

Can complementary pension plans take on the role of improving retirement pensions in developing nations? Case Study – The Dominican Republic

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In the last decade of the last Century a number of major changes started to take place in pension models of developing nations, most notably in Chile, in whose wake came first, several Latin American countries, then those of eastern Europe and following that, Central Asia. These changes revolved around the setting up and introduction of models based on a funded individual system with defined contributions and private management and until the present, although their development has not been without controversy, the overall result has been positive, given that such initiatives started from a coverage that was either insufficient or in effect non-existent. However, the reality is that levels of coverage still lag far behind those considered necessary to be able to pay out pensions that can be adequately lived on after retirement. Overall development of occupational complementary pension plans represents just one of several alternatives aimed at improving these pension (capital fund) levels, as illustrated by other countries, whose experience in the field of pensions experience goes back a number of decades. Such complementary plans should, provided their expense can be kept within viable limits for employers, mean that the level of coverage for the workforce grow notably, without causing major upheavals in the balance sheets of countries where they are put into practice. This article examines a number of complementary pension plan models created and undertakes a case study in a real environment, namely that of the Dominican Republic. It is proven herein that such models may indeed be a viable mechanism for developing countries.

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1. Introduction

Reforms in pension systems have been taking place in developing nations of late, especially in Latin America and the Caribbean, as well as in Eastern Europe and Central Asia. They have based on a change in their models in comparison to other countries with more mature pension structures, which have gradually consolidated throughout the 20th century. These

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new models are in overall terms based on individually funded accounts, i.e. implying that future pensions will only be available for those who have paid their contributions. They rarely take in either models of redistribution or solidarity, which are essentially left up to respective governments to decide on, e.g. in Costa Rica the social insurance manages non-contributory pensions, although governments themselves are responsible for transferring funds to it. That said, several authors, such as Mesa-Lago (2004, 2008a) and Gill *et al.* (2005) observe that mandatory pension systems in emerging nations do not stretch far enough to guarantee adequate pensions for corresponding eligible groups.

This article therefore looks into the viability of developing complementary pension systems as a vehicle to top up existing levels of coverage offered by the basic mandatory pension system operated by Social Security. The paper is divided into three parts. The first examines funded schemes, mainly in Latin America and offers a number of considerations on voluntary pension plans. The second section defines a model formulated for a variety of situations that takes account of the development of occupational pension plans when it comes to calculating amounts workers are to receive for their retirement pensions. The third part presents the results obtained by applying the proposed model to the Dominican Republic, a developing nation, from which all necessary information has been obtained in order to be used in the processes of the model. The reasons this country was chosen were namely because it was the latest to adopt a mandatory funded scheme as an exclusive form of pension coverage for its workers. The 2006 Panamanian reform includes part of this type of capitalisation, but not in an exclusive way. It also included recent reforms and furthermore provided sufficient information and at the start up too, as well as offering the chance to extrapolate the results of these changes according to the principals that guided them. The results of this model applied to the country under study will allow us to discern its viability in its own economic and business environment and thus consider the adequacy of extrapolating it to other developing nations.

2. Mandatory pension systems

In industrialised nations, pension systems have been based traditionally on three basic types: a) government intervention, (pensions organised controlled and handed out by the government), b) three-way financing, (employers, workers and the government itself) and c) use of a redistribution model, (contributions from one financial year being used to pay outs made over the same period). That said, this pattern has undergone change, and partially funded or use of models stemming from the pay-as-you-go (PAYG) system have also been taking shape, notably in Europe. Reforms derived from PAYG systems are basically of two types.

On the one hand, there are parametric reforms, where only the parameters of the system change, such as retirement age, years to take into account when calculating pension or increases in the contribution. Nearly 80% of OECD member countries with established systems include the entire working life in order to calculate retirement pensions. (Martin & Whitehouse, 2008). Likewise, countries such as Denmark, Germany, Iceland, Norway, United Kingdom and United States have been gradually raising retirement ages, which will be established at 67 at least.

On the other hand, structural reforms imply changes to the model on which the pension system is based, such as using partial or fully funded schemes instead of PAYG, using Notional Defined Contribution systems or adjusting pensions to life expectancy at the time of retirement. In the case of Notional Defined Contribution, the system is still a PAYG, but is based on individual accounts, lacking real funding to which a theoretical return rate is assigned, normally a rise in GDP, except in some countries such as Sweden, which use salary increase rates. Therefore, contributors accrue an amount towards the end of their working life equivalent to what they have contributed plus that of an assigned return rate. The pension is then calculated according to this amount depending on life expectancy at retirement. If life expectancy rises, with the same amount, the pension will be reduced, given that it must be paid over a longer period. Only France uses a different system: instead of reducing the pension, it raises the number of years workers must contribute in order to receive a full pension.

Latin America has pioneered the development of a new concept in pension systems. To be precise, in 1981, Chile kicked off the process of pension system reform throughout the region by introducing a mandatory individual savings account model, which revolves round private management, strict government control and supervision, where contributions are the exclusive responsibility of the workers, (Chile, Bolivia y Peru) or jointly with employers in the other countries. In the following two decades, this model of reform spread to other Latin American countries, with local modifications as required, but with the clear leitmotif of the Chilean Social Security system. Pension reform systems were designed to overcome existing problems encountered in the system at the time, which were overall inefficient, suffering from major financial imbalance and offering people scant cover, leading to a large extent to the shut down of the pre-existing public system. Here Brazil stands apart, as it offers high coverage and where funded schemes are voluntary and complementary.

Peru set up an individual savings account system in 1993 and in the following year new schemes were underway in Colombia and Argentina, whilst by 1996 reforms had been put in place in Uruguay, with Bolivia and Mexico getting on board a year later. El Salvador in 1998 and Costa Rica in 2001 also joined the bandwagon, although Ecuador, whose law was repealed, is now working on parametric reforms. Nicaragua passed reforms in 2001 but

with no development, and is currently not working. The Dominican Republic brought in reforms in 2003 and in 2006, Panama passed a partial reform to its pension system to introduce part of the individual savings accounts model to come into effect by 2008. After past experience, some of the above countries such as Argentina and Peru in 2007, and Chile and Bolivia in 2008 are pushing through adjustments to their reforms. Changes to Chilean law are worthy of note, as they bring in a universal solidarity pillar and steps to increase competition and cut costs (Mesa-Lago 2008b). In December 2008, Argentina, set up a “counter reform” which put an end to the pension system, transferring all capital accumulated to the public PAYG pension system (Mesa-Lago 2009).

In most countries, reforms to pension systems were carried out using a combination of changes to parameters of pre-existing regimes, (minimum age, minimum years of contribution in order to retire), along with a structural modification in the paradigm of the systems via the introduction of individual savings accounts and private management. In some cases, former PAYG schemes vanished completely, whilst others kept them on, with cohabitation with individually funded accounts for the entire population or for special groups or indeed mixed systems.

