Summer June 29, 2017

The Chilean Electronic Market for Annuities (SCOMP): Reducing Information Asymmetries and Improving Competition

Marco Morales
Guillermo Larraín, *Universidad de Chile*

The Geneva Papers, **2017**, **42**, (389–405)

www.genevaassociation.org

The Chilean Electronic Market for Annuities (SCOMP): Reducing Information Asymmetries and Improving Competition

Marco Morales[a] and Guillermo Larraín[b]
[a]Universidad Diego Portales, Santiago, Chile.
E-mail: marco.morales@udp.cl
[b]Universidad de Chile, Santiago, Chile.

The Chilean electronic market for annuities was created in 2004 in order to correct several malfunctions of the market for annuities. The Chilean pension system is composed of two phases. During the accumulation phase, savings are collected and managed by asset managers. The payout phase consists of pension payments mainly in the form of annuities and programmed withdrawals (offered by life insurance companies and pension fund administrators, respectively). The SCOMP or Electronic Consultations and Offers System for Annuities and Phased Withdrawals replaced the traditional way pensioners looked for and bought retirement products in the Chilean market. This electronic quotation system was created to help reduce search costs, as well as to allow pensioners to choose the best available deals offered by providers. Overall, this paper finds that, after controlling for other regulatory changes and the main determinants of annuity rates, the new quotation system raised annuity payments by 15 per cent. The database used for the econometric analysis goes from January 2001 to June 2008, with the implementation of the SCOMP located at the middle of the sample, and considering all 131,226 annuity policies sold during this period. The exogenous variables explaining the level of the annuity rates are a combination of individual and provider characteristics, given that the estimated equation corresponds to a reduced-form representation of the underlying structural supply–demand model for annuities.
The Geneva Papers (2017) **42,** 389–405. doi:10.1057/s41288-017-0054-3

Article submitted 5 September 2016; accepted 2 May 2017;
published online 29 June 2017

Introduction

The Chilean pension system is well known as a system based on capitalisation of pension savings in personal accounts, the so-called "second pillar" of the pension system, using the terminology of the World Bank. This system was reformed in 2007 improving the functioning of the second pillar and also creating a "zero pillar", in which pension benefits are granted to all citizens among the first three quintiles of the population, without other conditions, with a proper harmonisation between the two pillars, the most important of which is that the public pension decreases with the individual's level of income. A third pillar of voluntary pension savings, both individual and collective, was created. Pillars 2 and 3 make reference to the accumulation phase of the pension system, that is, how savings are collected from workers and managed by professional asset managers (pension fund

managers). But once savings have been accumulated, they must be spent. Hence, the *payout phase*, a much less-known facet of the Chilean pension system,[1] but an integral part of it.[2]

The *payout phase* of the pension system allows pensioners to choose mainly between two options, namely, programmed withdrawals in which savings belong to the pensioner and therefore he or she bears the longevity risk, or annuities whereby the person hands the savings over to an insurance company and the latter bears the longevity risk. With time, the market has gotten more complex. Most annuities now consider a *guaranteed period* during which, even if the pensioner passes away, savings still can be received by the survivors.

The payout phase of the pension system was reformed in 2004. The three most important elements of the 2004 reform include increasing the requisites for early retirement. Indeed, previous to 2004, workers could, under certain conditions, opt for retiring earlier than the legal age of retirement and the average age of early retirement had indeed decreased. The reform also changed the way mortality tables were established, designating the Superintendence of Securities and Insurance (SVS) and the Superintendence of Pensions to develop official mortality tables for building up technical reserves for life insurance companies. Finally, the 2004 reform created an electronic market for annuities, the SCOMP or Electronic Consultations and Offers System for Annuities and Phased Withdrawals (SCOMP according to its acronym in Spanish), in order to improve the functioning of this market, which is the critical interface between the accumulation phase and the payout phase of the pension system. The higher the transaction costs in this market, for any given amount of pension savings, the smaller the annuities that pensioners may receive.

During the 1990s, transaction costs increased systematically and reached a peak of 6 per cent in 1999, with fees for particular transactions as high as 11 per cent. That is, in the case of a person having worked for 30 years, given that the commission is computed as a percentage of the total premium, the cost of acquiring an annuity consumed on average 1.8 years of contributions. The nature of the problem was linked to asymmetries of information and myopia.

As stated, early retirement was relatively easy to obtain, as preconditions for it were lax. Therefore, agents from life insurance companies were able to identify persons potentially able to retire. Private sales agents approached them to offer "incentives" to retire. Those incentives ranked from purely monetary transfers to transfers in kind of all sorts. How were the incentives financed? By the retiree, since the annuity offered by the life insurance company incorporated the incentive as a production cost. The asymmetry arose from the fact that the pensioner could not see other offerings and that he or she was not informed about the origin and the consequences of the cash rebate he or she was receiving.

SCOMP replaced the traditional way pensioners looked for and bought retirement products in the Chilean market. The use of SCOMP is mandatory for all people selecting a

[1] For a thorough description of the annuities market in Chile, see Rocha and Thornburn (2007) and Walker (2006). For a broad description of other markets around the world, see Cannon and Tonks (2008) and Rusconi (2008).

[2] Another aspect of the system which we do not discuss in this paper is *disability and survivorship insurance*, which is available to all contributors and pensioners and which is managed by life insurance companies. This system was reformed in 2007 as well.

new retirement product or moving from a phased withdrawal to an annuity plan sold by a life insurance company.

Through this system, the information about workers and/or beneficiaries is transmitted to the participating entities of the system, as well as the offers of pension to workers. SCOMP includes pension fund administrators (PFAs), insurance companies and annuity brokers authorised by the SVS.

