assuming a Gompertz distribution and include the decision to annuitize as a regressor, as in Finkelstein and Poterba (2004). Unlike these previous papers, our interest is in whether there is a significant change in the degree of adverse selection, so we estimate our model separately for the pre-and post-SCOMP periods. Also, note that our focus is on the decision of buying or not an annuity, leaving aside the margin related to contractual provisions such as guaranteed periods.

The hazard and survivor functions are the following, where t_i is the age at death (or at the end of the observation window, in days):

$$h(t_i) = \lambda_i \exp(\gamma t_i),$$
$$S(t_i) = \exp\left\{-\lambda_i \gamma^{-1}(e^{\gamma t_i} - 1)\right\}.$$

The model is implemented by parameterizing $\lambda_i = \exp(x_i'\beta)$, where x_i includes the annuitization dummy and other observable characteristics, and γ is an ancillary parameter to be estimated from the data. In particular, we maximize the log-likelihood for a Gompertz mortality model with right censoring and entry at the moment of retirement:

$$\log L(\gamma, \beta) = \sum_{i=1}^{N} \left\{ d_i \log[h(t_i, x_i; \gamma, \beta)] + \log\left(\frac{S(t_i; \gamma, \beta)}{S(r_i; \gamma, \beta)}\right)\right\},$$

where d_i is equal to 1 if the person died during the observation window and r_i is retirement age (in days).

In Table 1 we report the marginal effects of each variable on median longevity (in years) for the whole sample of men (columns 1 and 2), for the subsample of those who retired within three years of the introduction of SCOMP (columns 3 and 4), and for those who retired in this time window and belong to the top six deciles of pension (columns 5 and 6). In the second half of Table 1 we present the results for women.[8,9]

characteristics observed by insurance providers (Finkelstein and Poterba, 2002, 2004).

[5] For a thorough discussion of the motivations to introduce the electronic platform see the history of Law 19.934, available in Spanish at https://www.bcn.cl/historiadelaley/nc/historia-de-la-ley/5712/. The initial draft was presented in January 1994 and the whole legislative process lasted almost ten years.

[6] The increased transparency that SCOMP brought to the market has been discussed by other authors. For example, Ferreiro (2015) refers to the excessive influence that salesmen used to have: "*People who once made retirement decisions under the harassment and capture of intermediaries..., today do so under conditions that promote simultaneous and comparative access to the available offers and a more informed decision*" (free translation). See also Ruiz and Mitchell (2011).

[7] The normal retirement age is 65 for men and 60 for women. In Table A.1 in the Appendix, we present the descriptive statistics of our dataset.

[8] Limiting the sample period is important to make sure the effect identified is not related to secular trends in longevity or annuitization. The results obtained are robust to the inclusion of time-fixed effects and a trend (these additional results are available upon request).

[9] Restricting attention to the top six deciles provides a robustness check, as early retirement requirements were tightened around the same time SCOMP was introduced, but those changes did not affect high-income workers significantly.

Table 1
Average marginal effects on median duration (years of life).

