AGEING WORKING PAPERS

Maintaining Prosperity In An Ageing Society: the OECD study on the policy implications of ageing

WORKING PAPER AWP 3.6

COMPREHENSIVE QUANTITATIVE MODELLING FOR A BETTER PENSION STRATEGY

This is one of a series of analytic papers that supported the OECD's ageing study, a "horizontal" project in the sense that it involved a number of OECD directorates. The results of the entire project are summarised in Maintaining Prosperity in an Ageing Society, OECD 1998. The OECD Secretariat's own work on modelling and ageing can be found in AWP 1.2, AWP 1.3 and AWP 5.5

The objective of this paper is to provide the reader with a general understanding of how models work and how they should be used to properly analyse pension schemes. It aims to stress both the importance of modelling as a means of sound governance and planning and the need of a comprehensive quantitative modelling even for the analysis of a single branch of a national social protection system. As currently in use in the ILO for the study of pension reforms, three types of models will be addressed: a social budget model which maps the macro socio-economic environment as well as the social protection environment of pension systems; a pension model used to assess the long-term financial implications of alternative benefit provisions and alternative financing options; and an income distribution model which determines the distributive aspects of a pension system or reform options. To conclude, results of typical applications are illustrated in the final section of the paper as a way to identify possible key policy variables and assumptions.

The authors are Michael Cichon and Denis Latulippe of the ILO. The paper is one of a series of papers on an Operational Framework for Pension Reform. It was presented at a joint ILO-OECD workshop on the development and reform of pension schemes, held in Paris, 15 -17 December 1997. The ILO is holding workshops on in various centres around the world and plans to publish associated papers. For any enquiries, please contact Dominique Blanvillain (ILO) at: tel: (41) 22 799 66 34, fax: (41) 22 799 79 62, e-mail: blanvillain@ilo.org.

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COMPREHENSIVE QUANTITATIVE MODELLING FOR A BETTER PENSION STRATEGY

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Foreword

1.   This paper is a synopsis of various sources from the ILO s Financial, Actuarial and Statistical Branch: technical assistance reports (for example for Bulgaria, Slovakia and Demoland), technical guides on the ILO social budget model and the pension model, and other papers presented by members of the Branch at various occasions. It also draws on experience gained in ongoing technical co-operation projects for example in Panama and the Ukraine. Authors of these publications are Martin Bernard, Michael Cichon, Christopher Daykin, Anne Drouin, Krzsytof Hagemejer, Kenichi Hirose, Michael Hopkins, Denis Latulippe, Karuna Pal, Wolfgang Scholz and John Woodall. The Branch is in the process of collating the technical expertise into two textbooks, one on social budgeting and one on actuarial practice in social security pension schemes. A list of recent reference publications is attached as Annex.

1.   Introduction: Why modelling?

2.   Depending on their state of development and their tradition of social protection, countries redistribute up to one third of their Gross Domestic Product (GDP) through national social protection systems. The pension scheme is often the major component of the social protection system, and in coming years, an increased proportion of the total social expenditure is expected to be channelled through the pension system as the population of most countries will be ageing gradually.

3.   The importance of redistributive systems of such a dimension does not only lie in the direct effect it has on the lives of successive generations but also in the direct or indirect impact it may have on the government budget, labour cost and productivity, and, hence, the overall economic performance of a country. Financial planning in the social sector is therefore an essential part of responsible governance. It can be achieved through the development of quantitative models giving a reasonable assessment of the expected financial development.

4.   Pension models can be used to project pension expenditure, to study alternative financing options and to assess the implications of the pension system on the distribution of income, both for contributors and beneficiaries. Pension systems are major economic and redistributive systems which often have a considerable impact on public budgets and on the financial status of other social protection components. Therefore, a proper analysis of a pension system also has to place the pension system in the context of the national social protection system in order to reflect the interrelationships between the different branches of the social protection system[1], to better understand how the available resources are

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[1]   There are significant interactions which have to be accounted for when evaluating different reform proposals. For instance, there are interactions between early retirement provisions on the one hand, and the

allocated, and to assess the implications of potential changes on public sector budgets. It is also necessary to assess how the whole social protection system reacts to changing economic and demographic conditions.

