

An Empirical Analysis of Possible Reforms to the Disability and Survivors Insurance in Chile

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Abstract This paper examines the costs of two possible reforms to the Disability and Survivors Insurance in Chile. The first is to separate insurance rates not only by sex but also by age segment. Within this proposal, we determine the most appropriate age groups for differentiating insurance premiums based on this variable, and assess the advantages and disadvantages of charging the maximum rate to all contributors, capitalizing the difference between that rate and the age-differentiated premiums in the individual retirement account. The second proposal to be evaluated is to let the system cover only the economic risk of the inability to work from the date of a claim until normal retirement age (disability claim) or the inability to contribute to household income in the event of death.

The analysis is based on data provided by the Chilean Office of the Undersecretary for Social Welfare. These data are the same as those used by the association of Chilean pension fund managers (AFPs) in the public bidding process for disability and survivors insurance of 2012.

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Introduction

By law, pension fund managers (AFPs) in Chile are required to maintain disability and survivors (D&S) insurance for their members. Since 2009, this insurance, separated by gender, has been put out to a public competitive bidding process by the AFPs. This mechanism is described and analyzed in (Reyes 2010), which also provides the results of the first bidding process in 2009.

This periodic bidding system was proposed by James et al. in 2008. A second recommendation, related to one of the subjects of study in this paper, is to give benefits only until retirement age. This way, insurers would face less uncertainty than they do currently and the moral hazard of disability close to retirement age would be reduced.

An aspect discussed in the literature prior to the 2008 reform is the cross-subsidy that can exist between genders. Valdés and Navarro (1992) provide an economic analysis of disability and survivors insurance that is focused on cross-subsidies. According to their findings, men did not necessarily have a higher claim rate than women. On the other hand, James et al. (2008) postulated that women indeed subsidize men. This cross subsidy was corrected, however, by the 2008 reform of the system through distinction by gender in the bidding process. On this point, it should be noted that the potential subsidy had a very unique characteristic: until that time, women who submitted claims (women who became disabled or died) did not generate benefits for the spouse, unless their spouse was disabled. Obviously, in this case the cost of a claim involving a woman was much lower than a claim involving a man because it generated fewer benefits. By equalizing benefits for women and men, cost (and pricing) differences between men and women were reduced.

Currently, member contributions used to fund the insurance are expressed as a percentage of contributable income, and are uniform, by gender, for all system members, regardless of the premium established in the contracts between the pension fund managers and the insurance company in each competitive bidding process. This means, for example, that if a company that submits a winning bid offers a rate of 1.4 % for 50 % of the total insurance and another offers 1.2 % for the other half, the first will receive 1.4 % and the second will receive 1.2 % of contributable income, and the member will pay the average of 1.3 %. The winning companies are those that offer the lowest rate, but no company may be awarded all of the premiums for men and women, so as to prevent excessive concentration.

Tables 1, 2 and 3 show the results of the first three bidding processes, carried out in May 2009, May 2010 and May 2012, to begin operating in July of the corresponding year.

On this point, it is important to mention that while the bidding process groups all contributors by gender, the D&S insurance contribution is uniform (with a single rate) for men and women, with both groups paying the rate of the highest average-rate gender. The difference between both average rates is deposited in each individual

Table 1 Disability and survivors insurance bidding process results, July 2009–June 2010

	Men		Women	
	Number of fractions	Rate awarded*	Number of fractions	Rate awarded*
La Interamericana Seguros de Vida S. A.	2	1.78 %	1	1.46 %
RBS (Chile) Seguros de Vida S. A.	2	1.88 %	1	1.63 %
Chilena Consolidada Seguros de Vida S. A.	2	1.92 %	1	1.75 %
BBVA Seguros de Vida S.A.			1	1.86 %
Ohio National Seguros de Vida S. A.	1	1.98 %		
AVERAGE		1.877 %		1.675 %

(*) The rate awarded is the rate offered by each winning bidder, adjusted according to the procedure established in the competition bases and any modifications or clarifications

Source: Pensions Superintendency (*Superintendencia de Pensiones*)

account as an additional old age savings contribution (beyond the required 10 %) for the gender with the lower D&S rate.

For example, as a result of the most recent competitive bidding process in 2012 (see Table 3), for the male insurance segment one company will receive a price of 1.25 % of contributable income, another will receive 1.26 % and yet another will receive 1.27 %. In the case of women, one company will receive 1.09 %, another 1.14 % and a third one, 1.15 %. However, both men and women contribute the highest average rate of both genders, in this case 1.26 % of contributable income, which corresponds to the

Table 2 Disability and survivors insurance bidding process results, July 2010–June 2012

	Men		Women	
	Number of fractions	Rate awarded*	Number of fractions	Rate awarded*
Ohio National Seguros de Vida S. A.	1	1.38 %		
Banchile Seguros de Vida S. A. and Euroamerica Seguros de Vida S. A.	1	1.49 %		
Compañía de Seguros Cruz del Sur S. A. and Seguros de Vida Previsión S. A.	1	1.50 %		
Compañía de Seguros de Vida Camara S. A.	2	1.51 %	2	1.43 %
BBVA Seguros de Vida S.A.	1	1.53 %	1	1.42 %
Valora Compañía de Seguros de Vida S. A.	1	1.54 %		
La Interamericana Seguros de Vida S. A.			1	1.48 %
AVERAGE		1.490 %		1.440 %

(*) The rate awarded is the rate offered by each winning bidder, adjusted according to the procedure established in the competition bases and any modifications or clarifications

Source: Pensions Superintendency (*Superintendencia de Pensiones*)

Table 3 Disability and survivors insurance bidding process results, July 2012–July 2014

	Men		Women	
	Number of fractions	Rate awarded*	Number of fractions	Rate awarded*
CN Life	1	1.25 %	1	1.14 %
Chilena Consolidada Seguros de Vida S. A.	4	1.27 %	2	1.09 %
Vida Security	2	1.26 %		
Penta Vida and Bice Vida			1	1.15 %
AVERAGE		1.26 %		1.12 %

(*) The rate awarded is the rate offered by each winning bidder, adjusted according to the procedure established in the competition bases and any modifications or clarifications

Source: Pensions Superintendency (*Superintendencia de Pensiones*)

men. Because women contribute the same 1.26 % as men but their insurance price is just 1.12 % of contributable income, the difference of 0.14 % is contributed to the women's old age individual accounts.