The introduction of this system seeks to give greater transparency and reliability in the selection process for retirement, by making all possible offers available to the worker simultaneously. With SCOMP, both workers and suppliers have access to all offerings, generating competition among bidders and allowing workers to make a decision with as much information as possible.

Moreover, the PFAs must make a public list for SCOMP members that contains information on those workers who are eligible for pensions, for both old-age and early retirement. Thus, the suppliers of retirement products have better information when making an offer to prospective retirees.

Apart from creating the electronic system, the law incorporates other modifications in order to improve the market for retirement. Among these additional changes, it is worth noting the increasing requirements for an early pension and the setting of a maximum fee for the intermediation of annuities (2.5 per cent of the total premium).

The aim of this study is to determine empirically the effects of SCOMP on the annuities market, analysing econometrically its effects on the annuity rate (implicit rate that makes equal the total premium and the present value of annuity payments).

The potential results arising from this study should be of great interest for any country where a defined contribution (DC) pension system has been implemented, given the fundamental role played by retiring workers decisions at the time of choosing the retirement product translating accumulated savings into retirement income.

Oxera's[3] comparative international research—prepared for the U.K. Financial Conduct Authority—analyses the competitive dynamics of retirement income markets for 10 countries with DC pension systems (Australia, Canada, Chile, Denmark, Ireland, the Netherlands, New Zealand, Singapore, Switzerland and the U.S.), concluding that regulatory initiatives to improve shopping for and purchasing annuities in order to choose the best available offer in the market show the clearest positive impact on annuitants deals. In the same vein, Banks *et al.* and Cannon *et al.*[4] estimate a direct positive impact on pension income streams from shopping around of 5 per cent in the Netherlands and 7 per cent in the U.K.

The remainder of this paper is organised as follows. The next section explains briefly the operation of SCOMP. In the subsequent section, a description of the situation prior to SCOMP and motivations for its implementation are provided. This is followed by an analysis of the effects SCOMP has had on the annuities market. The "Econometric analysis" section presents the econometric specification, the database used and the results obtained. The last section presents some conclusions arising from this analysis.

[3] Oxera's (2014).
[4] Banks *et al.* (2015); Cannon *et al.* (2015).

Previous situation and motivation for creation of the system

Before the implementation of SCOMP, both sales agents and annuity brokers had a significant role in the decision to take early pensions and the choice of the insurance company from which to buy the annuity. Hence, it was common to see higher intermediation commissions, thus allowing brokers to offer a cash rebate to pensioners as an incentive to buy the annuity.

Although there was a requirement of six offers from different companies for an annuity contract, this did not ensure that retirees obtained the best price, because dealers often recommended buying annuities from more expensive companies. It should be noted further that the brokers for these operations earned commissions only from the sale of annuities.

Moreover, before SCOMP, there was less competition between annuities and phased withdrawals. While PFAs made no sale efforts, many insurance companies devoted significant amounts to the marketing of retirement products.

In aggregate, this situation resulted in high dispersion in the rate of sale of annuities for retirees with similar characteristics.

One of the main motivations to implement SCOMP was to create a tool that would allow all potential retirees access to the best deal possible, by decreasing discrimination by the agent or company suppliers and reducing information asymmetries between pensioners and insurance companies or agents.

Operation of SCOMP

The process begins with a request for a "certificate of balance" from the PFA where the workers or survivors have retirement savings. Once the PFA has issued and sent the certificate of balance to SCOMP, and in order to obtain offers of annuities and programmed withdrawals, the participant or beneficiary must sign the "Request for Offers" form with a PFA, a life insurance company or an annuity broker enrolled in the registry of the SVS. This agent will enter the query into the system. The worker can make up to three consultations during the period of validity of the certificate of balance (35 days from issuance).

The offers are received by the worker or beneficiary through the "certificate of offers", which is sent by registered letter. Annuity offers are valid for 15 days from the issuance of the certificate and include a commission fee of up to 2.5 per cent of the premium.

If the worker or beneficiary does not want to accept an offer from the electronic system after the first consultation, she or he can choose from the following options:

- Accept an external source of annuity. This additional source should be better than the one sent in the first instance to SCOMP by the same company and for the same type of pension.
- Request an auction of pension annuity.
- Make a new query in the system.
- Withdraw the application for pension or change the type of pension.

To accept an offer of pension, the worker or beneficiary must go to the PFA or the insurance company selected or, in the case of survivors' pensions, to where the individual

capitalisation account of the deceased worker is located. Then the "Acceptance of the Offer" form must be signed.

Finally, acceptance of an offer must be completed in the PFA by signing the "Pension Type Selection" form.

Effects on the annuities market: after SCOMP and the Annuities Law[5]

A first issue observed after introducing the new quotation system, which could be evidence of increased competition through prices (annuity rate), is the reduction of intermediation fees converging to levels below the maximum set by the law.

As we can observe in Figure 1, the commission rate (intermediation fee) exhibits a significant decline during the year 2001. The reason behind the sharp reduction in broker fees was the threat of the draft law of putting a cap on commissions, producing a structural break favouring annuitants. This issue was highlighted and is supported by empirical evidence in Walker.[6] Since implementation of the Annuities Law, the cap on the commission rate has not been an active restriction, giving support to the idea of increased competition through the annuity rate (price competition) in the market. Currently, the commission rate is still under the new cap level established at 2 per cent.

The system significantly reduces retirees' search costs, since it offers the possibility to consult a wide range of pension alternatives (an average of seven per visit), in addition to receiving a high number of deals (eight different companies on average).