	Men						Women					
	1991–2013		± 3 years		± 3 years (top)		1991–2013		± 3 years		± 3 years (top)	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Panel A - Models controlling for year of birth, retirement age, and initial pension												
Annuity dummy (0 if PW)	−0.448**	1.934***	0.968**	2.474***	−0.106	1.958***	0.718**	2.049***	1.895***	1.961**	0.994	1.920
	(0.177)	(0.329)	(0.487)	(0.501)	(0.602)	(0.611)	(0.320)	(0.655)	(0.726)	(0.982)	(1.029)	(1.325)
Age at start of SCOMP	−0.087***	−0.300***	0.042	0.261	−0.098	0.187	−0.167***	−0.598***	0.415	0.701	0.709*	0.657
	(0.026)	(0.090)	(0.227)	(0.233)	(0.270)	(0.271)	(0.049)	(0.203)	(0.306)	(0.472)	(0.381)	(0.596)
Retirement age	0.050	0.210	−0.402	−0.171	−0.210	−0.058	0.071	0.713***	−0.621	−0.555	−0.769	−0.287
	(0.079)	(0.145)	(0.301)	(0.319)	(0.335)	(0.378)	(0.071)	(0.169)	(0.421)	(0.547)	(0.507)	(0.674)
Initial pension	0.147***	0.135***	0.149***	0.114***	0.075***	0.071***	0.141***	0.070**	0.150***	0.093**	0.134***	0.076
	(0.009)	(0.017)	(0.021)	(0.019)	(0.020)	(0.020)	(0.020)	(0.033)	(0.037)	(0.045)	(0.047)	(0.055)
LogLik	5.704	−3939.124	−1097.676	−1261.105	−712.066	−799.662	−4756.635	−3102.946	−1140.104	−1322.039	−665.344	−769.914
Panel B - Models with year of birth, retirement age, and initial pension decile fixed effects												
Annuity dummy (0 if PW)	−0.884***	1.299***	0.515	1.861***	−0.101	1.936***	0.456	2.113***	1.587**	2.269**	0.488	2.184
	(0.202)	(0.333)	(0.568)	(0.507)	(0.639)	(0.616)	(0.346)	(0.685)	(0.792)	(1.038)	(1.063)	(1.347)
LogLik	25.886	−3906.320	−1064.579	−1232.876	−699.456	−792.139	−4737.973	−3082.853	−1123.301	−1303.247	−648.761	−757.036
N	40308	77145	10392	13025	6207	7874	29626	71993	9464	13931	5698	8300

Standard errors in parentheses.
***$p < 0.01$.
**$p < 0.05$.
*$p < 0.1$.

In the first specification –Panel A– the control variables (pension, age at retirement, and age at SCOMP (cohort effect)) are treated as continuous variables, while in the second specification –Panel B– we use full sets of dummy variables for pension deciles, year of birth and age at retirement.

For example, the second column of Panel A suggests that those men who annuitized between 2004 and 2013 live 1.934 years more than those who chose PW. In contrast, men who annuitized between 1991 and 2004 lived half a year less than those who did not. The other coefficients can be interpreted as follows: increasing initial pension by 1UF is associated with an additional longevity of 0.135 years and being one year older when SCOMP was introduced is associated with 0.3 fewer survival years.[10]

Focusing on the marginal effect of the annuity dummy, we observe that post SCOMP (columns 2, 4 and 6) there is a positive and significant relation between longevity and annuitization (with values around 2 years in Panel A and between 1.3 and 1.9 in Panel B), while pre SCOMP the correlation is either negative (for the full sample), statistically non-significant, or, if positive, much smaller than for the post-SCOMP period. In other words, the introduction of the electronic platform exacerbated or brought adverse selection to this market.

In the case of women, we obtain qualitatively similar results, although somewhat weaker, which is likely related to the fact that women retire earlier and live longer, which implies that only a small fraction of them die in our observation window (around 2% for those who retired after 2004, see Table A.1).

Beyond the exacerbation of adverse selection, the introduction of SCOMP presumably brought other changes to the market. As mentioned above, one of the main objectives of the reform was to increase competition by reducing retirees' search costs. Morales and Larraín (2017) show that the introduction of SCOMP had a positive impact on the deals received by annuitants. However, the data also show that the fraction of retirees choosing annuities decreased after SCOMP (see Table A.1). These three facts – exacerbated adverse selection, better deals for annuitants, and lower share of annuitants – can be reconciled with the theoretical model discussed in the Appendix.

3. Conclusion

Our empirical finding is that adverse selection increased after SCOMP, and a plausible explanation is that increased transparency led to better-informed decisions which, in the context of asymmetric information about longevity, led to increased adverse selection.