The Washington Consensus, (Williamson 1990, 2003) has to a certain extent been an ideological benchmark when it comes to approaching the task of reforms, as it has meant the application of neo-liberalist measures in Latin America in which one of the basic parameters has been that of applying reforms based on individual savings accounts and privately managed systems. Over 20 years on, a look at the results of these pension models, Mesa-Lago (2004, 2008a) and Gill *et al.* (2005), from different viewpoints makes it clear that, despite a number of encouraging consequences, the reforms have not been wide-reaching enough to tackle shortcomings in terms of coverage. Mesa-Lago (2008a), point out that pre-reform coverage rates stood at 38% of the working population, whilst dropping to 26.3% once it had been introduced, in 2003. Four years later the coverage reached 32.2%, as illustrated in Table 1.

The author also underlines a lack of diversification inherent in investment portfolios of pension funds, which by no means helps to boost these economies. Most investments are allocated to financing the countries themselves through government bonds and financial institutions. Investment in stocks and local industry barely makes up 10% of the portfolios. Mesa-Lago (2008a) consider the two basic areas requiring serious work in order for reforms to take hold are namely; to bring the informal or black economy into a legal context, and secondly, development of capital markets, through which pension fund investments can be channelled.

Table 1. Percentage of population covered by private pension systems
2007

<i>Country</i>	<i>Coverage (%)</i>
Argentina	36.2
Bolivia	13.3
Chile	63.4
Colombia	26.3
Costa Rica	55.8
Dominican Republic	21.0
El Salvador	19.5
Mexico	34.2
Peru	17.4
Uruguay	64.3
Average	32.2

Source: Mesa-Lago (2008a)

Gill *et al.* (2005) analyse how successful the basic approaches of these reforms have been, and where they should go further. They coincide with Mesa-Lago in identifying the scant coverage, which they consider the major disappointment, following years of introducing reforms. Some criteria for improvement proposed by the above authors centre on prevention of poverty in old age and the role the government has to play in achieving this via improvements in the mandatory pension systems (cost reduction, risk management to reduce fluctuations in return rates, proportional contributions and to a large extent the socio-economic position of workers), and above all, with a direct bearing on the aims of this paper, growth of voluntary pension schemes, which encompasses the occupational pension plans.

Holzmann (2005) considers there is a belief that the reforms carried out must go further in terms of voluntary savings and safety nets. Likewise, Valdés-Prieto (2007), in their analysis on the influence of the World Bank in the reforms consider that development of the institutions in these countries has been a positive element. They have observed a change of tack in the middle of the present decade, which may produce different results, notably mitigating shortcomings present in the results of existing reforms and their sustainability.

The goal of this article is to prove the following: given that Latin America and other countries have reformed pensions without solving the problems faced by their people in this terrain and are shown to be lacking, one solution may be found in developing complementary pension plans for company workers. In this way, the total of the basic pension of the mandatory system added to that of the complementary occupational pension plan may provide sufficient income levels. This process will improve the replacement rate, i.e. the proportion the pension represents in comparison to a worker's

final salary, although it will not improve the coverage rate (of the population covered by the system), as it can only be applied to those workers who pay in their basic contributions.

3. Complementary pension systems: the second pillar

The Louvain Convention as well as the International Labour Organisation (ILO) sort the extent and coverage of Social Security in the area of pensions into three pillars or tiers. The first represents generic benefits, managed by the government, which are mandatory for all workers. The second is that of social protection derived from pensions freely established in worker- employer pacts as a formula of deferred remuneration. The third is that of unilateral and voluntary decisions made by individuals to allocate part of their income to savings.

Most OECD countries work according to this model, which is the historical benchmark for social protection. The concept of the government providing social protection came into being in Europe and it is where this criterion of three tiers of protection has reached its greatest expression, whereas in Latin America, this model does not exist. At most, along with the first tier there is evidence of the third, albeit limited to those few in the high-income brackets and hence it cannot represent an overall solution to the problem in hand. Nevertheless, the recent Chilean reform has introduced what the World Bank refers to as the zero tier of solidarity with minimum of pension coverage. Gill *et al.* (2005) meanwhile propose strengthening the second and third tiers.

Development of the second tier has, and will continue to hold dear a number of highly positive connotations for Europe in terms of the breadth of coverage, being a clearly defined goal of European Community policy (European Commission, 2006). Average coverage for each of the three tiers is given in table 2. Despite wide variations from one country to another, progressive growth of the second tier in Europe can be observed with estimates that in less than eleven years it will account for nearly 30% of all pensions received by European citizens.

Table 2. Average replacement rate for each tier - Europe (% of total income)			
	1994	1998	2020
1° Tier	88.8	83.5	64.0
2° Tier	7.0	11.6	28.5
3° Tier	0.9	1.5	4.5
Others	3.3	3.4	3.0

Source: Pragma Consulting (1999). Data taken to be objective by the European Union.

Several authors consider development of voluntary savings schemes (occupational or individual) as one of the major forces for stability in the pension system. It should be pointed out that it is difficult to obtain complete information on such plans in Latin America, just as legal initiatives to strengthen development of such plans is also lacking, something deemed an essential complement to establishing the first tier of funded individual accounts.

That said, relevant initial restrictions exist when it comes to analysing the European model and whether it may be applicable to Latin America and emerging nations as a whole, as listed below:

1. They have a radically different historical development, nearly a century apart.
2. The social environment and role of governments in each is vastly different (be it cultural, to do with development of forms of democratic governments, industrial and social and wealth development patterns...).
3. The system conceived in the first tier is just the opposite for Latin America. For Europe it is the obligation of the government to establish social security, (in the broadest sense of the word) for its citizens, and therefore it is involved in the origin, finance and management of the systems. For emerging countries though, it is a way of reducing poverty in old age as much as possible (Gill *et al.*, 2008) and creating internal savings, which provide for a country's economic development and where government involvement is far less to the extent where private companies are asked to manage pensions. There are cases of recent reforms in these systems. Chile has now introduced a basic solidarity tier, which is the responsibility of the government, whereas Argentina has nationalised the system wholly taking on a PAYG system run exclusively by the government.
4. The informal or black economy is an endemic force in all emerging countries, which hampers development of a stable and widespread system of social protection, although it is true that the informal sector generates a flux of transfers among families beyond those public programs, including those of pensions, and to a certain extent make for a substitute (Cox and Jiménez, 1990).

What should be looked into therefore is how companies in developing countries may set up complementary pension plans. One approach is offered by Valero (2000), who proposes developing a system based on the reduction of compulsory social contributions to public schemes and equivalent tax relief in order to foment occupational pension plans. This model is already developed in Spain and its adjustment to those countries under study cannot be ruled out.