With a public list of workers eligible for a pension, which includes those who qualify for early retirement, available to all participants in the system, the competitive advantages of companies allocating more resources to selling retirement products are significantly reduced. By offering both annuities and phased withdrawals, the system increases competition among insurance companies and PFAs.

On the other hand, given the increased requirements for the early retirement option, the number of pensions at old age and early retirement age has converged since the implementation of the law.

The dispersion of the annuity rate has decreased significantly since implementation of the system. The following graphs compare policies sold in January 2002 and January 2006.

If pensioners are divided according to the amount of the premium paid for the annuity, it is observed that the dispersion (variation coefficient) decreases by a lower percentage in the first third of the distribution, and its final level is even higher than in the other two-thirds.

One possible explanation for this is that, before SCOMP, insurance companies did not have the possibility of charging pensioners with low incomes an "expensive" price for annuities, because they risked their pensions falling below the guaranteed minimum pension (MPG), so retirees were forced to take a phased withdrawal.

[5] Formally known as Law N° 19.934.
[6] Walker (2006, 2009).

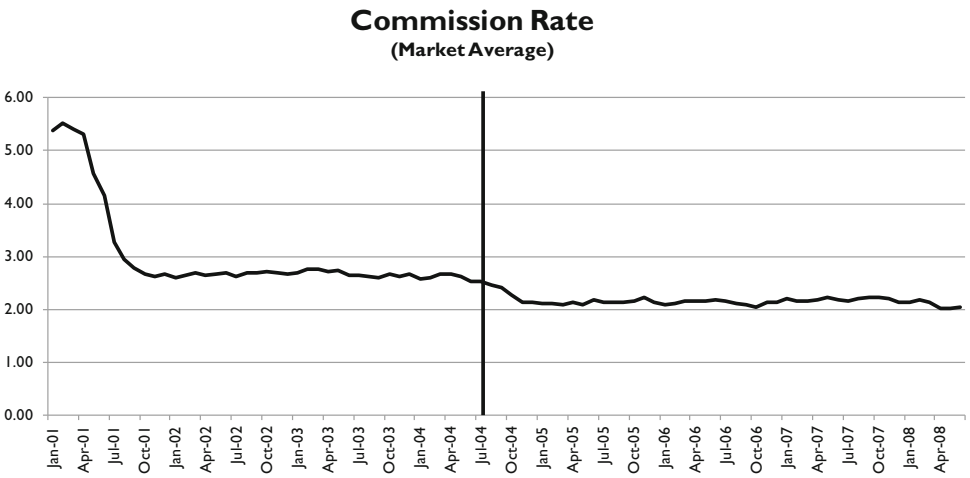


Figure 1. Commission rate (market average).

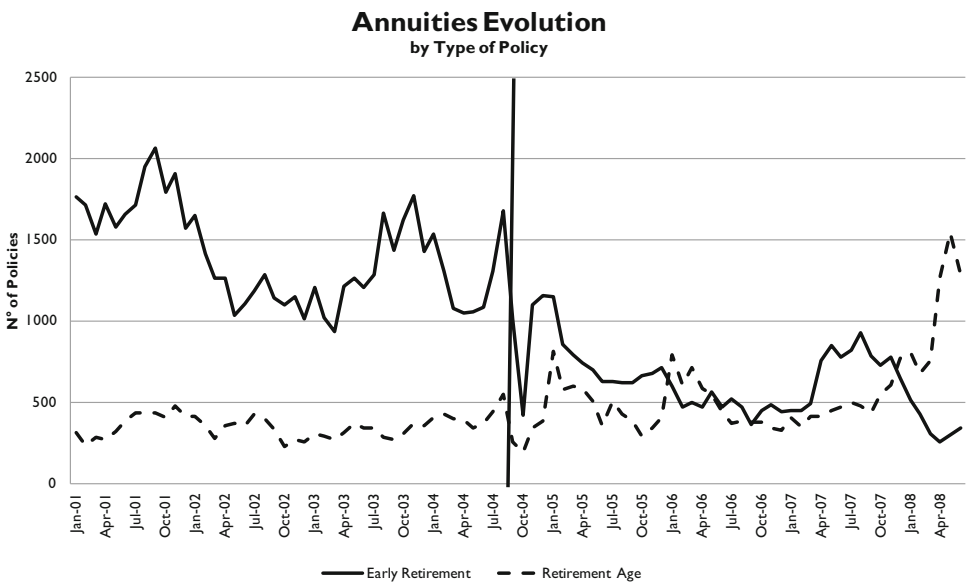


Figure 2. Annuities evolution, by type of policy.

For higher incomes, the sharp reduction in price dispersion may be related to the fact that, before SCOMP and the new law, pensioners could choose to receive a cash refund in exchange for a bad pension deal, an alternative that was no longer available afterwards.

Probably due to lower operating margins after implementation of the system, there was an increase in the market concentration index for the insurance companies that offer annuities. This could mean that some companies were unable to sustain a price war or lost their market niches.

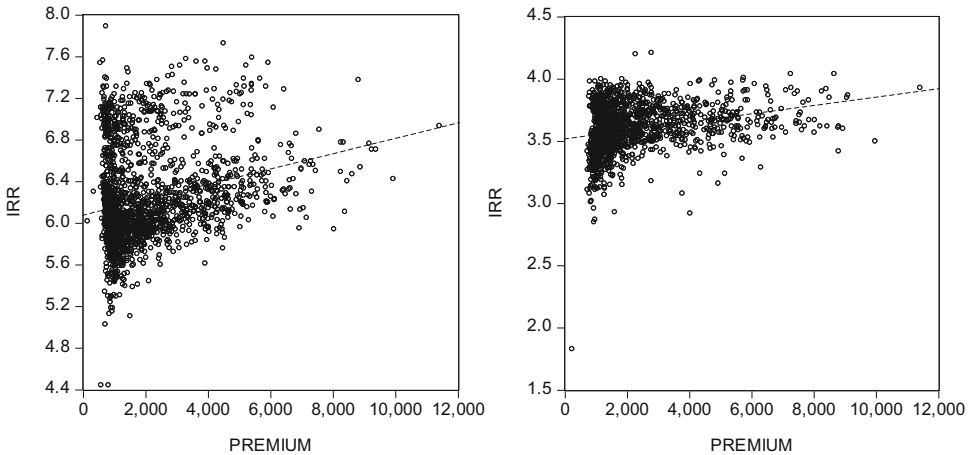


Figure 3. Individual annuities sold, January 2002 and January 2006.