The main objective of this study is to evaluate empirically two possible modifications to this insurance. The first is differentiation not only by gender but also by age. The second change evaluated is related to the possible advantages and disadvantages of restricting the D&S insurance coverage to the economic risk of inability to work from the date of the claim to normal retirement age, which has already been proposed by James et al. in 2008.

The first modification, differentiating by contributor age, includes an evaluation of the advantages and disadvantages of charging contributors the maximum rate from among the average awarded rates for the different age and gender groups and contributing the difference between that rate and the premiums differentiated by age and gender in the individual capitalization account, as is done currently by differentiating between women and men. What would be different is the application of this method to different age segments. Valdés and Navarro (1992) address the issue of cross-subsidies among contributors of different ages. They suggest that if all individuals passed, during their whole lives, through the same age with the same probability, then this cross-subsidy would not be significant. However, this argument is valid only if we assume that the person contributing does so throughout his/her entire working life. If this is not the case, there would be significant cross-subsidies that could displace workers to the informal sector of the economy or encourage them to seek mechanisms to avoid mandatory contributions to AFPs and D&S insurance.

The probability of dying or becoming disabled grows with age, so that there might still be some cross-subsidies among age groups. Additionally, these probabilities do not only grow with age but are different depending on the socio-economic group.

Finally, different socio-economic groups have different contributory profiles, which would also imply that some cross-subsidies may prevail even if all workers were to pass through all ages. Table 4 shows these differences. They present the cumulative contribution rates to the Unemployment Fund at different ages. The Unemployment Fund (Fondo de Cesantía) is made up of contributions from all workers affiliated to the Unemployment Insurance system. Every worker with a formal contract starting after

Table 4 Cumulative contribution rates to the unemployment fund at different ages

Age	Income Bracket 1 (1)		Income Bracket 2		Income Bracket 3		Income Bracket 4		Income Bracket 5		Income Bracket 6		Total	
	x < 10 UF (2)		10 < x < 20 UF (2)		20 < x < 30 UF (2)		30 < x < 40 UF (2)		40 < x < 50 UF (2)		x > 50 UF (2)			
	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
25	32 %	38 %	59 %	64 %	72 %	60 %	80 %	52 %	79 %	34 %	76 %	48 %	39 %	47 %
26	32 %	40 %	58 %	65 %	70 %	64 %	74 %	53 %	74 %	43 %	74 %	35 %	39 %	49 %
27	32 %	41 %	59 %	69 %	66 %	69 %	73 %	58 %	76 %	41 %	73 %	39 %	39 %	52 %
28	31 %	41 %	62 %	69 %	69 %	71 %	72 %	66 %	72 %	54 %	77 %	42 %	39 %	54 %
29	33 %	44 %	61 %	72 %	72 %	75 %	76 %	69 %	76 %	69 %	73 %	62 %	41 %	58 %
30	33 %	45 %	60 %	71 %	72 %	77 %	72 %	75 %	72 %	73 %	74 %	71 %	40 %	59 %
31	32 %	46 %	59 %	70 %	66 %	79 %	75 %	76 %	75 %	82 %	73 %	72 %	38 %	60 %
32	32 %	44 %	59 %	72 %	70 %	78 %	68 %	84 %	79 %	80 %	68 %	77 %	38 %	61 %
33	31 %	44 %	60 %	73 %	70 %	77 %	74 %	79 %	71 %	82 %	78 %	83 %	40 %	62 %
34	31 %	45 %	61 %	73 %	67 %	76 %	67 %	81 %	74 %	80 %	80 %	84 %	38 %	62 %
35	32 %	45 %	58 %	73 %	71 %	76 %	69 %	81 %	67 %	75 %	79 %	86 %	39 %	63 %
36	31 %	44 %	62 %	72 %	75 %	79 %	70 %	80 %	75 %	76 %	73 %	85 %	40 %	61 %
37	32 %	45 %	64 %	72 %	76 %	79 %	75 %	84 %	71 %	78 %	67 %	83 %	39 %	62 %
38	31 %	46 %	61 %	71 %	71 %	79 %	70 %	82 %	69 %	84 %	75 %	84 %	39 %	62 %
39	31 %	45 %	59 %	69 %	71 %	80 %	71 %	83 %	69 %	86 %	77 %	85 %	39 %	61 %
40	32 %	45 %	61 %	73 %	71 %	75 %	63 %	79 %	69 %	85 %	68 %	81 %	40 %	61 %
41	33 %	47 %	61 %	70 %	67 %	77 %	71 %	83 %	77 %	85 %	73 %	80 %	40 %	61 %
42	31 %	47 %	60 %	71 %	65 %	80 %	73 %	82 %	67 %	74 %	77 %	85 %	38 %	61 %
43	32 %	47 %	60 %	71 %	67 %	78 %	74 %	80 %	74 %	81 %	78 %	79 %	39 %	61 %
44	32 %	46 %	60 %	71 %	67 %	75 %	70 %	77 %	81 %	82 %	69 %	80 %	40 %	60 %

Table 4 (continued)