The material summarised above forms the basis around which this article intends to expand and provide further analysis, with the clear aim of putting forward a solution, which

will, in nature be partial and by no means exclusive to the problem of the shortcomings of pension systems in those countries tackling reforms to their social security systems. It must not be forgotten here that a shortfall in a pension system obliges a government to act in one way or another, and it is thought that an appropriate way of avoiding ensuing problems is that of encouraging private pension schemes (Stiglitz and Uy, 1996). Savings generated by complementary pension plans can play a major part not only on national savings affecting pensions, but can also represent a source from which other types of insurance or similar types of such necessary forms of coverage, as unemployment schemes, may spring. Vodopivec (2006) looks into this issue for emerging nations.

4. Initial hypotheses

The approach of the model can be summed up in the following hypotheses:

1. It is taken that pension reforms are insufficient and that the assertions of authors such as Mesa-Lago (2004a, 2004b y 2008) and Gill *et al.* (2005) are valid. This article does not aim to prove this hypothesis, given that other authors such as Devesa-Carpio and Vidal Meliá (2002), Palacios (2003), Crabbe (2005), Holzmann (2005) and Valdés-Prieto (2007), who back the wisdom of reforms do not deny that in themselves they are not enough.
2. The hypothesis that development of complementary occupational pension plans being one possible solution is postulated here. It is necessary to provide greater definition as to why it may be a solution. On the surface, if the goal sought after is that of achieving a high enough income level in old age, a basic level is not sufficient as any system contributing additional income is in fact a kind of solution. What must be demonstrated is that the system proposed is efficient.
3. In order for the system to be efficient, a model must be defined that proves:
 - The additional cost to employers of contributing to a complementary pension plan, further to that of a mandatory one is viable in terms of cost (comprised of the amount contributed and administrative costs of managing funds) and in addition may prove to be a suitable investment for them, whilst improving stable employment.
 - The government registers a positive balance sheet with the introduction of the occupational pension plans, which is accompanied by scheme of tax breaks¹.

¹ Concerning possible development of complementary plans as a way of channelling voluntary pension savings, Crabbe (2005) infers the need to strengthen tax systems of states in which favourable tax frameworks are established in order to develop basic and complementary systems. The scheme of taxation benefits is always going to be essential when developing occupational pension plans.

- The net balance for workers is greater than that obtained were such complementary schemes not to exist.

In this article the aim is to prove above all the first of the conditions of efficiency, i.e. that additional costs can be viably shouldered by employers. This viability in generic terms can be considered proved, if the costs arising from the application of occupational pension plans do not represent significant increases in labour costs. Hence the study will also focus on quantifying the costs required to develop this complementary pension tier.

The second affirmation is not considered as being a direct aim of analysis. Nevertheless, it is worth pointing out that the introduction of complementary pension plans is often linked to a budgetary drive to encourage their implementation and that in most countries it is expressed by tax breaks for amounts contributed in each pension plan. These schemes are commonly referred to as E-E-T models (“Exemption-Exemption-Taxation”) and involve exemption from taxation on the amounts contributed as well as exemption from tax on return rates obtained from pension funds and a tax at the end upon the investment recovered following retirement. This means that contributions made by a company to occupational pension plans are considered as tax deductible, the same as salaries, and is thus something that applies to workers. This represents a tax incentive which must be offset by revenue from another source and which has to do with an increase in savings at a national level with the associated macroeconomic repercussions this implies.

The third condition will clearly be achieved in overall terms. Any rise in contributions to complementary pension plans will generate a larger pension for workers. The question is to see whether this can be achieved within the terms we have considered as acceptable, whereby the pension level will rise significantly. All in all, we can assume that levels above 60% of the final pay can be taken as a both feasible and acceptable. This figure can be empirically considered as the protection threshold.

5. The model

The model is based, principally in determining the pension level the mandatory scheme is to award. In order to do this, a financial-actuarial projection of the established contributions in force in each country will be undertaken, along with its capitalization at the return rate stated in the hypothesis.

Pension plans are divided into either those of defined contribution or defined benefit. In the former, the contribution is established, then with its capitalization and real return rate of the fund, the amount to be paid out upon retirement is obtained, which may be received as a lump sum, or converted into either a temporary income or an annuity. For

the latter the income level is established upon retirement, and contributions to the plan will be determined by the actuarial calculations, which will, according to certain hypotheses, establish its full amount.

The model we have in mind is of the defined benefit type, which from a conceptual point of view is broader-based; although one of the options considered also involves eventual use of a defined contribution model based on results obtained from that of the defined benefit model. Two Alternatives to the model have also been created with different scenarios and with a sensitivity analysis for the main variables. For the purposes of this work, it is assumed overall that workers over the age of 45 keep up PAYG models, although this may stretch to take in age groups that run up even to retirement age itself.

Alternative 1 assumes an option of defined benefit by age groups that top up their first pillar pensions, and which will be used as a base for a defined contribution model (the contribution will be equivalent to the cost arising from the application of the defined benefit model). This requires setting down a life pension, established as a percentage of salary at retirement, to be 25% for those between 16 – 24 age group, 20% for the 25 – 34 and 15% for those between 35 – 44 year olds. These percentages have been set down as per standard practice when defining this type of pension, although they may be subject to variation or adjustment in later analyses. A restriction has been imposed whereby at no time is the sum of the mandatory pension and the additional top up to be greater than 100% of the final salary. This restriction applies for the youngest segment who have a long time ahead of them to save, and may be able to reach percentages that, added to the top up, may indeed go over this final salary limit.

Alternative 2 is a defined benefit model and is divided into three age groups, but aims to achieve an overall level of benefits. Unlike the first in which a fixed pension level was added to that awarded by the mandatory system for each group, here the goal is that between both mandatory and occupational schemes the total pension reaches a pre-fixed level, different for each age group. The model sets the following parameters for groups and pension levels, namely: for 16 - 24 year olds the replacement rate is set at 80%, for the 25 - 34 age group, 70%, and for those between 35 - 44, 60%. Once again, we set a limit of 100% of the final salary as a maximum pension.

The process adopted to set up this Alternative is as follows. First the pension for each age group and salary is worked out and expressed as a percentage of the last salary as provided by the mandatory system. Following this, for those whose pension level per corresponding age group is below the 80, 70 or 60%, a complementary system is then created which guarantees these minimums. Thirdly, in order to gauge the viability of the system, the monetary cost is calculated for the differential pension among the above percentages and the pension awarded by the compulsory system.