Table 1 Variation coefficient of the annuity rate

	Lower third	*Mid-third*	*Higher third*	*Total*
January 2002				
Mean	5.38	5.31	5.45	5.38
Standard deviation	0.75	0.77	0.80	0.77
Variation coefficient	14.00	14.47	14.71	14.38
January 2006				
Mean	3.38	3.38	3.48	3.42
Standard deviation	0.43	0.32	0.34	0.36
Variation coefficient	12.60	9.61	9.92	10.47
Variation %	−10.02%	−33.57%	−32.58%	−27.18%

Econometric analysis

The model

To evaluate the effect of SCOMP and implementation of the Annuities Law, it is necessary to analyse the exogenous variables determining the implicit rate for annuities.

Among the determinants of this price, we have included market factors and individual characteristics of each policy. The econometric specification used here should be understood as the corresponding reduced-form equation coming from the underlying structural supply–demand model for annuities.

As market factors, we consider the risk-free rate, the spread between the corporate bond and the risk-free rates, average brokerage fees, and the Herfindahl index of industry concentration.

As individual characteristics, we have the premium, age and gender of the pensioner, characteristics of beneficiaries (disabled child, number of years for a younger child to remain as beneficiary), deferred and guarantee period of the policy, and type of policy (joint vs single male/female, and old-age vs early retirement).

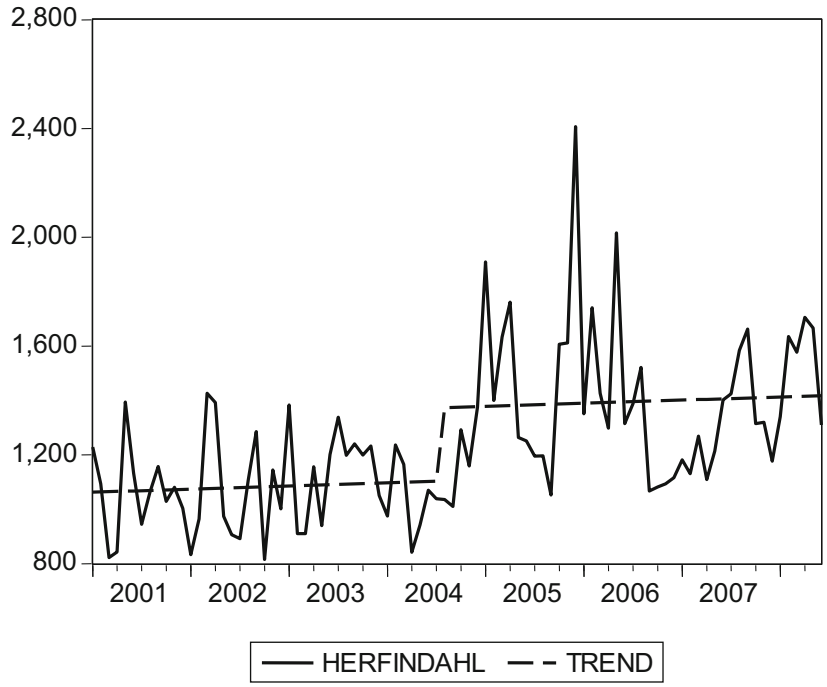


Figure 4. Herfindahl index for insurance industry.

The specification above follows the idea that the annuity rate (as well as the corresponding money's worth ratios) should be determined by a combination of individual and provider characteristics.[7] Previous to this work, there was no available database containing such a combination of variables to study the determinants of the annuity rate.

The risk-free rate (for a 20-year inflation-indexed bond) and the corporate bond spread have a direct effect on the annuity rate, since they represent the return on assets for insurance companies offering annuities. A larger financial return for providers allows them to offer better annuity rates to pensioners.

The brokerage fee, on the one hand, is an additional cost for providers that should reduce the annuity rate. On the other hand, from the demand side, the level of commissions represents the intensity of broker activity and services provided to workers, such that an increase in brokerage fees leads to an expansion in annuities demand, reducing the annuity rate. Moreover, before the implementation of the Annuities Law, there was an additional substitution effect between commissions and the annuity rate. The illegal cash rebate offered by some brokers, sharing the commission with annuitants, may induce workers to accept a lower annuity rate in exchange for the lump sum obtained this way.

Industry concentration, measured by the Herfindahl index, should capture a higher monopoly power of providers. So, an increase in the index should imply a lower annuity rate for pensioners.

[7] Rocha and Thorburn (2007); Rocha *et al.* (2008).

Turning to individual characteristics, the premium used to buy the policy has an ambiguous effect on the annuity rate. On the one hand, it could be highly correlated with the education and wealth of the worker, so a higher premium could be associated with increased longevity and, hence, with a lower annuity rate. On the other hand, policies involving workers paying larger premiums imply lower unit costs and more profits for insurance companies, so that insurance companies could be willing to pay better annuity rates for larger premiums.