Age	Income Bracket 1 (1)		Income Bracket 2		Income Bracket 3		Income Bracket 4		Income Bracket 5		Income Bracket 6		Total	
	x<10 UF (2)		10<x<20 UF (2)		20<x<30 UF (2)		30<x<40 UF (2)		40<x<50 UF (2)		x>50 UF (2)			
	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
45	33 %	46 %	62 %	70 %	74 %	78 %	75 %	80 %	69 %	77 %	74 %	78 %	40 %	59 %
46	32 %	46 %	59 %	72 %	67 %	77 %	80 %	80 %	79 %	79 %	80 %	76 %	39 %	59 %
47	33 %	47 %	59 %	70 %	68 %	77 %	72 %	80 %	76 %	76 %	77 %	79 %	39 %	58 %
48	33 %	46 %	57 %	70 %	67 %	76 %	80 %	81 %	73 %	83 %	70 %	76 %	39 %	58 %
49	32 %	46 %	62 %	71 %	63 %	75 %	67 %	81 %	67 %	71 %	86 %	75 %	39 %	57 %
50	31 %	46 %	60 %	71 %	72 %	77 %	76 %	81 %	71 %	80 %	72 %	74 %	39 %	57 %
51	32 %	49 %	62 %	70 %	69 %	75 %	78 %	81 %	68 %	80 %	79 %	76 %	41 %	57 %
52	30 %	46 %	60 %	70 %	74 %	76 %	70 %	75 %	71 %	79 %	78 %	79 %	39 %	56 %
53	33 %	47 %	59 %	71 %	72 %	77 %	77 %	76 %	67 %	78 %	73 %	71 %	40 %	56 %
54	31 %	46 %	62 %	70 %	69 %	74 %	69 %	80 %	81 %	71 %	84 %	72 %	40 %	55 %
55	31 %	48 %	61 %	68 %	71 %	74 %	62 %	77 %	55 %	67 %	72 %	71 %	38 %	53 %
56	34 %	46 %	58 %	69 %	68 %	79 %	63 %	73 %	69 %	62 %	78 %	75 %	39 %	54 %
57	31 %	46 %	60 %	68 %	59 %	74 %	72 %	74 %	71 %	72 %	70 %	72 %	38 %	53 %
58	32 %	48 %	61 %	68 %	72 %	77 %	71 %	71 %	77 %	65 %	70 %	66 %	39 %	51 %
59	31 %	45 %	60 %	67 %	68 %	71 %	73 %	72 %	68 %	66 %	69 %	64 %	40 %	50 %
60	32 %	45 %	61 %	66 %	69 %	78 %	77 %	58 %	70 %	58 %	72 %	71 %	40 %	49 %
61	32 %	44 %	61 %	65 %	70 %	72 %	81 %	70 %	77 %	76 %	85 %	68 %	40 %	48 %
62	26 %	45 %	64 %	71 %	73 %	59 %	90 %	82 %	90 %	75 %	80 %	78 %	40 %	48 %
63	33 %	43 %	57 %	66 %	74 %	74 %	77 %	79 %	78 %	70 %	71 %	66 %	39 %	47 %
64	28 %	44 %	54 %	67 %	73 %	65 %	81 %	49 %	75 %	75 %	58 %	63 %	39 %	45 %

Table 4 (continued)

Age	Income Bracket 1 (1)		Income Bracket 2		Income Bracket 3		Income Bracket 4		Income Bracket 5		Income Bracket 6		Total	
	x<10 UF (2)		10<x<20 UF (2)		20<x<30 UF (2)		30<x<40 UF (2)		40<x<50 UF (2)		x>50 UF (2)			
	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
65	29 %	40 %	65 %	62 %	47 %	59 %	85 %	76 %	87 %	50 %	61 %	53 %	39 %	39 %

(1) Income brackets refer to average non-zero monthly income in the last 5 years

(2) The Unidad Fomento (UF) is an inflation-indexed monetary unit used in Chile, worth approximately 40 U.S. dollars (May 2015)

Source: Prepared by the authors using the Unemployment Insurance data base on individual accounts

2002 is automatically affiliated. Workers with a formal work contract starting before 2002 can voluntarily affiliate.

If, for example, at age x the cumulative contribution rate is $y\%$, it means that workers who in March 2013 had x years of age, on average had contributed during $y\%$ of the total number of months where they had been affiliated to the Unemployment Insurance system.

The second change to be evaluated is limiting coverage of D&S insurance to the economic risk of being unable to work from the claim date until the retirement date. Thus, the insurance coverage would not include financial and economic risks associated with the interest rate and fund value. However, as will be shown later, in both the lump-sum payment and monthly payment methods the interest rate is still important in determining the cost to insurers. In other words, this D&S insurance coverage method does not completely eliminate all financial risks associated with the coverage.

Currently, in the event of disability or death, first the amount required for a defined lifelong pension is calculated. This amount is known as the “necessary capital”. Then the capital accumulated in the individual capitalization account is subtracted from the necessary capital to obtain what is known as the “additional net capital”. This is the amount covered by the insurance company.¹ Thus, if at the time of the claim the capital accumulated in the individual account is abnormally low due to an economic crisis or the interest rate is unusually low, resulting in a need for more capital to cover the same pension, the insurance company would experience substantial losses. This risk may be catastrophic, and cannot be reduced by the law of large numbers. However, there are mechanisms that enable insurers to cover these risks, including stop-loss reinsurance, financial hedges, and others.

In relation to this issue, it is important to mention that there is a significant proportion of contributors who in the event of disability or death have enough savings in their individual accounts to generate zero additional net capital. In these cases, workers who are paying for insurance receive little or no benefit. Table 5 shows the number of individuals for whom, when the disability (total or partial) or death event occurs, had an additional net capital amount of zero, considering the 2006–2011 period for the date of claim occurrence.²

Strictly speaking, it is important to emphasize that when the additional net capital is zero, it does not necessarily mean that the member has not received any insurance benefit. For example, in the case of disabilities (partial today, partial and total until September 30, 2008), there is a provisional pension payment over 3 years (plus “contributions” in the event of rejection of the disability claim at the end of the 3 years) which are a net benefit for the member, because these benefits don’t come from the individual account but rather are paid by the insurer. This is still true for partial disability (where there is a second disability ruling after 3 years) and was true for total disability until the end of 2008, after which the second disability ruling for total disability ceased to exist. The concepts of “provisional pensions” and “contributions” for people with total disabilities disappeared on September 30, 2008 since no second rulings are now needed for them.

¹ In the event of partial disability, the mechanics are slightly different. Rather than subtract 100 % of the balance in the individual account, only 70 % is subtracted to determine the additional net capital. This is explained in greater detail in later sections.

² Table 5 includes only the number of disability cases who have a final ruling during the period. Since the 2008 reform, the excluded cases would be only those who have an initial ruling of partial disability but have not yet received the second ruling. Before this date, Table 5 would also exclude total disability cases with no second ruling.

Table 5 Percentage of claims with additional net capital equal to zero, 2006–2011