At this juncture it is best to explain the reasoning behind the approaches to these two alternatives. Alternative 1 aims at establishing a complementary pension for different age groups. Technically speaking, it is a defined benefit model, but in practical terms it is often used as an input for a defined contribution model. Definition of the goal of the benefit here makes it possible to calculate the annual cost expressed as a percentage of the payroll. This cost becomes a contribution to the system itself and is not regularly standardized, (as would be the case in a defined benefit model), according to variation in the hypotheses in relation to real rates. This is a typical way of defining complementary pension systems known as *defined contribution with a benefit goal*. In this model, the employer's responsibility is limited to that of contributing a fixed percentage, while the worker will receive a pension equivalent to the savings represented by contributions made in both the basic as well as the complementary scheme.

Alternative 2 is a purer defined benefit model in which any basic pension scheme is topped up until it reaches a total percentage calculation based on the last salary. In this scheme, workers receive a fixed percentage of their last salary as a pension regardless of the performance obtained by the contributions made, whilst employers are obliged to provide the finance necessary to achieve the pension commitment. This is usually referred to as an *integrated defined benefit model*.

The restriction of limiting pensions to 100% of last salary is standard in all occupational pension plans, thereby preventing the model itself from providing higher retirement incomes than those earned during employees' working lives.

Overall, the results obtained from the application of the model will enable us to confirm or reject the hypothesis established on whether setting up occupational pension plans may prove to be a solution to the low coverage of the mandatory system in emerging nations or indeed in under which conditions this hypothesis proves to be acceptable.

4.1 A brief outline of the process of actuarial valuation

Costs and benefits of a defined benefit pension model are determined using actuarial valuation. Actuarial modelling and valuation of pension schemes is well documented in actuarial literature (Anderson (2006), Winklevoss (1993)). In essence, the basis of these models consists of calculating the pension that someone on the scheme will receive upon retirement, usually expressed as a monthly amount. Based on projections on survival and life expectancy of a group, this pension can be subsumed into its corresponding capital amount, a single, lump sum payment, which if expected demographic projections are born out, will prove to be enough in order to cover pension payments from retirement onwards. A further phase of the valuation process will determine the contributions required to achieve the necessary amount upon retirement, whilst taking into consideration expected

demographic evolution. This entire process, linked to significant time periods, must be updated in tune with implicit return rate in order to ensure the financial equivalence of capital flows.

As gathered from the above, in order to work out the costs incurred by a pension plan, it is necessary to establish a set of hypotheses, above all for those to do with return rates, referred to usually as technical rates and those linked to demographic patterns. In the valuation of a defined benefit plan it is necessary to deduct the value of future flows.

Mortality, survival and disability tables are used to establish the main demographic hypotheses to apply in calculating costs associated with pension plans. These tables provide an estimate of the probability that an individual may die in a given year, live to a certain age or become disabled, which would prevent them from being classed as a working individual.

The financial hypotheses used in this study have taken in a two-fold criterion as their starting point. Firstly, they take into consideration realistic technical return rates, (that offer credible estimates of rates that liabilities and funds will capitalize at in the future) and secondly, set the future rate of wage increases, which must gauge the average future growth rate of salaries of the entire group under consideration, using reasonable and prudent criteria.

The mortality tables chosen were those that best mirrored the behaviour of the group under study in terms of mortality and which therefore allow modelling of the evolution of the target group. Further to this, expected retirement age was taken into account.

The hypotheses have been established according to criteria laid down by the International Accounting Standard 19 (IAS 19), as far as possible, which despite being mainly to do with the valuation of employee benefits for a given company, may be used as a point of reference here. Indeed, IAS 19 states that actuarial hypotheses used must not be skewed and be mutually compatible with each other, and moreover financial hypotheses should be formulated on market-based expectations.

All formulae used in the paper can be supplied by the authors upon request.

5. Application of the model to the Dominican Republic

5.1 The Dominican Pension System

The Dominican Social Security System dates back to the year 2003 and draws on the following funding regimes:

- a) A Contributory Regime, that encompasses both civil servants and private employees as well as employers, funded by employees and employers alike, and including the government itself as an employer. To date, it is the only regime in force and is therefore that of most relevance to this work.
- b) A Subsidized Regime that will provide coverage to the self-employed with irregular incomes and below those of the national minimum wage, as well as the unemployed, disabled and destitute, in essence funded by the Dominican Government. This is the local equivalent to what are generally referred to as assistance pensions.
- c) A Subsidized Contributory Regime that covers freelance professionals and skilled workers with an income level equal to or greater than the minimum national wage, with worker contributions and a government subsidy which makes up for the lack of employer contributions. This is the freelance and self-employed workers' regime.

The Dominican system is an example of the Latin American compulsory pension systems described earlier. In keeping with this, pensions are managed by private entities called *Administradoras de Fondos de Pensiones* or AFPs, (Pension Fund Administrators), which are financial firms founded pursuant to the laws of the country, and whose sole purpose is to manage the personal accounts of those registered, invest pension funds suitably and award and manage payments of the benefit system. There are also government social security entities that run existing PAYG regimes.

The Contributory Regime, which is taken as a reference for the work summarised in this article, came into being on 1st February 2003 with the registration of those civil servants and private sector employees legally eligible to do so. It should be mentioned here that registration is compulsory, single and permanent, regardless of whether the beneficiary continues to work, undertakes more than one job at the same time, ends up working in the informal sector, emigrates or changes from one Pension Fund Administrator (AFP) to another. Each worker is obliged to choose their AFP and duly inform their employer of their choice in order for the latter to make the corresponding contributions.

This system provides different kinds of benefits, although in our analysis, we are exclusively concerned here with old-age pensions. This particular old-age pension provides for both pensioners and survivors alike. Those registered have the right to an old-age pension provided they satisfy the following; that they are a) at least 60 years old, having contributed at least 360 months or b) over 55 and having accrued a fund which allows the pensioner to enjoy a retirement greater than 50% of the minimum pension equivalent to the minimum legal wage. Upon retirement, the pensioner may choose from the following options:

- a) A programmed retirement pension model, where their funds remain with the AFP, in which case the pensioner maintains ownership of their funds, thereby taking on the risk of both longevity and future performance of their funds.
- b) An annuity, where their individual account is transferred to an insurance company and therefore they relinquish ownership of it, whereupon the latter takes on the risks of longevity and performance and must guarantee the agreed annuity. For effects of the study conducted, this latter model is the pension model that is of most relevance when defining the degrees of coverage for last salary.

Since coming into force in 2003, contributions funding the Contributory Regime have been made according to a transitional timetable, which began with contributions of 5% for retirement coverage, rising to 8% of salary contributed since 2007. The total amount contributed is in fact 10% of salary as it includes the life insurance cost of those registered, social solidarity fund and commissions, of which 70% comes from the employer and the remaining 30% from employees.