Given that there is a negative relationship between the expected duration of the policy—with consequent greater investment and longevity risks—and the annuity rate, the effect of an increase in age, as well as in the case of an old-age retirement policy relative to an early retirement policy, implies a higher annuity rate. For a similar reason, single policies should receive a better rate than joint policies (the main case in Chile), and we should expect that single-male policies have a better rate than single-female policies.

A longer guaranteed annuity period (potentially related to a bequest motive), by implying a longer payment period, leads to a lower annuity rate.

In the case of a longer deferred period, the payments are larger during the deferment compared to an immediate policy, so the annuity rate should be lower, the longer the annuity is deferred.

If there is a disabled child, he or she will be a permanent beneficiary of the policy, extending the expected duration and reducing the annuity rate. On the other hand, given that a child is beneficiary until he or she is 24 years old, the greater the number of years to age 24 for the youngest child, the lower the annuity rate.

Database

The information used in this study corresponds to 131,226 annuity policies sold during the period from January 2001 to June 2008, becoming one of the largest databases worldwide in the analysis of annuities pricing. Given that the main goal of the paper is to identify the effect of SCOMP on the annuity rate, the data used here are such that the implementation of the electronic quotation system is located in the middle of the sample, in order to avoid giving more weight to pre- or post-structural-change statistical information.

The vast majority of the data correspond to those required by the SVS, looking at information from both pensioners and their beneficiaries. Access to these data was essential in order to test the implications about how the characteristics of beneficiaries affect the price of the policy sold. These effects are virtually unexplored at the time of this study.

The empirical analysis includes annuities at old-age and early retirement age, as well as survival policies related to both types of retirement products.

In 2005, there was a change in the mortality tables used to calculate the rate of sale of annuities (table RV-04 was first used instead of RV-85), so an adjustment to the observed annuity rates used was necessary to achieve consistency in the information. During the first year of implementation of the new mortality Table (2005), insurance companies were asked to submit selling rates based on both tables, so it was possible to observe the difference between the two tables in the calculation of selling rates. The differences observed in this case respond only to the change in mortality tables, so by multiplying the rates before 2005 by this fixed factor, we make the annuity rates comparable across time.

Table 2 Descriptive statistics

	Irr.	*Rf.*	*Spread*	*Premium*	*Def.*	*Guar.*	*Age*	*Young*	*Herf.*	*Comm.*
Mean	4.54	3.91	1.48	2210.75	4.40	119.90	58.63	1.73	1224.16	2.68
Median	4.52	3.79	1.52	1599.03	0.00	120.00	59.03	0.00	1181.92	2.61
Maximum	10.24	5.75	2.32	56,483.16	96.00	360.00	95.21	23.92	2406.34	5.53
Minimum	0.09	2.12	0.86	46.11	0.00	0.00	37.90	0.00	814.78	2.03
Std. dev.	1.16	1.04	0.40	1666.93	7.91	72.21	5.56	4.20	275.87	0.81
Skewness	0.34	0.42	0.04	2.68	2.02	−0.42	−0.05	2.56	1.19	2.45
Kurtosis	2.01	1.92	1.74	25.27	7.97	2.40	2.83	9.14	5.21	8.41
Obs.	131,226	131,226	131,226	131,226	131,226	131,226	131,226	131,226	131,226	131,226

Consequently, the adjustment consisted in applying a fixed factor, corresponding to the average difference between the rates of sale between both tables for each type of annuity separately (1.26 for old age and 1.13 for early retirement). This adjustment applies to rates between January 2001 and December 2004.

As presented in the graphs below, this difference is quite stable over time for each type of annuity, so applying these fixed factors can be considered a reasonable way to take into account the change of mortality tables.

Estimation and results

Table 3 shows the OLS estimation of the model described above, including a dummy variable representing the implementation of the SCOMP (with the value 1 starting on August 2004), as well as a dummy variable (D2001) considering the structural break on brokerage commissions, taking the value 1 from January 2002 until the end of the sample.

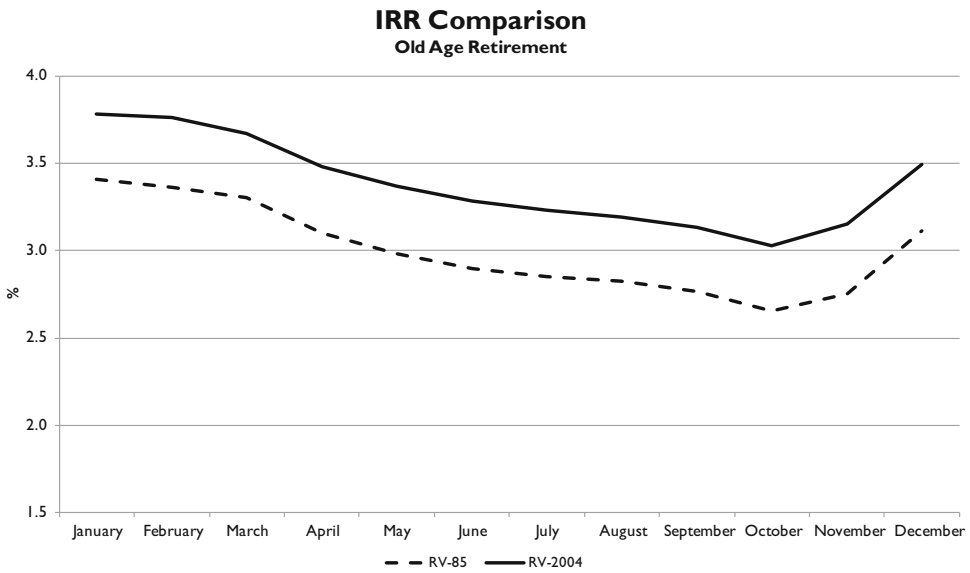
Given that the bulk of the market is joint and early retirement annuities, the regression takes these two types of annuities as the base case. In order to control for single-male and single-female policies a dummy variable taking the value 1 for each case is included (Male and Female, respectively). In the same line, when the annuity is sold at old age the dummy variable Policy takes the value 1.