However, a natural concern when interpreting our results is whether SCOMP may have brought other changes to the market that could explain the increased correlation between longevity and annuitization or whether other changes introduced around the same time could explain our findings. We argue here why we consider that it is indeed the increase in transparency that is behind our results.

First and foremost, one of the explicitly declared objectives of the introduction of SCOMP was to help workers make better-informed pension decisions. SCOMP indeed provides retirees with quote certificates that clearly compare the different annuities and PW offers, and succinctly describes the main differences between the two kinds of pension products. Pre SCOMP, individuals faced larger search costs and many may not have been aware of the PW option (or its attributes).

Second, although the auction-type mechanism implemented through SCOMP increased the intensity of competition among insurers, it is not obvious that increased competition would affect the longevity gap between annuitants and non-annuitants. The key insight of Handel et al. (2019)'s model is that, to induce a change in the longevity gap between annuitants and non-annuitants, the policy must alter the correlation between expected longevity and the minimum annuity the individual is willing to accept. Even though the model discussed in the Appendix is one of perfect competition, this insight is more general.

Another concern is whether some retirees could have foreseen the introduction of SCOMP and delayed retirement, and that this potential selection could be partially driving our results. We believe this is highly unlikely as it would require for postponement behavior to be correlated with longevity. Also, the legislative process that created SCOMP lasted almost 10 years and the time between its approval and implementation was less than a year. As a robustness check, we performed a regression discontinuity analysis to test for a jump in the age at retirement before and after the SCOMP introduction finding no such effect (economic or statistical).

[10] Annuities and many other contracts in Chile are expressed in *Unidades de Fomento* (UF), a unit of account that closely follows the CPI. On August 2004, 1 UF was approximately equivalent to US$ 27.

Table A.1
Average and standard deviations by sample period.
Source: Own calculations.

	Men						Women					
	Pre-SCOMP	Post-SCOMP	Pre-SCOMP 3	Post-SCOMP 3	Pre-SCOMP 3 (top)	Post-SCOMP (top)	Pre-SCOMP	Post-SCOMP	Pre-SCOMP 3	Post-SCOMP 3	Pre-SCOMP 3 (top)	Post-SCOMP (top)
Annuitized	0.6655	0.5976	0.6682	0.6015	0.6990	0.6257	0.6841	0.6996	0.6580	0.6330	0.6981	0.6352
	(0.472)	(0.490)	(0.471)	(0.490)	(0.459)	(0.484)	(0.465)	(0.458)	(0.474)	(0.482)	(0.459)	(0.481)
Birth year	1932.3	1944.3	1936.9	1940.0	1936.8	1939.9	1937.2	1947.9	1941.3	1943.8	1941.2	1943.8
	(3.883)	(2.730)	(1.385)	(1.375)	(1.416)	(1.421)	(4.243)	(3.419)	(2.153)	(2.418)	(2.175)	(2.384)
Deceased	0.4030	0.0563	0.2255	0.1435	0.2030	0.1283	0.1487	0.0210	0.0721	0.0527	0.0670	0.0496
	(0.491)	(0.230)	(0.418)	(0.351)	(0.402)	(0.334)	(0.356)	(0.143)	(0.259)	(0.223)	(0.250)	(0.217)
Age at retirement	65.621	65.700	65.565	65.659	65.692	65.734	61.345	61.834	61.227	61.706	61.315	61.742
	(1.037)	(0.989)	(1.013)	(0.974)	(1.067)	(1.044)	(2.039)	(2.084)	(1.950)	(2.150)	(1.976)	(2.140)
Age at death or last observation[a]	78.706	69.450	75.834	73.362	76.137	73.513	75.725	65.943	72.274	69.863	72.421	69.928
	(5.012)	(2.665)	(2.800)	(1.985)	(2.649)	(1.932)	(4.586)	(3.390)	(2.503)	(2.544)	(2.481)	(2.516)
Age at death[b]	75.863	69.057	72.198	70.410	72.620	70.619	72.638	65.814	68.717	66.775	68.903	66.762
	(5.372)	(2.471)	(3.404)	(2.622)	(3.443)	(2.603)	(5.861)	(3.239)	(4.206)	(3.220)	(4.085)	(3.146)
Initial pension all (US$)	469.83	494.12	599.46	656.88	862.08	941.00	465.07	459.11	559.60	576.52	778.69	795.82
	(473.76)	(486.31)	(574.32)	(628.85)	(617.01)	(670.43)	(407.44)	(330.09)	(475.36)	(478.29)	(503.79)	(513.09)
Initial pension annuitants (US$)	454.76	488.54	534.93	531.60	729.29	710.00	425.62	445.26	484.15	471.46	625.66	612.11
	(418.90)	(403.80)	(465.31)	(434.47)	(495.57)	(462.49)	(285.56)	(246.60)	(300.05)	(255.86)	(290.94)	(242.52)
Initial pension PW (US$)	499.82	502.40	729.43	845.94	1170.55	1327.20	550.48	491.37	704.75	757.76	1132.61	1115.66
	(566.15)	(587.75)	(730.02)	(805.00)	(747.43)	(777.89)	(581.58)	(468.61)	(674.94)	(677.22)	(682.49)	(676.93)
Months of exposition	156.466	44.398	122.681	91.905	124.785	92.812	171.985	48.691	131.998	97.348	132.701	97.701
	(59.533)	(29.614)	(31.813)	(20.712)	(30.003)	(19.632)	(50.572)	(31.089)	(20.563)	(15.531)	(19.808)	(15.174)
Observations	40308	77145	10392	13025	6207	7874	29626	73056	9464	13939	5698	8308