The *Cuenta de Capitalización Individual* or CCI, (Individual Savings Account) keeps record of the vested rights of those registered in the contributory regime and is comprised of both compulsory and voluntary contributions, with the returns stipulated for the corresponding pension fund, *Bono de Reconocimiento* (Recognition Bond), (where required) and payment of benefits. The Dominican Government guarantees right to a minimum pension of all those registered. To this effect a Social Solidarity Fund is set up to aid all those registered over 65 year-olds with low income that have contributed at least 300 months to any current pension system and whose personal account does not have sufficient funds to cover.

Certain registered individuals satisfying a number of pre-requisites are also allowed to have accumulated contributions from former systems recognised and are thereby accredited with an “Recognition Bond” for the sum total of their acquired rights dated from when the system came into being, in addition to an annual revaluation of 2% above the rate of inflation, to be paid out upon retirement. Nevertheless, this particular work does not include this bond for its transitory character and the fact that it affects only part of those registered. Moreover it is neither calculated nor communicated to those affected in order to represent an integral part of their pensions.

5.2 The Data

The databases used in this study are taken from the only available official sources which handle such statistical data in the Dominican Republic, namely; a) Banco Central de la

República Dominicana (Dominican Central Bank); b) Unipago, a private entity formed by those operating the system which processes the data of the Dominican Social Security system, and c) information obtained from the Superintendencia de Pensiones de la República Dominicana, (Directorate of Pensions of the Dominican Republic) – the regulatory and supervisory body of the pension market. Relevant information obtained from the above sources for the purpose of the study undertaken refers both to statistics on the Dominican population, those registered to the Dominican Social Security System and the National Survey on the Workforce.

Information studied is presented in the following tables. It is worth mentioning at this juncture that the information was used as the basis at the start up of the system itself, with a registration process that lasted three months from the start up in February 2003, and took in all those able to be registered. Variations with respect to the database of registrations do not represent discrete leaps, but a simple ongoing vegetative growth of those who start to work less, and those that leave the registry for any reason. In terms of salaries, variation should not be significant on average, given the real evolution of the economy and salaries in the period that has elapsed since publishing of the data used until the present.

5.2.1 Population affiliated to the Dominican Social Security System

Information referring to those on the Dominican Social Security register (which does not necessarily coincide with the number of registered workers) provides a figure of some 1,451,825 individuals, whose distribution into age groups is provided in table 3 below.

Table 3. Population affiliated to Dominican Social Security affiliated by age group 2003

<i>Age group</i>	<i>Affiliates</i>
15-19	101,395
20-24	212,338
25-29	192,133
30-34	202,543
35-39	199,517
40-44	181,244
45-49	129,555
50-54	117,571
55-59	60,420
60-64	55,110
Total	1,451,825

Source: Unipago (2003).

From the information given in the above table, we have chosen the segment of the affiliated working population that benefit entirely from the mandatory system pursuant to that set down by law, i.e. those between 15 – 44. The population segment included in this study is therefore made up of a total of 1,089,170 people.

5.2.2 Salaries

Information on average salaries for the population of the Dominican Republic per age group is given in Table 4.

<i>Age group</i>	<i>Monthly salary</i>	<i>Annual salary</i>
0-14	2,641.97	34,345.55
15-19	2,953.56	38,396.22
20-24	4,045.43	52,590.56
25-29	5,188.80	67,454.35
30-34	5,916.71	76,917.25
35-39	6,376.68	82,896.80
40-44	6,464.83	84,042.78
45-49	6,341.76	82,442.94
50-54	6,991.13	90,884.66
55-59	5,432.31	70,619.99
60-64	6,543.38	85,063.96
65 and over	5,063.99	65,831.81
Average		69,290.57

Source: National Workforce Survey of the Banco Central de la República Dominicana (February 2003) and author's own compilation. Amounts expressed in Dominican pesos. Salaries paid out in a total of 13 payments over the year.

<i>Age group</i>	<i>Annual salary 2003^(*)</i>
15-19	39,548.11
20-24	54,168.28
25-29	69,477.98
30-34	79,224.77
35-39	85,383.70
40-44	86,564.06
Average	69,061.15

Source: National Workforce Survey of the Banco Central de la República Dominicana (February 2003) and author's own compilation. Amounts expressed in Dominican pesos. ^(*) Salary deduction factor: 3%.

Table 5 shows average yearly salaries for the affiliated population used in this study and duly capitalized to 2003, for which the necessary information is available.

5.3 Macroeconomic hypothesis in the application of the model

Viability of the model will be analysed taking into account average costs on the payroll, i.e. the ratio calculated is that which represents the cost derived from the implementation of the model on salaries paid by Dominican employers in general. Any result which tells us that those costs (i.e. the percentage of the salary to be contributed by the employer) makes up less than 6% of the payroll can be considered as acceptable in terms of viability. If this cost is between 6 – 10%, the viability of the model is called into question and doubtless not all will be able to handle this level of contribution. Anything greater than 10% will make the model clearly unfeasible overall. Choice of the above limits is established by a number of general and specific considerations concerning the country under study, principally:

- The Dominican Republic is a country that has maintained an annual GDP growth rate of 9.5% in recent years, recovering from a deep financial and economic crisis, which affected the nation in 2003.
- This growth has not had an effect on salaries, which have practically gained no real spending power, but if anything the opposite.
- Inflation has been generally quite volatile. 2003 was seen out with a rate of 42.66%, and the following year it had dropped to 28.74%, later plummeting to 7.44% and 5.00% in 2005 and 2006 respectively, experiencing a minor upturn in 2007 to 8.88%. All in all, following the 2003 crisis which led to a high rate of inflation, the overriding pattern has seen prices kept to below double digit rises of late.
- Employer contributions to the Mandatory Social Security System add up to 7% of the salaries of those workers affiliated compared to an average 11.43% across Latin America, (Mesa-Lago, 2008). Taking into account those countries most similar to the Dominican Republic in terms of size or geographical affinities, (Bolivia, El Salvador, Colombia, Uruguay), the average rises to 13.42%.

Furthermore, this study works around the following central hypotheses:

- The technical return rate (nominal rate) is: 7.5%. The Dominican Republic does not have a primary bond market, and references used therefore are in general those of bank liability rates. This rate, which is slightly more long term, has been hovering just above 8% following a period of very high rates in the country as a result of the financial crises mentioned.