In order to consider the structural break in brokerage commissions related to the implementation of the Annuities Law, as well as in the new requirements for early retirement, the interaction between dummy variables with intermediation fees and type of policy is also included in the regression analysis. The introduction of the electronic quotation system came simultaneously with the cap on commissions and higher requisites for an anticipated retirement. In this way, in order to estimate the change in the intercept (the effect of the introduction of SCOMP), controlling for the change in the response of the annuity rate to the cap on commissions and the change in the response of the annuity rate to new requirements for early retirement, we use the same dummy variable for the constant and slopes (interactions), even though the reason for the three structural changes are totally different. Econometrically, we cannot define three different dummy variables with the same values.

The econometric results exhibit the expected signs—at significant levels—for most of the variables in the model. The only exception is the coefficients for the deferred period and the dummy variable indicating the existence of a disabled child, both with positive and negative signs but not statistically different from zero. Actually, in the case of the dummy variable for "disabled child", it took the value 1 only for 929 policies in the sample, so the statistical information is not sufficient for an accurate estimation of this variable's effect on the annuity rate.

Even though the coefficient for single-female policies is larger than the one corresponding to single-male annuities, the number of single-male policies is small relative to single-female annuities in the sample, so this could explain why we do not find a larger parameter for the single-male case. Rocha and Thorburn[8] offer, as a possible explanation for larger annuity rates of single-female over single-male contracts, the average size of premiums for the female case. However, here we are controlling for the size of premiums (log of), so this possibility is excluded.

[8] Rocha and Thorburn (2007).



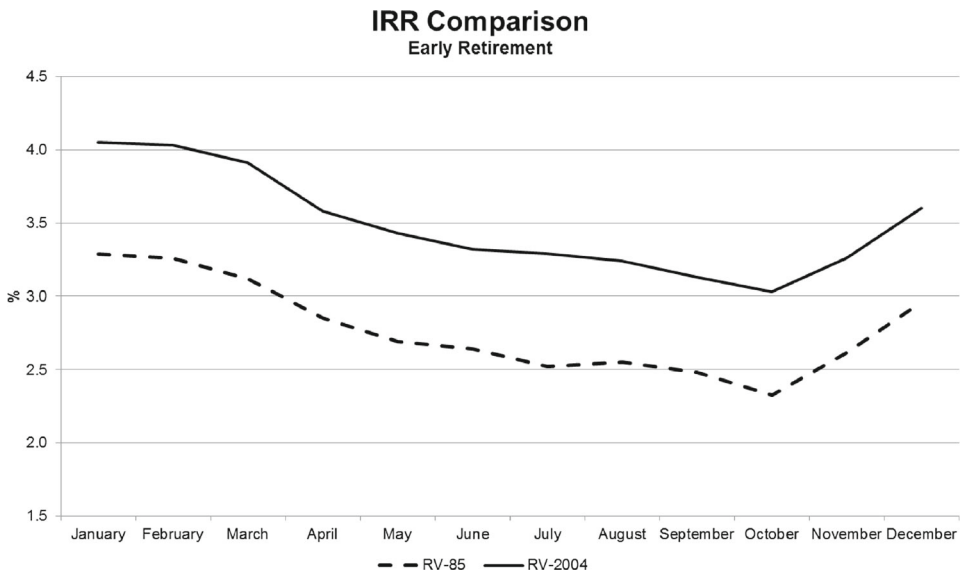


Figure 5. Internal rates of return for 2005 using both mortality tables.

The positive and significant impact of SCOMP on the average annuity rate is consistent with a better deal for annuitants after the implementation of the new electronic quotation system.

Table 3 Retirement regressions (Newey–West standard errors)

Variable	*All age*	*All age (No 2001)*	*Early age*	*Old age*
Dependent variable: internal rate of return				
Constant	0.9309***	−1.5130***	0.7623***	2.2944***
Risk free rate	0.8561***	0.8605***	0.8702***	0.8396***
Spread	0.3807***	0.3192***	0.4081***	0.3386***
Log (premium)	0.1211***	0.1073***	0.1105***	0.1434***
Deferred period	−0.0001	−0.0001	0.0000	0.0001
Guaranteed period	−0.0001***	−0.0001***	−0.0001***	−0.0001**
Age	0.0023***	−0.0014***	0.0041***	−0.0052***
Disabled child	0.0026	0.0176	−0.0024	0.0079
Younger child	−0.0022***	−0.0017***	−0.0019***	−0.0039***
Herfindahl	−0.0003***	−0.0002***	−0.0003***	−0.0002***
Commissions	−0.2700***	0.6868***	−0.2589***	−0.3131***
Male	0.0290***	0.0288***	0.0244***	0.0462***
Female	0.0535***	0.0588***	0.0320***	0.0456***
Policy	0.6774***	0.6470***		
DSCOMP	1.5673***	1.5370***	1.8928***	1.5448***
DSCOMP * commissions	−0.6811***	−0.6831***	−0.8730***	−0.8159***
D2001	−2.8220***		−2.0919***	−5.0026***
D2001 * commissions	0.9506***		0.6966***	1.6948***
DSCOMP * policy	−0.6443***	−0.5946***		
Sample	*Jan 01–Jun08*	*Jan 02–Jun 08*	*Jan 01–Jun 08*	*Jan 01–Jun 08*
Total obs	131,226	105,846	90,589	40,637
R^2	0.9057	0.8650	0.8986	0.9160
Adj-R^2	0.9057	0.8650	0.8986	0.9160

*Significant at 10 per cent level.