5.   The future economic conditions and the behavioural implications of changes to social legislations are difficult to predict and thus the inherent degree of uncertainty contained in projections increases as the projection period extends long in the future. Thus, models should be considered as providing the analytical framework needed for decision-making rather than providing exact figures and straightforward conclusions. This means that they should provide consistent results for alternative policy options, based on reasonable assumptions which can be subject to alternative scenarios to test the results sensitivity and to identify the main determinants for future financial development.[2]

6.   The objective of this paper is to provide the reader with a general understanding of how models work and how they should be used to properly analyse pension schemes. It aims to stress both the importance of modelling as a means of sound governance and planning and the need of a comprehensive quantitative modelling even for the analysis of a single branch of a national social protection system. As currently in use in the ILO for the study of pension reforms, three types of models will be addressed:

- a social budget model which maps the macro socio-economic environment as well as the social protection environment of pension systems;

- a pension model used to assess the long-term financial implications of alternative benefit provisions and alternative financing options;

- an income distribution model which determines the distributive aspects of a pension system or reform options.

7.   To conclude, results of typical applications are illustrated in the final section of the paper as a way to identify possible key policy variables and assumptions.

2.   The social budget model

2.1. Objectives and overview

8.   The social budget model sets the demographic and the macro-economic framework needed for the detailed analysis of the pension system, and it provides a consolidated view of the financial status of the social protection system. It is designed to support the political decision-making process by:

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labour market situation, the system of unemployment benefits and active labour market programmes on the other hand. There are also interactions between invalidity pensions, sickness benefits and unemployment benefits. The utilization of social assistance benefits clearly depends on the level of old age, survivor and invalidity benefits provided by the national pension systems.

[2]   The degree of sophistication of the projection models may vary considerably depending on the exact purpose of the projections, the information available, and the degree of uncertainty of future demographic and economic developments. In theory, models could include endogenous behavioural responses to social or economic policies. Although great attention is devoted to determine the assumptions in a consistent and reasonable manner, the models discussed in this paper do not integrate such behavioural equations.

- describing how the present system of social protection would behave in financial terms if the provisions and the financing are not changed (status quo projections);

- assessing the implications for public sector budgets;

- measuring the impact of changes to the social protection provisions, taking into account the interrelationships between the different branches of protection;

- testing the sensitivity of the system to different scenarios on the future demographic and economic development.

9.   It allows decision-makers to understand what level of expenditure and social protection the country might have to afford, and how it would be allocated between the different branches of protection and the different categories of beneficiaries. It also provides the base information necessary to establish a financial system (who should pay and which funds should be set aside) and to measure the financial impact of reform options designed either to maintain expenditures within politically acceptable limits or to improve the efficiency of the system taking into account the social and fiscal priorities.

10.   The exact content of national social budgets varies from country to country depending on both the spectrum of benefits offered and the organisation of the national social protection system. Nevertheless, there are core elements which normally appear in national social budgets.

11.   On the expenditure side there are pensions, health care, short-term cash benefits, family benefits, social assistance and unemployment benefits. On the income side all resources used to finance the above expenditure should be accounted for: social security contributions, taxes (general and earmarked) and government subsidies, private or collective insurance contributions, and investment income.

12.   A social budget encompasses the income and the expenditure of the social security institutions as well as other government and (to a lesser extent) private expenditure and income pertaining to social protection. It therefore makes it possible to have a better understanding of the financial situation of each fund or each institution. It may also provide relevant information on the mix between public and private mechanisms.

13.   The social budgeting process includes accounting for past observation years and projections in the future for a medium-term period. Social expenditure and income are often projected over an horizon of 5 to 10 years, but projections over longer periods of time could also be necessary to assess the impact of long-term structural changes.

2.2. Modelling the socioeconomic environment

14.   Demographic and economic assumptions on the future development of a country are required before undertaking projections. The key assumptions are related to the population, the economic growth, the labour market and the wages. Assumptions on the future rate of return on investments may also bear a significant impact if substantial reserves are accumulating or if government expenditure are to a high proportion debt service. Complementary behavioural assumptions, such as the enforcement of contribution payments or the periodical ad hoc adjustments of benefits or contribution ceilings to account for inflation are also needed.

15.   Possible interrelationships between these assumptions, especially the economic assumptions, have to be properly taken into account in order to ensure their consistency. For instance, the assumption on

the development of wages cannot be defined without reference to the assumption on economic growth and the assumption on the development of employment and unemployment.

16.   The selection of assumptions should also take into account the recent experience to the extent that information is available and applicable, but in recognition of the nature of the schemes (especially the pension schemes), the assumptions should reflect long term trends rather than give undue weight to recent experience.

17.   More details on the selection of assumptions are provided in Table 1.

2.3. Modelling the social protection system

18.   Indicators are developed to measure the impact of the provisions of the schemes, the characteristics of the covered population, and the demographic and the economic environment on the financial situation of the social protection system. It is useful to better understand the financial determinants of the system and to estimate future expenditure and income.