- Salary growth rate: 3%. This is perhaps the most unpredictable of all the hypotheses. Salaries have shown a tendency to lose purchasing power, and inflation has remained reasonably steady, (with the exception of the latest upturn as a result of the worldwide price evolution in a country whose economy is highly dependent on what is happening beyond its shores). The Dominican economy is growing, however there are still major challenges faced in bringing the labour market into line, above all when it comes to getting rid of the black economy. This all leads to suggest that salary rises that will not under any circumstance outstrip the rate of inflation, which means that the differential between interest and inflation rates may be supposed to hover around 4 points, a figure that can be historically backed up, and which appears really quite close to the potential of the Dominican economy. All in all, the sensitivity analysis to be carried out in the study in hand on this indicator will show what could happen for cases with a different rate of salary growths and the corresponding effects on costs.
- Mortality tables: EMSS1997, from the Mexican experience, which are those currently used by the Dominican Social Security system, and despite the lack of past data compiled from their own past to contrast with survival and longevity patterns for the Dominican population itself, they appear to be the most reasonable. Nevertheless, a sensitivity analysis will be presented with variations made to the mortality tables and substituting them with others based on European experience. Given that the existing affiliated population census does not give separate numbers for men and women, a single mortality table has been created dividing values provided in the Mexican mortality table for men and women by 50%.
- Retirement age: 60. This hypothesis is set taking this figure as the legal retirement age, which furthermore is the most common in other Latin American countries of reference, given existing demographic conditions.

As mentioned in the section, which deals with the definition of the models, two alternatives were looked into. Alternative 1 describes a defined contribution model based on a defined benefit scheme by age groups, which complement mandatory pensions. Alternative 2 is a defined benefit model, also divided into age groups and aims to achieve an overall level of benefits. For models, three different scenarios or cases have been analysed in which only the technical return and salary increase rates vary:

- *Scenario 1 - Conservative:* where the return rate (i) is 6.5% and the salary increase rate (Δw) 2.5%.

- *Scenario 2 - Central:* that cited previously, with a return rate of 7.5% and a salary increase rate of 3.0%.
- *Scenario 3 – Aggressive:* in which the return rate is at 8.5%, and the salary increase rate is 3.5%.

5.4 Simulations on the basic benefits of the System

The first goal is to estimate the basic benefit level or so-called replacement rate awarded by the Dominican Social Security System based on the hypotheses created. The results derived from the actuarial valuations for each of the above scenarios for the population under study are shown in table 6. Note that a sensitivity analysis is included for shifts in salary growths for the hypothesis of one - two percentage points respectively giving a greater degree of uncertainty as to the expected behaviour of this indicator, labelled here as Scenarios *bis* and *ter*.

Table 6. Estimated benefits of the Mandatory Pension System of the Dominican Republic: Average Replacement Rate

<i>Scenario</i>	<i>Replacement rate</i>
Conservative (1)	43.89%
Central (2)	52.46%
Aggressive (3)	62.46%
Conservative (1bis*)	36.18%
Central (2bis*)	43.06%
Aggressive (3bis*)	51.06%
Conservative (1ter**)	30.19%
Central (2ter**)	35.79%
Aggressive (3ter**)	42.27%

Source: Own compilation. *Shift in salary growth - hypothesis for one percentage point. **Shift in salary growth - hypothesis for two percentage points.

The replacement rates that measure the level of benefit coverage with respect to final salary show a high level of sensitivity to changes from one case or scenario to another. In the Central, Scenario 2, the replacement rate is 52.46%, but a change in scenario represents a differential of nearly ten points in the level of replacement. This rate means that on average, Dominican workers would receive a constant annuity equivalent to just 52.46% of the salary received upon retirement.

However, if we raise the salary growth rate by 1% (Scenarios 1bis, 2bis, 3bis, respectively), the replacement rate in the Central Scenario would be reduced to 43.06%, while if we raised it by 2% (Scenarios 1ter, 2ter, 3ter, respectively) the replacement rate for

this scenario would now become 35.79%. Therefore under conditions of greater salary increases, the rate of replacement of the mandatory system would be substantially lower.

5.4.1 Results for the complementary pension system: Alternative 1

Table 7, provides results obtained for Alternative 1 where three cases are studied in which conservative, central and aggressive conditions are simulated. For this situation we calculated the average coverage rate or replacement rate associated with complementary benefits that occupational pension plans may offer, arising from application of coverage in three separate age groups. Furthermore, we have presented the total coverage having added the benefits provided by the mandatory pension system and those obtained through the complementary one. Lastly, the annual cost to employer of the occupational pension plan is shown in terms of the constant percentage of payroll. This form of measurement, which is typical to compare costs with respect to labour costs of companies, provides us with a fundamental piece of information, which is the level of costs a company will have to bear to cover the average percentage of the corresponding complementary coverage. It should be pointed out that over time this percentage remains a constant part of the payroll and most specifically to the payroll of affiliated employees. Companies can therefore forecast its future costs in so much as that they are able to vary the payroll from one year to the next.

INSERT TABLE 7

As illustrated above, the Central Scenario considers replacement rate within the mandatory system of 52.46%. The creation of three segments for companies of 25, 20 and 15%, for the respective age groups of 16 - 24, 25 - 34, and 35 - 44 year-olds is equivalent to that of defining a percentage of additional average coverage for all the population of 16.55%, which amounts to total coverage of 69.01%. This value represents a cost to those companies contributing of the equivalent of 3.07% of the payroll of affiliated workers, as shown in Table 7.

The other two cases are deserving of further comment. In Scenario 1 basic mandatory coverage is the lowest of all three and therefore, the limit of 100% does not come into play for age groups over 18 years of age. This means that the complementary segments are applied nearly in full, with a greater level of coverage and consequently costs, which for this case will reach 3.87% of the payroll. In Scenario 3, a high level of basic mandatory coverage leads to a limit of 100% being reached for age groups up to 24 inclusive, thereby seeing additional coverage drop to an average 13.63% with the corresponding fall in costs which represents 2.41% of the payroll.

As expected, the main conclusions to be drawn from this Alternative hinge around the relationship which determines that the greater the basic mandatory coverage, which is determined above all by a higher growth in salaries, as seen in the previous section, the lower the need for complementary coverage and therefore the lower the cost too. Cost levels derived from this Alternative fall within maximum acceptable ones (6% of the payroll). Furthermore, all in all total benefits top the 60% mark that the authors set as a minimum. Therefore, we can classify this Alternative as viable in terms of the proposals set out in this study.

We also undertook a sensitivity analysis to do with a one percent independent variation of salary growth rates just as we did for public benefits. The results can be seen in the middle section of table 7.

The overriding lessons to come out of table 7 are that firstly, any increase has a direct impact on the level of basic mandatory coverage, on the degree of complementarity of the system proposed and on the annual cost for companies. The 2b or central Scenario shows us that if basic mandatory coverage drops, fewer individuals are affected by the limit of their final salary, which implies a greater complementary rate on behalf of the company of 19.65%, (compared to 16,55% in the previous case). Along the same lines, greater complementary coverage means higher costs for companies, reaching 3.90% of the payroll, and thereby increasing costs derived from a 1% salary rise by 27.03%.

Another aspect to take into account here is that, although costs for business remain within those set out for the margin of tolerance, in the 1b Scenario, benefits do not reach the 60% required, whereas the central Scenario barely tops this limit. It is not difficult to foresee that in a further simulation where salary growth rates are raised by 2%, benefit levels would not make the required minimums. This assertion was proved, as can be seen in the bottom columns for Table 7.