Total number of disability cases, 2006–2011				Total number of survivors cases, 2006–2011			
Age segment	M	W	Overall total	Age segment	M	W	Overall total
1: Up to 20 years	7	6	13	1: Up to 20 years	32	2	34
2: 21 to 25	211	66	277	2: 21 to 25	481	73	554
3: 26 to 30	447	207	654	3: 26 to 30	932	186	1,118
4: 31 to 35	598	369	967	4: 31 to 35	1,262	272	1,534
5: 36 to 40	911	609	1,520	5: 36 to 40	1,585	443	2,028
6: 41 to 45	1,404	959	2,363	6: 41 to 45	2,164	596	2,760
7: 46 to 50	2,219	1,420	3,639	7: 46 to 50	2,825	727	3,552
8: 51 to 55	2,980	1,792	4,772	8: 51 to 55	3,067	612	3,679
9: 56 to 60	3,549	2,144	5,693	9: 56 to 60	2,726	342	3,068
10: 60 to 65	3,053	155	3,208	10: 60 to 65	2,013	32	2,045
Overall total	15,379	7,727	23,106	Overall total	17,087	3,285	20,372
Total number of disability cases with additional net capital = 0				Total number of survivors cases with additional net capital = 0			
1: Up to 20 years	0	0	0	1: Up to 20 years			
2: 21 to 25	7	1	8	2: 21 to 25	1		1
3: 26 to 30	15	7	22	3: 26 to 30	1		1
4: 31 to 35	22	16	38	4: 31 to 35	71	23	94
5: 36 to 40	47	41	88	5: 36 to 40	85	39	124
6: 41 to 45	91	64	155	6: 41 to 45	161	62	223
7: 46 to 50	164	106	270	7: 46 to 50	315	121	436
8: 51 to 55	277	118	395	8: 51 to 55	481	176	657
9: 56 to 60	417	110	527	9: 56 to 60	780	150	930
10: 60 to 65	455	2	457	10: 60 to 65	868	20	888
Overall total	1,495	465	1,960	Overall total	2,763	591	3,354
Percentage of total cases				Percentage of total cases			
	9.7 %	6.0 %	8.5 %		16.2 %	18.0 %	16.5 %

In addition, the period analyzed (2006–2011) includes a sub-period (2006–2008) in which it was more likely that a claim involving a woman had zero cost because no benefits were provided by them to their non-disabled spouse. This is especially important in the case of death but is also applicable to cases of disabled women. This situation changed on October 1, 2008, when women began to generate benefits to a non-disabled spouse.

Valdés and Navarro (1992) address the issue of cross-subsidies among different income groups. On the one hand, they explain that since income is positively correlated with health, agents with higher income have a lower claim probability, so they would be subsidizing the less advantaged. However, they also explain that the directionality may be inverse, since high-income contributors participate less in the informal sector than low-income contributors.

Another factor to be considered is that high-income contributors can pay for better doctors to ensure that their disability claims are accepted. Valdés and Navarro (1992) are unable to determine the directionality of this subsidy among income groups, but we

can mention that average income of disability pensioners is higher than the average income of contributors to D&S, suggesting that on average, high income workers tend to be subsidized by low income contributors.

Another problem addressed in the literature is that of moral hazard. This problem is modeled by Golosov and Tsyvinski (2006), who look for tax instruments that will ensure that only those who are truly disabled submit disability claims.

To end this introduction, we should point out that changes in D&S premiums may affect formal labour market participation and labour market earnings. As (Repetto and Vega 2013) point out when analyzing possible contribution-rate increases, these may negatively affect formal labor participation and eventually may even affect pensions negatively.

Even though they do say that this last effect on pensions appears only in a few of the simulations performed, when labour demand and supply elasticities are high and when the contribution is perceived mainly as a tax on income, the point is made that increases from the present 10 % to, say, 13 %, should not be taken to mean an increase in pensions of 30 %, not even in the long run.

In the present study, where differentiating by contributor age in the D&S insurance is proposed, there could in principle be a positive impact on formal labor participation in those age groups ending up below the average contribution rate and a negative impact on those age groups where the rate ends up above the average. As will be seen later in this article, younger (older) groups would be positively (negatively) affected since the cost of insurance would be lower (higher). Of course, if, as also proposed here, the maximum rate from among the average awarded rates for the different age and gender groups is charged to all groups, then we should only expect a negative effect on formal labour participation. If, again as proposed, the difference between that rate and the premiums differentiated by age and gender in the individual capitalization account is capitalized, as is done currently when differentiating between women and men, the magnitude of the negative effect will depend, as in (Repetto and Vega 2013), on the elasticities of demand and supply for labour and the degree in which workers perceive contributions as a tax on income.

We should say however that measuring the possible bias on D&S costs of the above mentioned effects is beyond the scope of the present study.

International Situation³

What follows is a description of how disability and survivors insurance functions in pension systems around the world. This includes member countries of the International Federation of Pension Fund Administrators (FIAP) and the United States. These countries are a good reference for analyzing the Chilean case because they share a similar funding regime. The FIAP member countries are Bolivia, Bulgaria, Chile, Colombia, Costa Rica, Dominican Republic, El Salvador, Mexico, Peru, Poland, Romania, Ukraine, and Uruguay. In all of these countries, the pension system includes disability and survivors insurance, but it is important to note that FIAP member countries require different levels of disability to obtain a pension and they also grant different levels of benefits.

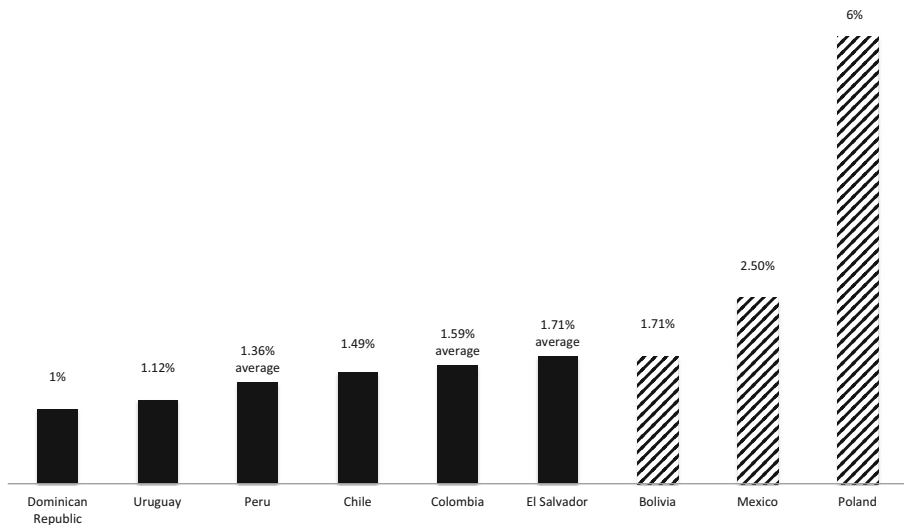
³ This section is based on FIAP (2010, 2011) and Stonehouse (2013) for the case of the United States.

In most of the countries mentioned, disability insurance provides a lifelong pension; in other words, disabled persons are granted a stable pension throughout their entire lives. However, this does not occur in Bolivia, Poland, the Dominican Republic and the United States. In these countries, the disability pension is received until retirement age, at which time they begin to receive an old age retirement pension. In Bolivia and the Dominican Republic, the insurance company additionally pays a monthly contribution into the individual capitalization account, so that the individual has sufficient capital accumulated for his/her retirement pension.