19.   There are three principal indicators: the coverage ratio, since expenditure and income are a function of the extent of coverage of the scheme, the beneficiary ratio related to the proportion of beneficiaries in the covered population, and the benefit level ratio related to the level of benefits provided by the scheme.[3]

20.   These indicators are calculated for all types of cash benefits (pensions, sickness benefits, unemployment benefits...) . For benefits in kind such as health care or social assistance, further refinements must be introduced to better reflect the utilization of the different types of services and their unit costs.[4] The methodology used for cash benefits will be discussed below, paying special attention to pensions.

21.   The *coverage ratio* is a function of both the proportion of the population covered and the level of covered earnings. In the case of pension schemes covering wage earners, the coverage ratio can be split into three components:

- the coverage rate which is the proportion of the employed population insured under the scheme;

- the wage share of GDP which is the proportion of national income paid to wage-earners;

- the catchment factor which is the proportion of individual wages covered by the scheme and usually subject to the application of a ceiling on covered earnings.

22.   The coverage rate is a key indicator of the effective level of protection provided by pension schemes, especially in developing countries where coverage is usually limited to people in urban areas.

23.   A variation in the coverage will have an immediate impact on the amount of total contributory income. However, there is a time-lag before the impact on expenditure can be felt, especially in the case of

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[3]   The beneficiary ratio and the benefit ratio are used to calculate the PAYG cost rate. The coverage ratio makes it possible to express social expenditure and income as a percentage of total wages or total GDP.

[4]   For more detailed information refer to the ILO technical guide on the social budget model.

old-age pensions where the individual history of covered earnings is used to calculate the pension to be received at a much later stage.

24.   The *beneficiary ratio* measures the proportion of the covered population receiving benefits. It varies according to the entitlement conditions specified in the provisions and according to exogenous factors such as the employment record and the population age structure in the case of old-age pensions.

25.   Population ageing normally results in an increase of the beneficiary ratio of pension schemes assuming no change to the entitlement conditions. In many countries, this should be a determinant factor in the progression of pension expenditure in the future.

26.   The *benefit level ratio* is also referred to as the replacement rate. It compares the average level of individual benefits to the average individual level of earnings. The benefit level ratio is dependant on the replacement rate when benefits become payable (initial replacement rate) and in the case of pensions, on the indexation provisions during the payment period.

27.   The individual initial replacement rate may vary according to the benefit provisions, the employment record (or residence record for demogrant pensions) and the development of earnings during the working years.[5] Following the introduction of new provisions, there may also be a slow progression of the average initial replacement rate as it may take many years for a pension scheme to mature.

28.   The effective replacement rate is also dependant on the mechanism of indexation of benefits in payment, i.e. whether it is linked to changes in prices or changes in wages. When compared to average earnings, the individual replacement rates would go down as pensioners get older if wages are increasing in real terms and benefits are indexed according to changes in prices. Individual replacement rates would also go down rapidly if there is a high rate of inflation and benefits are only partially indexed.[6] The average replacement rate for the whole population of pensioners would then be lower than what might be expected from the legal provisions. The replacement rate is therefore a key indicator of the effective level of protection provided by pension schemes.

29.   Pension models are used to estimate the future value of the indicators for pension schemes and to project pension income and expenditure. Pension models are discussed in the following section.

3.   The pension model

3.1. Objectives and overview

30.   The purpose of the pension model is twofold. First, it is used to assess the financial viability of a pension scheme either to confirm that income and expenditure should remain in balance over a definite period of time or to make recommendations on the necessity to revise the contribution rate and the structure of benefits. Second, it is used to examine the financial impact of alternative options for reforming

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[5]   The replacement rate may also be reduced in case of early retirement and increased for deferred retirement, but a system of flexible retirement age also has an impact on the beneficiary ratio. There should be no net effect if the system is actuarially neutral.

[6]   Refer to the paper by Drouin and Scholz for more detailed information on indexation of pensions in a context of high and volatile inflation.

a pension system, in order to assist policy-makers in the design of sound benefit provisions and to make recommendations on the financing of the scheme. More specifically, the pension model is used to:

- project expenditure and contributory earnings under status quo conditions and for different reform proposals;

- assess the relevance of building up a contingency or a funding reserve;

- propose schedules of contribution rates consistent with the funding objective;

- test how the system reacts to changing economic and demographic conditions.

31.   The pension model is a long-term projection tool that serves primarily to develop the salary base of the insured contributors and the benefit expenditure.

32.   Afterwards, schedules of contribution rates can be calculated for different financing options based on projected contributory earnings and expenditure. The cost of a scheme (benefit expenditure + administration) is dependent on the benefit provisions as well as the demographic and economic environment. The choice of a financing system aims to allocate the financing of the cost of the scheme over the years and among the participants in an orderly and rational manner. The financial system has to be established taking into account the economic, financial, fiscal and political objectives and constraints.