In effect, according to analysis of results, only when return rates are high can both conditions of cost and level of benefits be met (Scenario 3ter). In the other two Scenarios, although the cost for the company never tops 6%, benefit levels remain substantially below 60%. Moreover, it should also be noticed that in this case no individual would be affected by the limit set out for the maximum total pension of 100%, as can be observed from a glance at the average employer contribution which is the same for all three scenarios.

5.4.2 Results from the complementary pension system: Alternative 2

Unlike the case of Alternative 1, here an average target replacement rate is sought that will be calculated as the sum of the rate of replacement of the mandatory system and the complementary system combined. The average employer contribution will, in this case, be

the difference between the target replacement rate and the replacement rate of the mandatory system. The results are given in Table 8.

INSERT TABLE 8

As illustrated in the above table, data on the average replacement rate or average percentage coverage of the mandatory system on last salary are once again the same as we obtained in Alternative 1; hence the initial hypotheses have not altered. That said, now for the *Central Scenario* our target is to obtain a total coverage of 72%, (contemplating 3 segments of 80, 70 and 60% for the respective age groups of 16 - 24, 25 – 34 and 35 – 44 years of age, setting a limit of 100% of final salary). Of this total, 52.46% is to be born by the mandatory system and the remaining 19.54% by the new complementary system. The cost to companies works out as 4.9% of the payroll of affiliated employees.

In *Scenario 1* basic mandatory coverage is the lowest of the three scenarios and therefore requires the greatest top up from the new system. Average coverage is nearly 70%, but with participation of the complementary system representing 25.9% this means that the financial burden on the employer is much higher, exceeding the 6% we set out as a maximum reference, (6.82% to be exact). Scenario 3, which is known to have the highest degree of basic mandatory coverage, allows an outstandingly high percentage of total coverage to be reached 77.08%, with a cost to employers of 3.51% of the payroll. In this scenario coverage of the complementary system is a mere 14.62%. The most relevant conclusion to be pointed out here is that Alternative 2 by definition, is suitable in terms of its benefit level (the minimum for the age group with the lowest overall benefit is already 60%), but it will be practically unviable if the real case is Scenario 1. This assertion does not apply to the other two *Scenarios*, which come within the tolerance limits.

Sensitivity to any shift in salary growth rates of 1-2 percentage points respectively in circumstances where all other variables remain equal is also shown in Table 8. In both cases costs to employers are observed to be between 6-12% of the payroll for practically all cases, which means the system simply will not be workable, if the initial hypotheses are taken into account. We can see that the target replacement rate takes on the same value in all three scenarios, given that this is the upper limit that can be funded in this model for low benefit levels of the mandatory system.

Alternative 2 clearly envisages a more expensive system for employers than Alternative 1, given its higher degree of overall coverage.

5.5 Sensitivity to variation in mortality tables

Sensitivity in this case is measured starting from variation in mortality tables, in this case using tables GR95, which take in the experience of the Swiss and which are widely used across the European market. Tables 9 and 10 provide the results obtained for each of the alternatives.

INSERT TABLES 9 and 10

The most relevant conclusion to be gleaned from Table 9 is that the application of a mortality table such as that of GR95, which bears a greater ageing of the population, tends to significantly raise annual costs for employers when introducing a complementary pension scheme for employees. Hence, in the Central Scenario costs rise from 3.07% to 3.48%, some 13.35% more. The influence is clearly less than that of the rise in the salary growth rate, (approximately half), but nevertheless relevant. All in all, Alternative 1 still lacks viability for all basic scenarios, although in Scenario 1 is it scraping the limit of the minimum overall coverage required.

As for Alternative 2 (table 10), the conclusions are less than favourable in terms of its viability, as in the Central Scenario it is close to 6%. It therefore goes to underline that which was previously stated concerning the sensitivity of this Alternative to variations in reference variables and how easily it can drift beyond the reference limits set out. Only benefit levels manage to keep to acceptable rates.

6. Conclusions

By way of the simulations carried out on the level of coverage of the basic mandatory pension system of the Dominican Republic, it has been possible to demonstrate that the replacement rates obtained in practically all cases fail to make the 60% threshold, which we had laid down as a minimum. Therefore, the initial hypothesis set out in this study namely that of the inadequacy of the basic pension system can be considered to be upheld.

Nevertheless, the main conclusion arising from this study shows that it is possible to set up a complementary occupational pension system in the Dominican Republic, which combines both a reasonable cost and the possibility of employers being able to implement an occupational pension plan scheme, which would provide decent retirement income. In order to prove this assertion, a significant number of simulations were undertaken on two Alternatives to be applied, along with different hypotheses, which have enabled us to produce a full sensitivity analysis. The output from these actuarial valuations corresponds

to the primary and tertiary efficiency conditions, (the viability of employers being able to take on the costs implied and significant increase in the benefit level). Over half the simulations returned favourable results, which proves that there is a clear basis for viability of introducing complementary systems. The second efficiency condition refers to the impact of these schemes on the government's balance sheet. Bearing in mind that the basic structure of taxation in such systems remain free of taxes in their accumulative phase, when it comes to anticipating some of the budgetary repercussions in the application of the model, it is forecast that it should also prove to be viable in terms of its effects on the Dominican balance sheet.

In reality, the current taxation system in place in the Dominican Republic has a very high limit for personal taxation, given that exemption is set for annual incomes below 316,017 Dominican Pesos per annum, far beyond the average salary figure of 69,061 pesos per annum we have been using as a benchmark here. This means that, in terms of contributions, the consideration of deductibility of contributions made would not appear to have significant effects on collection of taxes. Research will be required in the future into taxation issues to do with the performance of accumulated funds and the burden this may represent for the Dominican Government, though at the same time, it must not be ignored that such complementary savings will add up to an additional injection of capital for the economy, which can be used to build up development of autochthonous capital, a stable form of investment which can enable the government to finance business projects. Nevertheless, to achieve this, it will still be necessary to carry out a series of wide-sweeping changes in the local capital markets and in business practices, which are relatively unfamiliar with stock market investments. In fact, almost all pension savings accrued since the mandatory pension system kicked off in 2003 have been invested in bank deposits.

Another finding to come out of this study is that it would not prove complicated to extrapolate such an analysis to other developing nations. Introduction of pension models in Eastern Europe, Asia, Latin America or even Africa, (although the vast majority of countries in this continent still have a very low Social Security cover for their population and extremely low salaries), would make sense in terms of providing a complementary coverage in those where a more or less generally extended, but shallow basic mandatory system already exists.