In most countries, when the contingency occurs the insured person obtains a disability pension but is not entitled to a lump-sum amount. However, in both Bulgaria and the United States the insured may choose between withdrawing the funds accumulated in the individual account as a lump sum or in partial payments.

Contribution rates for disability and survivors insurance are shown in the table below.⁴ In the Dominican Republic, Peru, Chile, Colombia, and El Salvador the insurance is provided by private insurers, while in Bolivia, Mexico, and Poland it is provided by the state or a government managed institution. In Uruguay, D&S insurance is financed by private insurers in conjunction with a state-run PAYG system.⁵

Contribution Rate, D&S Insurance for FIAP Member Countries (*)



Source: FIAP 2011

(*) Data as of December 2011. In Peru, Colombia, and El Salvador, the figure provided is an average of the rates of the different AFPs, which contract the insurance individually. In the Dominican Republic, Uruguay, and Chile the insurance rate is uniform for the entire system. It should be noted that in Chile, the 1.49 % rate applies to men. The net rate for women in 2011 was 1.44 %. The 0.05 percentage point difference was paid into the individual account of women

⁴ Other FIAP member countries not included in the table have a state D&S insurance program that does not have a distinct rate for these purposes; rather, D&S is included in the overall contribution rate.

⁵ No information is available about the percentage of the contribution to the public program in Uruguay; the rate shown applies only to private insurers.

Another case that is quite distinct from the FIAP countries is the United States. That country's citizens may choose a retirement plan other than the state-managed Social Security program that also has disability and survivors insurance. The most widely used plan offered in the United States is the 401(k). To complement this retirement plan, a supplementary disability insurance was created. If the insured becomes disabled, this insurance provides a stable income until retirement; or, if the insured prefers, he/she can withdraw the entire amount he/she would receive until retirement as a lump sum in order to invest it and obtain market returns.

Methodology

Following is a description of the methodology used to meet the different objectives of this study, which are:

- 1) Measure the cost of D&S insurance by age segment and gender.
- 2) Evaluate the different alternatives for grouping by age segment and gender.
- 3) Measure and evaluate a modification to D&S insurance that includes only the economic risk of the inability to work from the claim date to retirement age.

The methodology followed consists of projecting, on the one hand, the number and cost of claims to occur during the period studied and on the other hand, projecting the contributable income for which the price for this insurance is calculated and applied. This projection is carried out separately for men and women, by age segment.

The study also included the following phases:

- a) Database analysis and cleansing.
- b) Estimation of probabilities and number of claims to occur, by age and gender.
- c) Estimation of the costs of different claims, by age and gender.
- d) Estimation of the total cost of claims, by age and gender.
- e) Estimation of the contributable income basis used to determine premium income, by age and gender.
- f) Estimation of the total cost of claims, by age and gender, as a percentage of contributable income.
- g) Comparison of the current situation in which there is a single rate for each gender.

Data Utilized⁶

As mentioned in the introduction, the analysis was based on data provided by the association of AFPs in the disability and survivors insurance bidding process of 2012. The databases were the following:

⁶ For more details on the database analysis and cleansing process, see (Edwards et al. 2013).

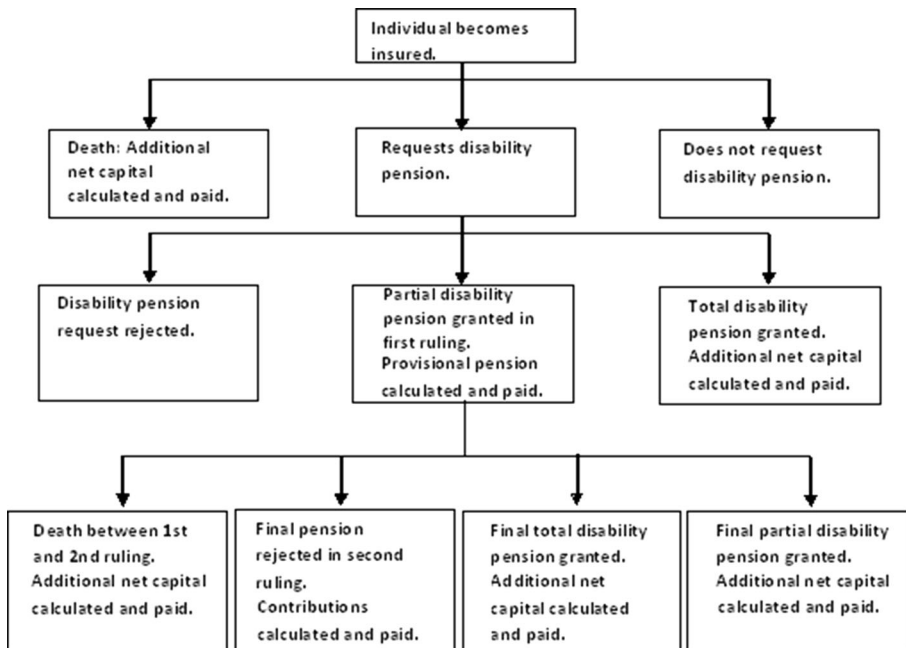


Fig. 1 Disability and survivors insurance scheme

- a) Contributor Database, 2006 – 2011.
- b) Disability Claim Database, 2006 – 2011.
- c) Survivor Claim Database, 2006 – 2011.
- d) Database of Beneficiaries (Disability and Survivors Claims), 2006 – 2011.

Estimation of Claim Probabilities

In this stage, claim probabilities were estimated using the following model presented in Fig. 1, in which rulings are defined as those issued after all possible appeal processes and any recourse that could be presented by the parties.

Estimation Methodology

To estimate claim probabilities, two databases were used:

- a) The database of contributing members for the 2006–2011 period. In regard to this database, it should be emphasized that the number of contributors is merely a proxy for the number of members covered by the insurance, since there are some contributing members who are not covered by it, as well as non-contributing members who are covered by it (because they recently stopped contributing). In addition, it is important to note that women and men above 65 years of age have been excluded from the contributors database because they are not covered by the insurance during the period analyzed.

- b) The claim database for the 2006–2011 period, both for survivors and disability (separately).

The evolution of the number of contributors by gender and age group during the period evaluated was measured.

In addition, the claim database was used to measure the evolution of the number of deaths and disabled persons (per the first ruling) in the period studied, by gender and age group.

Probabilities or claim frequencies by age and gender were generated by combining historical data bases on exposed (contributors) and observed claims (deaths and disabilities).