3.2. Pension model inputs

33.   The demographic and macroeconomic assumptions are defined as discussed in the section on social budgeting, but generally with a longer time perspective than for social budgeting purposes. Assumptions specific to the scheme, such as the contribution collection rate and the incidence rates of retirement and invalidity, also have to be specified. They are defined by looking primarily at the scheme provisions and the historical experience of the scheme.

34.   Information on the covered population at valuation date is needed, such as insurable wages, credited past service, pensions in payments, etc. The data must be desegregated on a basis maintaining the homogeneous characteristics of each group of insured persons. In practice, separate calculations are made for males and females, and for populations covered by distinct schemes or provisions. Within each group, assumptions on the salary distribution and the employment distribution are formulated on an age-specific basis.

35.   Finally, information on the existing scheme assets, if any, is needed to project the annual cash flows of investment income. An interest rate assumption based on the nature of the assets, the past returns and the investment policy must be formulated. This assumption is established in relation to the assumptions of economic growth and wage development.

3.3. Projection methodology

36.   Based on the insured population data and the set of assumptions, pension projections are performed following a year-by-year cohort methodology. The existing population is aged and gradually replaced by the successive cohorts of participants on an annual basis according to the demographic and coverage assumptions. The projections of insurable earnings and expenditure are then performed according to the economic assumptions and the scheme provisions.

37.   Pension reforms have to be introduced following a proper assessment of the long-term financial implications. In fact, pensions are long-term benefits and the financial obligations that a society accepts when adopting financing provisions and benefit provisions for pension schemes are of a long-term nature: participation in a pension scheme extends over the whole adult life, either as contributor or beneficiary. During their working years, participants gradually build entitlements to a pension that will be paid even after their death to their survivors. Moreover, reform proposals may only become fully effective many years following their implementation.

38.   The objective is not to forecast the exact development of income and expenditure over a long period. It is rather to check the financial viability of the scheme -the relative balance between future income and expenditure- using consistent and reasonable assumptions. The model will provide the necessary contribution rates, and whether they are acceptable or not is a matter of political decision.

3.4. Financing system

39.   One important aspect of pension modelling is the financing system issue: how to raise resources systematically, in order to meet expenditures as they arise. In the context of a defined benefit scheme, the choice of a financing system determines how the contribution rate will develop over the years and what level of pension assets will be accumulated.[7] A summary of the different financing techniques and their major characteristics is provided in Table 2.

40.   Occupational pensions are normally fully funded to protect the participants against the risk of insolvency of the sponsor and to avoid cross-subsidization between employers. Social security pensions provide benefits according to laws and regulations and the risk of insolvency, for a society as a whole, cannot be managed the same way as for a firm or an individual. The exact funding level of social security pension schemes varies depending on:

- the need to promote the stability of the contribution rate;

- the necessity to adapt the funding level of the scheme to the present economic situation and expected future developments in order to make the most effective use of the resources.

41.   Stability of the contribution rate may be desirable to enhance the sustainability of the actual provisions of the scheme by promoting greater confidence in the scheme, by strengthening fiscal discipline (governance) via an early recognition of the long-term financial implications of plan amendments, or by reducing labour market distortions due to frequent changes of the contribution rate. It also contributes to a more equal distribution of cost across successive generations. However, frequent revisions of the contribution rate could be preferable to avoid an excessive accumulation of reserve funds and to gradually adjust the contribution rate, or alternatively to keep the contribution rate at a low level in a period of economic difficulties or at early stages of economic development.

42.   The accumulation of reserve funds is desirable to promote the stability of the contribution rate in the context of an ageing population or a maturing scheme. Nevertheless, a great stability of the contribution rate is not synonymous with a full funding of pension liabilities. The assets accumulated under a fully funded scheme amount to several years of contributions, and a high level of funding makes

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[7]   By definition, the contribution rate of defined contribution schemes is fixed, and the pension amount at retirement depends on the account balance and the prevailing conditions (such as the level of interest rate) at that time.

the contribution rate sensitive to the unavoidable deviations of the experience of the scheme from the actuarial assumptions. These deviations generate surplus or deficits that make necessary periodical revisions of the contribution rate to maintain the funding objective of the scheme.[8]

43.   In this context, the modelling exercise should serve two objectives:

- to simulate schedules of contribution rates, and the corresponding liabilities if applicable, for different financing options and different scenarios of economic and demographic development (including the necessary revisions to the assumptions over the years);

- to assist decision-makers in the determination of an optimal financing strategy considering the situation of the scheme, the financing objectives and the environment.