It should be pointed out that this option in itself cannot offset the lack of widespread pension coverage in countries where the basic system is inadequate. What this proposal does achieve though is to show that where workers already contribute to a basic mandatory system, they can indeed enjoy the perspective of an improved pension in the longer term, although, as such, this is worthless to those who are not affiliated to the system and who work within the so-called informal sector, and will therefore not be eligible for a pension upon retirement. In such cases, on the one hand, greater thought must be

given to introducing a basic pillar of solidarity, financed by the government via general taxation and applicable to all those, whose basic needs remain unmet following retirement, and on the other hand, the issue of the black or informal economy must be got to grips with, as this sector employs a vast amount of workers which are not creating any right to future pensions.

The issue here is to check whether the results drawn from this study for the Dominican Republic can be extrapolated to other developing nations, which have set up mandatory savings schemes for basic pensions. Each country has its own singularities, its own model, history, population and salary distribution and without doubt the models analysed here will require adaptation to each case, but what is really of relevance here is that regardless of the model applied, is the verification of whether for such countries development of complementary occupational pension schemes may represent a solution to problems of pension coverage. The results obtained here enable us to express a certain degree of optimism to this effect and the overall conviction that there are indeed ways of improving living standards after retirement and that it is possible to tackle the issue of poverty among the retired.

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Table 7. Estimated benefits of the Complementary Pension System: Alternative 1

	<i>Conservative</i> (1)	<i>Central</i> (2)	<i>Aggressive</i> (3)	<i>Conservative</i> (1bis)	<i>Central</i> (2bis)	<i>Aggressive</i> (3bis)	<i>Conservative</i> (1ter)	<i>Central</i> (2ter)	<i>Aggressive</i> (3ter)
	$i= 6.5\%$ $\Delta w= 2.5\%$	$i= 7.5\%$ $\Delta w= 3.0\%$	$i= 8.5\%$ $\Delta w= 3.5\%$	<i>Shift in salary growth of +1%</i>			<i>Shift in salary growth of +2%</i>		
Replacement rate	43.89%	52.46%	62.46%	36.18%	43.06%	51.06%	30.19%	35.79%	42.27%
Employer contribution 16-24	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%
Employer contribution 25-34	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%
Employer contribution 35-44	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%
Employer contribution ^(*)	19.31%	16.55%	13.63%	19.83%	19.65%	17.47%	19.83%	19.83%	19.83%
Replacement rate Total ^(**)	63.20%	69.01%	76.09%	56.01%	62.71%	68.53%	50.02%	55.62%	62.10%
Annual cost ^(***)	3.87%	3.07%	2.41%	4.60%	3.90%	3.16%	5.38%	4.59%	3.93%

Source: Own compilation. ^(*)Employer contribution: percentage of salary that the company will add at date of retirement. The result given is the average of employer contributions for each age group. The contribution is limited in so much as that the replacement rate plus the employer contribution may not exceed 100%. ^(**)Total replacement rate: the sum of the replacement rate and that of the employer contribution, i.e. the sum of the total coverage of the mandatory system plus the proposed complementary system. ^(***)Annual cost: Cost to companies to finance the employer contribution, measured as a percentage of the payroll.

Table 8. Estimated benefits of the Complementary Pension System: Alternative 2

	<i>Conservative</i> (1)	<i>Central</i> (2)	<i>Aggressive</i> (3)	<i>Conservative</i> (1bis)	<i>Central</i> (2bis)	<i>Aggressive</i> (3bis)	<i>Conservative</i> (1ter)	<i>Central</i> (2ter)	<i>Aggressive</i> (3ter)
	$i= 6.5\%$ $\Delta w= 2.5\%$	$i= 7.5\%$ $\Delta w= 3.0\%$	$i= 8.5\%$ $\Delta w= 3.5\%$	<i>Shift in salary growth +1%</i>			<i>Shift in salary growth +2%</i>		
Replacement rate	43.89%	52.46%	62.46%	36,18%	43,06%	51,06%	30,19%	35,79%	42,27%
Target replacement rate 16-24	80.00%	80.00%	80.00%	80,00%	80,00%	80,00%	80,00%	80,00%	80,00%
Target replacement rate 25-34	70.00%	70.00%	70.00%	70,00%	70,00%	70,00%	70,00%	70,00%	70,00%
Target replacement rate 35-44	60.00%	60.00%	60.00%	60,00%	60,00%	60,00%	60,00%	60,00%	60,00%
Target replacement rate ^(*)	69.79%	72.00%	77.08%	69,66%	69,66%	71,10%	69,66%	69,66%	69,66%
Employer contribution ^(**)	25.90%	19.54%	14.62%	33,48%	26,60%	20,04%	39,47%	33,87%	27,39%
Annual cost ^(***)	6.82%	4.90%	3.51%	9,20%	6,77%	4,87%	11,92%	9,10%	6,76%

Source: Own compilation. ^(*)Target replacement rate: average replacement rate in proportion to the number of people and target replacement rate of each age group. ^(**)Employer contribution: the percentage of salary at retirement that the company will contribute. The result given is the average of the employer contributions for each age group. The contribution is limited so that the replacement rate plus the employer contribution may not exceed 100%. ^(***)Annual cost: cost to the company of financing the employer contribution measured as a percentage of the payroll.

**Table 9. Estimated benefits of the Complementary Pension System: Alternative 1
Mortality Table GR95**

	<i>Conservative</i> (1)	<i>Central</i> (2)	<i>Aggressive</i> (3)
	$i= 6.5\%$ $\Delta w= 2.5\%$	$i= 7.5\%$ $\Delta w= 3.0\%$	$i= 8.5\%$ $\Delta w= 3.5\%$
Replacement rate	39.73%	48.03%	57.73%
Employer contribution 16-24	25.00%	25.00%	25.00%
Employer contribution 25-34	20.00%	20.00%	20.00%
Employer contribution 35-44	15.00%	15.00%	15.00%
Employer contribution	19.80%	17.98%	14.76%
Replacement rate Total	59.53%	66.01%	72.49%
Annual Cost	4.32%	3.48%	2.70%

Source: own compilation.

**Table 10. Estimated benefits of the Complementary Pension System: Alternative 2
Mortality Table GR95**

	<i>Conservative</i> (1)	<i>Central</i> (2)	<i>Aggressive</i> (3)
	$i= 6.5\%$ $\Delta w= 2.5\%$	$i= 7.5\%$ $\Delta w= 3.0\%$	$i= 8.5\%$ $\Delta w= 3.5\%$
Replacement rate	39.73%	48.03%	57.73%
Target replacement rate 16-24	80.00%	80.00%	80.00%
Target replacement rate 25-34	70.00%	70.00%	70.00%
Target replacement rate 35-44	60.00%	60.00%	60.00%
Target replacement rate	69.66%	70.74%	74.57%
Employer contribution	29.93%	22.71%	16.84%
Annual cost	8.31%	5.94%	4.21%

Source: own compilation.