Finally, the number of exposed for 2012 was projected, and the previous probabilities were then applied to them. To do this, we applied a growth rate (based on historic trends) for the missing quarter to the data from the latest available year (October 2011 to September 2012).

In the case of partial disability, to estimate the probability that the second ruling would ratify or change the first one, we once again used the claim database, specifically those cases with two rulings. Although initially an attempt was made to break down the analysis of this conditional probability by age group and gender, ultimately it was only broken down by gender. This implies the assumption that age does not affect the probabilities of the different alternatives for the second ruling after a first partial disability ruling.

On this point it should be noted that to estimate the probabilities of the first ruling we used claim rates for the period from the second half of 2009 through the first half of 2011. The second half of 2011 was not used because the figures do not appear reliable, as they do not match expected trends. This is due, we believe, to the fact that these are preliminary figures. Data prior to the second semester of 2009 were also excluded because, in our judgment, 2 years is sufficient to obtain a representative sample of actual claims.

For the second ruling, we used information for the period from 2006 to 2008 (date of the first request). Subsequent figures were not used because the second ruling typically takes 3 years. While some final result data (death, total disability, partial disability or rejection) is available for claims first requested after 2008, the data are biased toward deaths.

Tables 6 and 7 show the projections for 2012 for women and men by age segment.

Cost Estimation of Different Claims, by Age and Gender

The claim database since 2006 was used to estimate the cost of claims in each case. While this database does include both the necessary capital and the additional net capital to be paid by the insurance company, this last number had to be recalculated for the following reasons:

- 1) The interest rate has not been constant over time. The necessary capital and the additional net capital to be paid by the insurance company had to be revised and recalculated⁷ to reflect the interest rate estimated for the projection period addressed in the study.

⁷ Recalculation of the necessary capital implies taking each claim from the disability and survivors database together with their beneficiary (family group) and using an actuarial model which, along with an estimated discount rate for the evaluation period and current mortality rates for the period, gives the capital necessary to cover a pension unit. Once the capital necessary to cover a pension unit (annuity factor) is calculated, the necessary capital is computed as the product of the annuity factor and the amount of pension benefits to be received by the pensioner.

- 2) Official mortality tables have varied over time in the database, which means that the “necessary capital” and “additional net capital” figures have to be recalculated and the projections must be based on current mortality tables (B-2006 or MI-2006, adjusted to 2012 with the AAx factor).
- 3) Elimination of the transitory period for total disability in the historic database, due to the 2008 legal reform that eliminated the transitory period for total disability.

Once the additional net capital figures have been recalculated with the conditions that would exist in 2012, the insurance cost for each individual in the database are given by the following expression:

$$D\&S\ Cost = Additional\ net\ capital + Transitory\ Pension + Contributions$$

In this expression, the additional net capital refers to the amount expressed in inflation-indexed units (*unidades de fomento*, or UF) that results from the difference between the capital necessary⁸ to finance the reference pensions and the amount of capital accumulated by the member in his/her individual capitalization account (*cuenta de capitalización*, or CCI) including the recognition bond (*bono de reconocimiento*, or BR),⁹ on the date of the member’s death, or is certified as totally disabled, or receives a second ruling of partial disability. When this difference is negative, the additional net capital to be paid by the insurance company will be equal to zero.

In the event of death or total disability, the additional net capital to be paid by the insurance company is calculated as:

$$Additional\ net\ capital = Necessary\ Capital - (CCI + BR)$$

where the necessary capital is calculated for the reference pension, which is equal to 70 % of the base income.

In the case of partial disability, the equation used to determine the additional net capital is slightly different. Rather than subtracting the total amount of capital accumulated by the member and the recognition bond from the capital necessary to pay the reference pension, which is equal to 50 % of the base income in this case, only 70 % of the individual account is subtracted from this sum.

It should be noted that in the cases of partial disability, there are also transitory disability pensions provided for a 3-year period starting from the date of the first ruling. At the end of the 3-year period, the member is summoned for a second, and final, ruling. This transitory pension corresponds to the worker’s reference pension, which in the case of partial disability is equal to 50 % of the base income.¹⁰ In addition, if a

⁸ The necessary capital is the present value of all reference pensions that the member generates for him or herself and their family group, starting from the time at which the death occurs or when the final disability ruling is issued until expiration of the right to a pension of the member and each of the accredited beneficiaries and the funeral expense allowance (15 UF).

⁹ The recognition bond is an instrument expressed in money terms, issued by the state, that represents the contribution periods registered in the previous social welfare regime by workers who transferred into the new pension system.

¹⁰ The reference pension for total disability is 70 % of the base income, similar to the reference pension for survivors. The base income is defined as the amount that results from dividing by 120 the sum of contributable income in the last 10 years prior to the month in which the death occurs or in which disability is declared via the first ruling, whichever is applicable, and updated according to variation in the CPI. One exception is the case of those between the ages of 25 and 35, where the base income is given by the effective average of contributable income received during their active work life.

Table 7 Claim projection for men up to 65 years Old

Age Segment	Total contributors, monthly average, 2012 (estimated)	Projected number of deaths, 2012	Projected number totally disabled, 2012	Projected number of partially disabled, first ruling, 2012	Projected number of partially disabled, first ruling, declared totally disabled in second ruling, 2012	Projected number of partially disabled, first ruling, declared partially disabled in second ruling, 2012	Projected number of partially disabled, first ruling, rejected in second ruling, 2012	Projected number of partially disabled, first ruling, who died prior to second ruling, 2012
1 = up to 20	108,526	6	4	4	1	2	0	0
2 = 20 – 25	328,835	86	64	17	6	9	1	1
3 = 25 – 30	388,059	182	116	28	10	14	2	1
4 = 30 – 35	380,489	233	147	42	16	22	2	2
5 = 35 – 40	387,517	313	228	78	29	40	4	4
6 = 40 – 45	363,172	415	320	106	40	55	6	5
7 = 45 – 50	355,682	606	538	162	61	84	9	8
8 = 50 – 55	276,095	714	797	223	84	116	12	11
9 = 55 – 60	178,412	708	993	252	95	131	14	12
10 = 60 – 65	82,312	499	699	151	57	78	8	7
Average/total	2849,100	3,762	3,906	1,061	399	551	59	51

member is declared not disabled in the second ruling, the pension fund administrator will pay the so-called “contribution” into the member’s individual capitalization account. This contribution represents the amount that would have accumulated from paying the 10 % contribution on the partial disability pension received under the first ruling. In this case, the member becomes active again.