4.   Modelling distributional effects

4.1. Objectives and overview

44.   The primary objective of the modelling of distributional effects is to assess the implications of the expenditure and the financing of the social security benefit system on the distribution of household income, both for contributors and beneficiaries. Since there are limits to the level of redistribution societies want to afford, the distribution impact of pensions also has to be analysed in the overall context of the social protection system. More specifically, the distribution model is used:

- to assess the effect of alternative benefit and contribution provisions on the current income of contributors and pensioners at a given point in time;

- to compare the effect of pension provisions on lifetime earnings for successive generations of participants or for persons with different socioeconomic characteristics;

- to measure the impact of the development of social expenditure on the development of net earnings of different categories of contributors, taking the various sources of financing of the social protection system into account.

45.   The objective pursued is to estimate the direction and the magnitude of redistribution for typical individual cases and for different economic and demographic scenarios. This is needed to evaluate if the pension system achieves the desired redistributive social policy objectives, and how it will be judged by the public.

46.   All pension and social protection systems redistribute income, but the causes and the extent of redistribution vary depending on the nature of the scheme, the provisions of the scheme and how it is financed, the structure and the characteristics of the population, and the economic situation.

47.   Defined benefit schemes financed on a collective basis generally redistribute within generations according to the plan provisions. There may be redistribution between men and women, full-time workers and part-time workers, rich and poor, etc.

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[8]   The great difficulty to guarantee pension indexation with funded schemes illustrates this point.

48.   Defined benefit schemes also redistribute income between generations. The inter-generational redistributive effect refers to the comparison of the contribution burden and the benefit payments for successive generations of contributors.[9] With PAYG financing, a generation of contributors may receive more or less than the sum of its past contributions. It also happens with fully-funded schemes when there is unanticiapted inflation or deflation[10], or, in the case of schemes financed on a collective basis, when surplus or deficits that arise because of plan amendments or experience gains or losses are financed over a long period.

49.   In case of individual retirement savings, redistribution depends primarily on the evolution of real interest rates over the years (and more specifically at time of retirement), as well as on the efficiency and the selection and classification rules of the annuity market. There is also some minor degree of redistribution within generations depending on how administration costs are allocated between participants and whether savings are managed on an individual or a collective basis.

50.   A proper comparison of different policy options requires the modeling of these different redistributive effects.

4.2. Indicators of distributional effects

51.   The redistributive impact of pensions may be first assessed by comparing the effect of alternative pension and contribution provisions on the income of contributors and pensioners at a given point in time. This is called the individual current income effect . It is also possible to compare the values of contributions and benefits over the lifetime of an insured person. This is called the individual actuarial balance . Finally, the impact of the development of total social expenditure on the progression of net earnings of contributors with different characteristics may be measured. This is called the net income effect .

Individual current income effect

52.   The redistributive impact of alternative provisions may be assessed by calculating and comparing replacement rates and effective contribution rates for hypothetical individuals at a given point in time. It is then possible to identify who wins and who looses (and by what margin) under different provisions. The hypothetical individuals are characterized by their earnings level and their contributory periods.

53.   Calculations are made for different earnings levels as the contribution rate and the benefit rate may vary with the earnings level. The contributory periods are defined on the basis of employment patterns, and different employment patterns, such as full-time work and part-time work, might imply different redistribution patterns.[11] The specification of different employment patterns also allows to

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[9]   No matter how the pension scheme is financed, pensions paid to retirees are financed from current GDP. Nevertheless, contributions are often paid on covered earnings which represent only a fraction of total income and pension assets held by workers represent only a fraction of all financial assets. Part of the pension assets may also be invested in other countries. The degree of intergenerational equity for successive generations of contributors to a pension scheme might thus be different from the degree of inter generational equity in the national population as a whole.

[10]   Refer to (Barr, 1993) for more explanations.

[11]   Links may be established between earnings levels and contributory periods to properly measure redistribution between persons at different levels of earnings.

measure the redistributive impact of provisions granting credits under specific circumstances, such as child care, disability or unemployment.

54.   Calculations are made at given points in time, either during the years following the introduction of new provisions or once the scheme has reached maturity. In order to properly assess different policy options, the benefits provided by all the mandatory tiers of the pension system might have to be considered: in addition to the mandatory pension or savings scheme, amounts of demogrant pensions, social assistance benefits, and state guarantees to individuals (such as a minimum rate of return) might have to be estimated. Finally, the redistributive effect of pension taxation might be estimated by calculating replacement rates and contribution rates on both a gross and a net basis.

Individual actuarial balance   Equilibrium rate of return

55.   The actuarial balance is the difference between the present value of lifetime benefits and the present value of lifetime contributions.[12] When calculated for different categories of individuals and different policy options, it provides an indication of who benefits from an increase in lifetime income and who suffers a decrease in lifetime income as a result of the pension system. It is also possible to calculate the equilibrium rates of return at which the actuarial balance is in equilibrium (the present value of benefits equal the present value of contributions).