**Significant at 5 per cent level.

***Significant at 1 per cent level.

Even though the average annuity rate is decreasing over time and the money's worth ratios (MWRs) are not, the main finding of the paper is not necessarily inconsistent with the empirical evidence for Chile where MWRs are stable over time.[9] In the first place, the positive effect of SCOMP on the annuity rate is conditional on keeping all the variables constant. That is, without SCOMP, annuity rates would fall more than they actually do. In the second, as presented in Figure 2, early retirement exhibits a decreasing trend during the sample. Given that, the MWRs for early retirement policies should be lower than for the old-age policies; this sharp reduction in early contracts would help to compensate the effect of a declining annuity rate on average MWRs.

After controlling for the structural break generated by the draft law, as well as for the simultaneous increase on requirements for early retirement and the explicit cap on brokerage commissions (2.5 per cent of the premium), the marginal effect of the SCOMP on the average annuity rate is statistically and economically significant. That is, an approximate increase of 1.5 percentage points, implying an increase of 15 per cent in annuity payment (based on simulation evidence, we can say that each additional point corresponds approximately to 10

[9] Thorburn *et al.* (2007).

per cent larger annuity payment). This change is 2–3 times the one estimated by Banks *et al*.[10] and Cannon *et al*.[11] for England and the Netherlands, respectively, as a direct impact on pension income streams from shopping around.

In order to check the robustness of the results for the complete sample, the second column of Table 3 shows the estimation results excluding the year 2001, in order to be sure that the results are not due to the inclusion of this year, which presents a well-documented structural break.

The draft law, submitted in 2001, threatened to reduce broker commissions and the extensive use of illegal cash rebates. Both changes should benefit annuitants, since higher commissions and liquidity preferences (the acceptance of a lower pension payment by "sharing" the commission) imply a lower annuity rate for annuitants.

However, by looking at the evolution of early versus old-age retirement policies (Figure 2), it is possible to observe a significant decline in the number of early annuity contracts. Given that the early annuitants used to get better rates because of larger premiums compared to annuitants not able to satisfy the level of pension payment required for early retirement, the sharp reduction in early policies could be the explanation for the negative effect obtained in the regression results. The proportionally higher effect on early versus old-age annuitants, since submission of the draft law in 2001, is explained by the fact that the first group was the main target of brokerage activity at that time.

Finally, as we will see later in Table 4, the law has a positive effect on reducing the dispersion of annuity rates, which is in line with the idea of a better deal for annuitants as a whole.

Columns 3 and 4 present regression results by type of policy. The idea of splitting the sample has to do with the possible change in composition of retirees (early versus old age) after the implementation of the new law (and the SCOMP).

As we can see in the last two columns of Table 3, the results are consistent with the All Age Retirement case, with the only exception of the coefficient for Age in the Old Age regression. In this case, the coefficient has the opposite sign and is statistically significant. These results are, however, consistent with evidence for the U.S. and the U.K. in terms of money's worth ratios,[12] respectively).

If we analyse the effect of SCOMP on the variance of the model, by means of heteroskedasticity regressions (Table 4), we do not find strong evidence in favour of a reduction in dispersion of prices (annuity rate) after the implementation of the quotation system.

The variance analysis is performed for the same cases studied above. It is interesting to note that the coefficient for the dummy related to the draft law (announced in 2001) is negative and statistically significant in all the cases. This issue is consistent with the proposition by Walker[13] pointing that the main benefits for annuitants come from the threat of the draft law, more than its effective implementation in the year 2004.

The individual effect of the SCOMP dummy is positive and statistically significant in all the variance equations. However, we can see that the interaction between the dummy variable and Brokerage Commissions has a negative and statistically significant effect on variance (even though each variable has a direct individual effect on dispersion).

[10] Banks *et al*. (2015).
[11] Cannon *et al*. (2015).
[12] Mitchell *et al*. (2001) and Brown *et al*. (2001).
[13] Walker (2006, 2009).

Table 4 Heteroskedasticity tests

Variable	*All age*	*All age (No 2001)*	*Early age*	*Old age*
Dependent variable: squared residuals from retirement regressions				
Constant	−0.5635***	−1.2905***	−0.3579***	−1.3131***
Risk free rate	0.0446***	0.0444***	0.0222***	0.1031***
Spread	0.0686***	0.0757***	0.0407***	0.1187***
Log (premium)	−0.0026	−0.0045*	−0.0029	−0.0056
Deferred period	−0.0002***	−0.0002**	−0.0001	−0.0005***
Guaranteed period	−0.0001***	−0.0001***	−0.0001	−0.0001***
Age	0.0048***	0.0057***	0.0037***	0.0116***
Disabled child	0.0061	−0.0023	−0.0016	0.0291
Younger child	−0.0006***	−0.0008***	−0.0008***	−0.0039***
Herfindahl	0.0000***	0.0000***	0.0001***	−0.0000
Commissions	0.0063***	0.2993***	0.0073***	0.0010**
Male	0.0321***	0.0356***	0.0229***	0.0538***
Female	0.0061**	0.0093***	0.0042*	0.0300***
Policy	0.070390	0.0726***		
DSCOMP	0.6828***	0.6037***	0.8160***	0.7075***
DSCOMP* commissions	−0.2482***	−0.2080***	−0.3165***	−0.2338***
D2001	−0.6766***		−0.8463***	−0.7132***
D2001 * commissions	0.2935***		0.3485***	0.3514***
DSCOMP * policy	−0.0791***	−0.0878***		
Obs * R- squared	9864	8022	4,781	4,217
p value	0.0000	0.0000	0.0000	0.0000

*Significant at 10 per cent level.