Methodology for Calculating the Additional Net Capital

For each individual in the claim database, first the necessary capital per unit of pension was recalculated,¹¹ based on a single interest rate, current mortality tables and the fact that in 2008 the transitory period for total disability cases was eliminated.

To estimate the average costs per age segment and gender, initially all cases of disability and survivors in the claim database were used. Only those cases in which the base income or balance in the individual capitalization account were not available were discarded. The estimations were carried out for different groups of originators by gender, age segment and type of claim.¹²

The total expected claim cost by age and gender is the product of the number of claims (frequency) of disability (distinguishing between partial and total disability) and survivors as described previously, and the applicable average unit cost, for each combination of age and gender.¹³

Estimation of the Contributable Income Base to Determine Premium Income

Data from the Pension Superintendency was used to estimate the contributable income base for determining premium income. Specifically, the database used was the “number of contributors and average contributable income by type and gender,”¹⁴ which provides the number of contributors by gender and period and their respective total contributable income.

To separate the data by age segment, we used the “Number of male (female) contributors by age and contributable income” database. This database provides information by age segment and average contributable income.¹⁵ This information enables these groups to be separated into age groups similar to the contributors database

¹¹ The capital per unit of pension is the amount, in present value terms, needed to finance one pension unit.

¹² The claim types include death, total disability, partial disability in the first ruling with total disability/partial disability/rejection/death in the second ruling.

¹³ Unfortunately, the data base on claims (deaths and disabilities) does not provide precise information on the level of income of the deceased and disabled workers. Had this information been available, we could have also computed the cost of D&S claims and their claims ratios (as a percentage of income) by income group levels, in addition to age and gender. On the claims data bases, such information is not available, making it impossible to obtain cost estimates by income level.

¹⁴ See (SPensiones) information as of September 30, 2013.

¹⁵ This database provides the contributable income by age segment in terms of a range of values in pesos. The midpoints of each segment were used to project the percentages of the total contributable income for the aforementioned “Number of contributors and average contributable income by type and gender” database. In other words, the age segment database was only used to see the percentage distribution of the contributions among the various age segments.

described earlier in this paper, which was provided by the Undersecretary for Social Welfare for this research.

Estimation of the Claims/Income Ratios by Age and Gender

Finally, the disability and survivors insurance cost rate by age segment and gender as a percentage of the contributable basis of the contributors to the social welfare system is the result of using the total expected cost as the numerator and the contributable basis as the denominator for each pair or combination of age and gender.

Findings

Following are the study findings for each of the objectives proposed.

First Objective: Measurement of the Cost of D&S Insurance by Age Segment and Gender

Table 8 shows the cost of disability and survivors insurance by age segment. We used a discount rate of 3.14 % for the necessary capital per unit of pension¹⁶ and 2012 mortality tables for beneficiaries and disabled persons.

Table 8, in addition to showing the costs as a percentage of contributable income, will be used as the base case for subsequent comparisons.

The last row of Table 8 provides the actuarial cost of D&S insurance under current law, which only distinguishes between women and men and not by age. This estimation is based on the prevailing interest rate during the period studied (2012) and the applicable mortality tables for 2012. The actuarial figures do not include any costs for administration, risk provisions or profits.

It is evident that the actuarial cost of the insurance substantially increases with age. This increase is produced by the significant differences in claim probabilities (frequencies), as shown in Tables 6 and 7, rather than by the additional net capital required per deceased or disabled person.

What is notable is that the last segment of women (60 to 65 years old) has lower insurance costs than the previous segment (55 to 60 years old). We believe this is the result of selection bias because the number of exposed is substantially lower.

Second Objective: Grouping by Age

Tables 9, 10 and 11 show what would happen to actuarial costs for D&S insurance if the ages were grouped in different ways. The alternatives considered are: 1) two segments: 18–35 and 36–65 years of age; 2) two segments: 18–40 and 41–65 years of age; 3) three segments: 18–30, 31–45 and 46–65 years of age.

¹⁶ This is the rate prevailing in 2012 to calculate the additional capital to be paid by the insurance companies.

Table 8 Cost of D&S Insurance by age segment and gender as a percentage of contributable income; 2012 projection; discount rate: 3.14 %

Age segment	Men	Women	Overall total
1 = Up to 20	0.05 %	0.02 %	0.04 %
2 = +20 – 25	0.20 %	0.08 %	0.16 %
3 = +25 – 30	0.33 %	0.17 %	0.27 %
4 = +30 – 35	0.39 %	0.30 %	0.35 %
5 = +35 – 40	0.64 %	0.55 %	0.61 %
6 = +40 – 45	0.99 %	0.83 %	0.93 %
7 = +45 – 50	1.43 %	1.34 %	1.40 %
8 = +50 – 55	2.15 %	2.30 %	2.20 %
9 = +55 – 60	3.03 %	4.09 %	3.39 %
10 = +60 – 65	3.44 %	1.77 %	3.18 %
TOTAL	1.07 %	0.92 %	1.02 %

Source: Authors' estimations. These values are the actuarial cost of the insurance and do not include other administrative costs or corporate profit

The decision about which alternative to use in order to differentiate by age should at least take into account the following:

- a) Desired cost dispersion.
- b) Size of the various bundles in a competitive bidding process, both in terms of number of people and actuarial costs.
- c) Maximum cost of D&S insurance.

Table 9 Total cost as a percentage of contributable income; age segments: 18–35 and 36–65 years of age; 2012 projection; discount rate: 3.14 %

Age segment	Men	Women	Overall total
1 = +18 – 35	0.31 %	0.20 %	0.27 %
2 = +35 – 65	1.53 %	1.46 %	1.50 %
TOTAL	1.07 %	0.92 %	1.02 %

Table 10 Total cost as a percentage of contributable income; age segments: 18–40 and 41–65 years of age; 2012 projection; discount rate: 3.14 %

Age segment	Men	Women	Overall total
1 = +18 – 40	0.41 %	0.30 %	0.37 %
2 = +40 – 65	1.82 %	1.81 %	1.81 %
TOTAL	1.07 %	0.92 %	1.02 %

Table 11 Total cost as a percentage of contributable income; age segments: 18–30, 31–45 and 46–65 years of age; 2012 projection; discount rate: 3.14 %

Age segment	Men	Women	Overall total
1 = +18 – 30	0.27 %	0.14 %	0.22 %
2 = +30 – 45	0.66 %	0.54 %	0.62 %
3 = +45 – 65	2.16 %	2.25 %	2.19 %
TOTAL	1.07 %	0.92 %	1.02 %

It should be noted that the numbers above do not include expenses for administration, catastrophic risks such as changes in interest rates, or the insurer's margin.