56.   Actuarial balance or equilibrium rates of return can be calculated for different earnings levels and employment patterns as well as for successive cohorts of participants (gender distinct or not). Assumptions specific to each group may be used if there are significant differences or if the assumptions vary over time. This is particularly important for economic assumptions, but specific demographic assumptions may also be used to reflect mortality differentials between income groups and mortality improvement over time for instance.

57.   Calculating the actuarial balance or equilibrium rates of return to compare pension funding methods deserves special notice. When pensions are funded, the contribution rate (for a defined benefit scheme) or the benefit level (for a defined contribution scheme) is dependent on the interest rate, and a prospective calculation of an equilibrium rate simply replicates the interest rate used as assumption. In fact, interest rates are dependent on the other economic and demographic variables: savings by large cohorts of young people and dissavings by large cohorts of old people could have an impact on the rate of return on investments that have distributional consequences. In this context, using generational accounting to compare the rate of return for successive generations and for different funding methods may be misleading unless the dynamic effects of population ageing are properly accounted for.

58.   Finally, calculations of actuarial balance and equilibrium rates have to be put in a proper context to ensure a sound interpretation of the results. The different components of the pension system are not designed only to maximise the rate of return. For instance, proper management of the pension risks (investment risk, longevity risk...) is also necessary to achieve an objective of income replacement and security in retirement, and the implementation of a pension scheme may be the expression of other concerns such as social solidarity and social cohesion. This means that income redistribution between subgroups might be a positive feature of social security pension scheme, and all subgroups should not have the same actuarial balance. In this context, calculations of actuarial balance or equilibrium rates of

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[12]   Pension contributions paid by employers and employees are normally considered to estimate the present value of contributions, but government subsidies financed from general taxation can also be taken into account.

interest should prove to be a useful tool to check if the results are conforming to the policy objectives. Nevertheless, it is important to make a clear distinction between the tools, the means and the end.

Net income effect

59.   The projection of total social expenditure using the social budget model indicates the absolute level of transfers that take place via the social protection system. There are limits to the level of social transfers a society is willing to accept, and it is important to look at the rate of development of these expenditures and their impact on the progression of net income of hypothetical individuals. The net income effect is the measure of the proportion of future increase in gross income which would be taken away by increased levels of social transfers.[13]

60.   The rate of progression of net income (as a proportion of the rate of growth of gross income) is dependent on both the level of social expenditure and the way expenditure is financed. The financing of a scheme by contributions on covered earnings allocates the cost between the participants, usually as a fixed percentage of earnings up to a ceiling. Alternatively, taxation financing spreads the cost across all income-earners but at different rates according to the taxation rules and schedules. The tax status of social contributions and benefits also has to be taken into account to assess the impact of the development of social expenditure on the progression of net income.[14]

5.   An illustration of typical applications: The case of Demoland

61.   The above methodology is now applied to a model country called Demoland. Demoland is a real country made anonymous according to the technical assistance agreement with the ILO.

62.   Demoland is a middle income country with a population currently growing rapidly. Only 40% of the labour force is covered by the three main social insurance systems (public sector employees, private sector employees, self-employed). Social insurance benefits include pensions, short-term cash benefits and health care services. An unemployment benefit system was due to commence operations in 1996 and social assistance is a fairly restrictive system providing low level means-tested benefits only to the old and disabled poor.

63.   The major characteristics of the public pension schemes may be summarized as follows:

- the contribution rate is fixed de facto and the deficits of the last years had to be fianced from general revenues[15];

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[13]   Assuming an unchanged level of public deficit and no change to the other public policy and fiscal measures.

[14]   The objective is not to test the impact of alternative fiscal rules, but rather to test alternative pension financing options considering the current fiscal rules. Therefore, average effective taxation rates might be estimated for different income levels, different categories of taxpayers or different sources of income in order to be able to make the necessary calculations without having to develop a complete taxation model.

[15]   While the public pension schemes were originally designed to be partially funded, they are now functionning on, effectively, a PAYG basis.

- the average benefit ratio (ratio of the average pension to the average insured earnings) is high, ranging from 67% to 95% on average depending on the scheme;

- the contribution ceiling on maximum insurable earnings is very low so that pensions are low when compared to national average earnings and an increasing proportion of retirees are entitled to a social support supplement;

- a large number of retirement pensioners draw their pensions at relatively young ages because of liberal eligibility conditions introduced to reduce unemployment rates;

- there is a widespread tendency to under-declare earnings because of a weak relationship between contributions and benefits and because of weak compliance procedures.