Standard deviations in parenthesis.
[a]The end of the observation window is June 1st, 2014.
[b]Only considers individuals who died during the observation window.

Finally, the introduction of SCOMP brought a reduction in the share of retirees choosing annuities. This is hard to reconcile with a competition effect only, since better deals for annuitants, ceteris paribus, should lead to increased annuitization. Increased transparency can reconcile these facts, especially considering that one of the dimensions of the increased transparency was to give more visibility to the PW option, a product more suitable to individuals with shorter longevity prospects.

Data availability

Data will be made available on request.

Appendix

A.1. Descriptive statistics

See Table A.1.

A.2. The mechanism

We discuss an adaptation of the Handel et al. (2019) model and present a graphical analysis in line with Einav and Finkelstein (2011). We consider a competitive market for a standardized annuity product in which individuals hold private and noisy information regarding their expected longevity.

We denote by w_i the minimum annuity that individual i is willing to accept and assume $w_i = v_i + \epsilon_i$, where v_i is the correct or true valuation of the annuity (which may depend on life expectancy, risk aversion, bequest motives, etc.) and ϵ_i is an individual specific noise.[11] The distribution of ϵ, we assume, is affected by the introduction of SCOMP.

Fig. A.1 illustrates the zero-profit equilibria pre and post SCOMP (left and right panels, respectively). In the x-axis, individuals are sorted according to the minimum annuity they are willing to accept (w_i), represented by the solid line WW. For an individual "q" in the x-axis, MA (long-dashed line) represents his actuarially fair annuity, while AA (short-dashed line) is the average actuarially fair annuity (across all individuals up to "q").[12] The competitive equilibrium of the market is where AA and WW intersect and firms obtain no profits.

If we integrate curve MA from zero up to q_{eq} and from q_{eq} up to q_{max} and divide by q_{eq} and $q_{max} - q_{eq}$ respectively, we would obtain the average actuarially fair annuity for those individuals that choose to annuitize and for those that opt for the PW: AA_{ann} and AA_{pw} on the y-axis. The difference between these two averages reflects the difference in expected longevity between the two groups.

The introduction of the electronic platform is assimilated to a *reduction of noise* –i.e., a change in the distribution of ϵ. The effect naturally depends on the assumptions about the distributions of ϵ pre and post-SCOMP.