Third Objective: Restriction of D&S Insurance Coverage

To evaluate the advantages and disadvantages of restricting D&S insurance coverage to the economic risk of being unable to work from the claim date until the normal retirement date, the same database was used to determine the cost of covering income during that period. The payment could be made on a monthly basis from the claim date until the normal retirement age, or as a lump sum. The amount in the individual's account would not be affected in any of the aforementioned cases. However, in both the lump sum payment and monthly payment methods, the interest rate will continue to be important in determining the cost to insurers. In other words, this D&S insurance coverage method does not completely eliminate all financial risks associated with this coverage.

Estimation Assumptions

- a) The number of months of payments until the maximum coverage age of 65 is taken as a certain event.¹⁷ This number is valid for both men and women.
- b) This certain payment is made once there is a final ruling in the case. This means that in the event of partial disability, the certain payment is made upon the second ruling or the date of death if this occurs prior to the second ruling. In any case, it should be noted that the applicable transitory pension for the period between the first and second disability ruling (or date of member's death, if prior to the second ruling) is also included as part of the costs to insurers.
- c) However, an amount associated with the necessary contributions for a retirement pension is not included. Simply multiplying the numbers by a constant factor will give a close approximation on the cost increase.¹⁸

¹⁷ A certain event is defined as payment of the assigned pension under all circumstances. If the originator dies during the period between the disability ruling and the month in which he or she turns 65, the pension will be fully paid to the beneficiaries.

¹⁸ In the case of partial disability rejected on the second ruling, transitory pensions are fully paid and would not command contributions for a retirement pension. Hence the lack of strict proportionality.

- d) The discount rate used to estimate the present value of certain payments until the retirement date is 3.14 %.

Cost of D&S Insurance with Certain Payment (Coverage up to 65 Years of Age)

Table 12 shows the costs of D&S insurance under the aforementioned assumptions, considering a certain payment until the maximum coverage age of 65, for both women and men. The first part of the table shows the base case presented in Table 8 above for purposes of comparison.

It is evident that for men this product is more expensive than the current program for those under the age of 55, and in the case of women, the costs would be higher (more expensive) only until 45 years of age. Overall, this scheme should increase costs for men, but reduce costs for women, and slightly increase the cost for the whole exposed group.

Conclusions

1. The actuarial cost of D&S insurance, expressed as a percentage of contributable income, grows with the age of the insured person. While the average individual cost of claims declines significantly in the older age segments, claim frequency is much higher among older persons than younger ones and this effect becomes dominant. As a result total costs, expressed as a percentage of contributable income, are ultimately higher for higher age segments. The implementation of a D&S insurance that is differentiated by age, but in which all pay the price that corresponds to the most expensive age group, would imply that younger insured

Table 12 Cost of D&S Insurance by age segment and gender as a percentage of contributable income: comparison of alternatives in coverage

Life coverage through “additional net capital” to be paid by insurance company				Coverage only until normal retirement age			
Age segment	Men	Women	Overall total	Age segment	Men	Women	Overall Total
1 = Up to 20	0.05 %	0.02 %	0.04 %	1 = Up to 20	0.08 %	0.03 %	0.06 %
2 = +20 – 25	0.20 %	0.08 %	0.16 %	2 = +20 – 25	0.32 %	0.13 %	0.25 %
3 = +25 – 30	0.33 %	0.17 %	0.27 %	3 = +25 – 30	0.50 %	0.21 %	0.38 %
4 = +30 – 35	0.39 %	0.30 %	0.35 %	4 = +30 – 35	0.54 %	0.34 %	0.46 %
5 = +35 – 40	0.64 %	0.55 %	0.61 %	5 = +35 – 40	0.80 %	0.60 %	0.73 %
6 = +40 – 45	0.99 %	0.83 %	0.93 %	6 = +40 – 45	1.19 %	0.93 %	1.10 %
7 = +45 – 50	1.43 %	1.34 %	1.40 %	7 = +45 – 50	1.69 %	1.33 %	1.57 %
8 = +50 – 55	2.15 %	2.30 %	2.20 %	8 = +50 – 55	2.43 %	1.99 %	2.28 %
9 = +55 – 60	3.03 %	4.09 %	3.39 %	9 = +55 – 60	2.88 %	2.60 %	2.79 %
10 = +60 – 65	3.44 %	1.77 %	3.18 %	10 = +60 – 65	1.63 %	0.76 %	1.49 %
TOTAL	1.07 %	0.92 %	1.02 %	TOTAL	1.17 %	0.83 %	1.05 %

- persons could save an additional significant portion of their salaries in their individual accounts. This amount would be equivalent to the difference between the maximum price charged to all contributors and the price that corresponds to the age group. These additional savings could total 4 % or even more of contributable income in the case of younger age groups (see Table 8).
2. While on average the actuarial cost for women, expressed as a percentage of contributable income, is lower than that of men, at older ages the cost for women equals or exceeds that of men. This means that if D&S insurance were to be differentiated by age and gender, not all women would receive an additional contribution in their individual accounts. In fact, older women have the highest D&S insurance cost, so this group would determine the maximum price of all age groups, which could be close to 4 % of contributable income (see Table 8).
 3. The higher level of D&S insurance cost by age segment and gender can be managed by determining the age groupings to be used. If instead of working with 5-year age groups, each gender is grouped into two or three segments, the results obtained are different from those described above. For example, for both alternatives with two age segments in this study, in the oldest age segment the men have the higher actuarial cost for D&S insurance, expressed as a percentage of contributable income. However, in the alternative with three age segments proposed in this study, the women in the oldest age group have the highest actuarial cost of D&S insurance, expressed as a percentage of contributable income (see Tables 9, 10 and 11).
 4. The study findings indicate that restricting D&S insurance coverage benefits to the economic risk of being unable to work from the claim date until retirement and paying disability and survivors benefits only during that period and providing the worker with the capital accumulated at his/her retirement would not reduce the overall cost of disability and survivors insurance. This product only becomes less expensive than the traditional product starting at 55 for men and 45 for women, and this latter result is due to the short time remaining for payment of disability and survivors insurance benefits until the normal retirement age. If we were to include as an additional benefit under this scheme the necessary contributions for a retirement pension, the costs would be slightly higher.

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