64. The following sections briefly discuss:

- the main assumptions;

- the development of total social expenditure and the impact on the government consolidated budget for a projection period of 10 years assuming status quo conditions;

- the financial viability of the current benefit and financing provisions of the pension schemes;

- an assessment of the financial and distributional effects of different pension reform options;

- the sensitivity of the results to major assumptions.

5.1. *The assumptionsDemographic assumptions*

65. Population projections are important for both pension and social expenditure modelling in a context where the social security system aims to cover all the population or a significant proportion of it. Moreover, the proportion of elderly is expected to increase significantly in Demoland in the future.

66. Slightly more than 30 percent of the population in Demoland is currently under the age of 15. This is explained by high fertility rates in the recent past. Consequently, there will be a significant increase in the number of people in the working age groups in the coming years. In the longer term, there will be an increase in the proportion of persons of age 65 and older: from 4.7% in 1995 to 13.2% in 2025 and to 16.1% in 2050. Declining fertility rates are mainly responsible for this trend.

Economic assumptions and labour market developments

67. The major assumptions and results on labour market developments are summarised in Table 3. The number of employed people in the future is derived according to exogeneous assumptions of real economic growth (as a measure of total output) and wage increase (as a measure of output per worker). Unemployment is obtained by subtracting total employment from the number of people available for work (labour force). Figures on the size of the labour force are derived from the demographic projections and labour force participation rates which are assumed constant.

68. Based on the labour market assumptions, the unemployment rate should go down in the coming years: the growth of the size of the labour force will be more than compensated by the growth of

employment. The sensitivity of the results to an alternative assumption of economic growth and employment growth will be tested.

69.   Considering the current low level of the ceiling and the inflationary context characterizing Demoland, the assumption on the future indexation of the ceiling on covered earnings is an important one. It is assumed that the ceiling will be indexed in the future according to the rate of increase in average earnings. It is assumed that the current high rates of inflation will gradually go down over a period of 5 years.

Coverage and compliance

70.   The present coverage of the total employed and self-employed population by the three social insurance schemes in Demoland is about 40%. As a base assumption, it is assumed that the coverage level will rise by about one-third between now and 2050. The sensitivity of the results will be tested assuming a more significant increase of the coverage level.

5.2. Diagnosis of the status quo

The social budget model projections

71.   The impact of those assumptions on total social expenditure and its financing over the period 1995 to 2005 is set out in Table 4. The share of total social expenditure in GDP is estimated to be 10% in 1995, increasing to 12.9% in 2005. In other words, it is projected that the share of GDP which is re-distributed via the social security system will grow by about 30 % over 10 years. Pensions account for most of the increase, although health expenditure also increase as a percentage of GDP.

72.   Under these assumptions, it is projected that the deficit of the social security institutions will grow over the years as the contribution rate remains unchanged during the projection period and social expenditure grows faster than earnings and GDP. Consequently, the share of social security financing which must be met from general revenues will grow from 4.7% of GDP in 1995 to 6.5% in 2005.

73.   The impact on the consolidated government budget is shown in Table 5. Revenues and expenditures of the Exchequer are projected based on the same economic assumptions as those used for projecting social expenditure and income. The deficit of the social security institutions is added to government expenditure. This projection indicates that the government budget deficit should show a decline during the first half of the next decade, to be followed subsequently by a renewed increase. From 1998 onwards and assuming that the assumptions underlying the projections are fulfilled, the consolidated budget would be in balance if it were possible to eliminate the deficits of the social security institutions. [16]

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[16]   Further sensitivity tests with the model showed that, if the level of nominal interest rates for 1996 and subsequent years remains at the 1995 level (which is very high), the consolidated budget deficit would double, around 8% of GDP, in 1996 and increase *dramatically* thereafter - as a result of which the combined deficits of the social security institutions would represent a relatively insignificant percentage.

The pension model projections

74.   The long-term future demographic and financial development of the public pension system in Demoland has been modelled on the basis of the current benefit provisions. Under this base case scenario, it is assumed that the schemes will continue, with no changes in either structural or operational aspects.

75.   Graph 1 depicts the salient features of the main performance indicators of the pension system: the beneficiary ratio, the benefit ratio and the PAYG cost. The PAYG cost is approximately equal to the product of the beneficiary ratio and the benefit ratio.

76.   The PAYG cost increases 1.5 times during the next decade (from 40% in 1995 to 62% in 2005) and reaches a level of 106% by 2050. That means that after about 2035 the average contribution per worker in the economy would be equal to his/her covered earnings. The average contribution rate for the three schemes is 21.5% of covered earnings. The future increase of the PAYG cost rate is driven mainly by the steady rise of the beneficiary ratio in the coming decades. Nevertheless, the high replacement rate (benefit ratio) of the scheme has a direct impact on the level of the PAYG cost rate.