**Significant at 5 per cent level.

***Significant at 1 per cent level.

Consequently, it is possible to think that the second significant reduction in commissions after implementation of the law is reducing the dispersion of annuity rates, after the main effect resulting from the threat of the draft law in 2001.

Conclusions

The main conclusion that can be obtained from the analysis in this paper is that competition through prices increased significantly after the implementation of SCOMP, as well as other changes made by the Annuities Law.

With the new electronic quotation system, keeping all the other variables constant, the annuitants were able to obtain a better rate of approximately 1.5 percentage points, compared to before the implementation of the new quotation system. This is a significant improvement in pensions if we consider a payout phase covering at least 20–30 years of retirement, which means, *ceteris paribus,* an annuity payment approximately 15 per cent larger compared with the situation before implementing SCOMP.

However, as a byproduct of the SCOMP there was an increase in market concentration for insurance companies, a fact that should be taken into account when assessing the benefits to the industry after the implementation of the system.

As a consequence of changes introduced by the implementation of SCOMP, the role of intermediaries (brokers and sales agents) should be focused towards financial advice rather than towards the marketing of retirement products. The role that SCOMP gives to competition through prices, at the expense of the service quality of the companies, is an aspect to be considered in possible future improvements to the system.

Overall, the econometric results obtained in this paper should be of great interest for any DC pension system looking for a more competitive decumulation process, in particular more competitive annuity markets. On the other hand, in order to legitimise an immature or growing DC pension system, effective replacement rates paid to retired workers should be as high as possible, so any improvement in the payout phase offering a better deal for retirees must be a policy goal for pension authorities in the corresponding countries.

Acknowledgements

The authors are grateful of the outstanding research assistance by Juan Ignacio Zucal, as well as helpful comments and suggestions by Osvaldo Macias, Ernesto Rios, Roberto Rocha, and Dimitri Vittas.

References

Banks, J., Crawford, R. and Tetlow,G. (2015) 'Annuity choices and income drawdown: Evidence from the decumulation phase of defined contribution pensions in England', *Journal of Pension Economics and Finance* 14(4): 412–438.

Brown, J., Mitchell, O.S. and Poterba, J.M. (2001) 'The role of real annuities and indexed bonds in an individual accounts retirement program,' in J. Brown, O.S. Mitchell, J.M. Poterba and M.J. Warshawsky (eds), *The Role of Annuity Markets in Financing Retirement*, Cambridge, MA: MIT Press.

Cannon, E. and Tonks, I. (2008) *Annuity Markets*, Oxford: Oxford University Press.

Cannon, E., Stevens, R. and Tonks, I. (2015) 'Price efficiency in the Dutch Annuity market', *Journal of Pension Economics and Finance* 14(1): 1–18.

Mitchell, O.S., Poterba, J.M., Warshawsky, M.J. and Brown, J. R. (2001) 'New evidence on the money's worth of individual annuities,' in J. Brown, O.S. Mitchell, J.M. Poterba and M.J. Warshawsky (eds), *The Role of Annuity Markets in Financing Retirement*, Cambridge, MA: MIT Press.

Oxera (2014) *The retirement income market: Comparative international research, prepared for Financial Conduct Authority*. Available at http://www.oxera.com/Latest-Thinking/Publications/Reports/2014/The-retirement-income-market-Comparative-internati.aspx.

Rocha, R., Morales, M. and Thorburn, C. (2008) 'An empirical analysis of the annuity rate in Chile', *Journal of Pension Economics and Finance*, 7(1): 95–119.

Rocha, R., and Thorburn, C. (2007) *Developing annuities markets: The experience of Chile*, Washington, DC: World Bank.

Rusconi, R. (2008) *National annuity markets: Features and implications*, OECD Working Papers on Insurance and Private Pensions, No. 24, Paris: OECD publishing. Available at http://www.oecd.org/finance/private-pensions/41237210.pdf.

Thorburn, C., Rocha, R. and Morales, M. (2007) 'An analysis of money's worth ratios in Chile', *Journal of Pension Economics and Finance* 6(3): 287–312.

Walker, E. (2006) *Annuity markets in Chile: Competition, regulation—and myopia?,* World Bank Policy Research Working Paper 3972, Washington, DC: World Bank. Available at http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2006/07/21/000016406_20060721143736/Rendered/PDF/wps3972.pdf.

Walker, E. (2009) 'Los mercados de rentas vitalicias en Chile: Competencia, regulación, ¿y miopía?', *El Trimestre Económico*, 76(301): 145–179.

About the Authors

Marco Morales is Associate Professor of Economics at the Universidad Diego Portales, PhD in Economics from Boston University. Previously he has served as Chief of the Research Division of the Superintendency of Securities and Insurance, Economic Advisor at the Ministry of Finance, and Economist at the Research Department of the Superintendency of Banks and Financial Institutions. He has also been consultant to the Corporate Affairs Division of the OECD, Division of Operations and Financial Sector Policy of the World Bank, and to the Division of Statistics and Projections of ECLAC.

Guillermo Larraín is Associate professor of Economics at the University of Chile, PhD in Economics from the Paris School of Economics. He has been Superintendent of Securities and Insurance, Superintendent of Pensions and Chairman of the State Bank of Chile. He is currently a member of the board of Banco Internacional based in Santiago and a member of the Economic Advisory Board of the International Finance Corporation (IFC), based in Washington D.C. He has advised several countries in financial regulation in Latin America, Central Europe and Africa.