If we believe that the noise is heterogeneous across individuals and that sales agents were able to oversell annuities pre SCOMP, that would imply that ϵ had a negative mean before SCOMP. By facilitating the comparison between the two products and by forcing the individuals to compare them in a structured decision-making process (and therefore reducing the influence of sales agents), SCOMP would reduce the mean (in absolute value) and variance of the distribution of ϵ.

In terms of our figure, there would be a re-sorting of individuals along the x-axis and the curves WW and MA will rotate: WW clockwise and MA anti-clockwise, as represented in the right

[11] We assume individuals are identical to the eyes of insurers, but the results of the analysis can be interpreted as conditional on the observable variables that may affect longevity and the annuity decision.

[12] Note that MA is increasing because individuals are ordered according to the minimum annuity they would accept, which is negatively correlated with expected longevity (individuals close to the y-axis are longer-lived in expectations and their actuarially fair annuity is smaller).

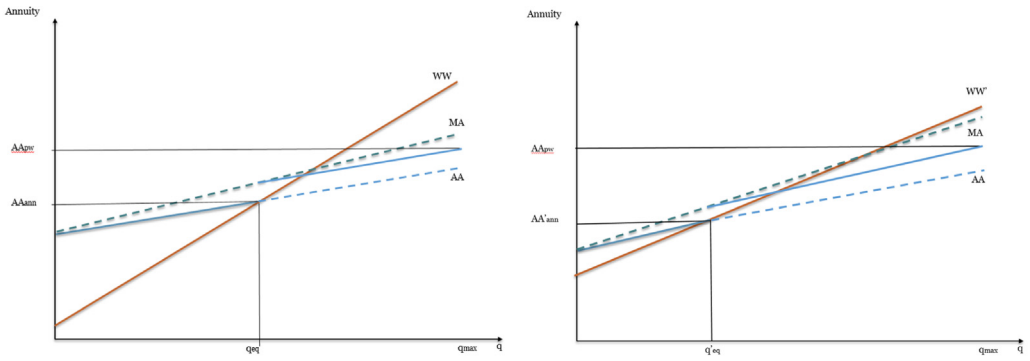

Fig. A.1. Competitive equilibrium and the effect of a noise reduction.
Note: The left figure represents the equilibrium pre SCOMP and the right one the equilibrium post SCOMP.

panel of Fig. A.1.[13,14] As a direct consequence, the expected difference between the average actuarially fair annuities of the groups of annuitants and non-annuitants will be increased.

The intuition of why the difference in expected longevity increases is clear when one analyzes what happens at the margin. When the noise is reduced, those who were buying an annuity in the pre SCOMP scenario and whose true value v_i were above the equilibrium value of the annuity would not buy in the post SCOMP scenario. And those who were initially not buying but whose v_i was below the equilibrium would switch and buy an annuity. As a consequence, some individuals that expect to live longer would start buying annuities, and some that expect to live less would stop buying annuities, increasing the difference in expected longevity between the two groups.

Moreover, if the mean of the noise is also reduced in absolute value – e.g., because after SCOMP the ability of sales agents to steer consumers is reduced and the saliency of the PW option increased – we can expect a lower fraction of individuals choosing to annuitize, even if annuity deals improved after SCOMP.

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[13] The intuition why WW rotates clockwise is as follows. Pre SCOMP, those willing to accept the lowest annuities are individuals who expect to live long and, on top of that, received a negative and large shock ϵ_i. As the shock is reduced or eliminated, the minimum annuity these individuals are willing to accept is increased. The opposite occurs at the other extreme with the individuals with the highest w_i.

[14] For the intuition on why MA rotates anti-clockwise, imagine that pre-SCOMP the variance of ϵ_i is very large compared to v_i. In such case the decision of buying an annuity would be barely correlated with longevity and MA would be flat, while post SCOMP the positive correlation between longevity and w_i generates a positively sloped MA curve.