77.   Graph 2 presents the annual expenditure and the annual deficit assuming that the present contribution rates were to be kept constant during the projection period. The annual deficit corresponds to the negative annual cash flow (contributions-expenditure); it is expected to increase steeply from a level equivalent to 1.2% of GDP in 1995 to 11% of GDP in 2050.

78.   One of the primary purposes of the pension model is to assess the financial viability of a scheme. Clearly, in the long run, the insured population will be unable to finance meaningful pensions for all pensioners if the present system is not changed:

- to make the system financially self-sustainable would require a contribution rate greater than 100%;

- to maintain the contribution rate at an acceptable level would require a multiplication of the present already substantial annual transfers from Government revenues or deficit.

The distributional effects

79.   The ratio of lifetime benefits over lifetime contributions ranges from 3 to 8 depending on the scheme and the income level. In other words, between 2 and 7 demo-dollars of benefit is paid for every demo-dollar paid in as contributions. It corresponds to equilibrium rates of return of about 3.7% to 7% in real terms in the long-run.

80.   These high rates of return can probably not be achieved by other investment in the country over a long period, and in fact, they are not earned by the scheme but are exclusively due to external subsidisation by the Government. Such large subsidies are not caused by accidental negative external factors, such as unfavourable development of employment or wages, but are to a large extent rooted in a systemic disequilibrium between the contribution rate and the benefit provisions.

81.   Social expenditure were projected assuming a high rate of economic growth so that under this scenario the cost of the desequilibrium between the contribution rate and the benefit provisions could be financed out of economic growth for the next years. In other words, workers would still register a significant increase in their net income level even though they have to finance an increased level of

transfers. The situation would gradually deteriorate as the number of retirees will increase and the rate of economic growth will diminish.

82.   Finally, it must be noted that high levels of transfers from government revenues would imply regressive redistribution if the coverage of the population by the scheme remains limited to people with earnings above national average. Benefits paid to better-off people would then be financed by all taxpayers.

5.3. *Options for pension reform*

83.   Three different reform options will be discuseed below in order to highlight the key parameters under different circumstances:

> Option 1:   Restructured Pay-as-you-go (PAYG) scheme
>
> Option 2:   Individual savings account
>
> Option 3:   Multi-tier system with a defined benefit component and a mandatory savings component.

84.   A summary of the features of each option is provided in Table 6.

85.   It is assumed under the three options that the standard pensionable age would be set initially at 55 for men and 53 for women, rising to 60 and 58 respectively over a ten-year period. Early retirement on a correspondingly reduced pension would be permitted, but only if the reduced pension were equal to at least the minimum pension. Currently, participants are entitled to an unreduced pension once they satisfy the minimum contribution conditions. There are cases where an unreduced pension is payable before the age of 50.

86.   All reform options assume for the new pension system a contribution rate equal to the present contribution rate. Expenditure exceeding the contribution income will have to be financed from general revenues, including the liquidation of acquired rights under option 2. Maximum and minimum levels of insurable earnings are assumed to be initially raised and then adjusted annually in line with average earnings.

87.   Option 3 is a mixture of a defined benefit component (like option 1) and a defined contribution component (like option 2). In this context,the focus will be mainly on options 1 and 2, in comparison with the current provisions.

The social budget model projections

88.   Under option 1, the development of social expenditure for the first five years is only gradually reduced when compared with the base case as most pensioners still receive pensions based on the old pension formula and new pensioners still benefit from transitional measures. During the second half of the first decade divergence begins to develop more significantly. Details are shown in Table 7.

89.   Under Option 2, total expenditure increases which is due to the build-up of reserves (savings accounts) under the new scheme, in addition to the payment of benefits based on the old pension formula for the rights acquired before the introduction of the new scheme.

90.   In the medium term, the proposed raising of the earnings ceiling for contribution purposes has positive effects on the financing of social expenditure under option 1. This leads to a reduction in the deficit of the social protection system which must be financed by the Government. Under Option 2, the extra amount of contributions resulting from the increase of the contribution ceiling is invested in individual savings accounts so that the Government remains burdened by the need to finance the continuing deficits of the old "frozen" social insurance pension schemes.

91.   Thus, option 1 shows the greatest positive effect on the General Government Account in the medium term.

The pension model projections

92.   The pension model projections indicate that the overall financial impact of all the reform options, as measured by the total accumulated deficit in 2050, is very similar assuming that the contribution rate charged under each of the proposed new schemes remains constant, i.e. 21.5%. The overall accumulated deficit of the pension system can be substantially reduced (in the order of 85%) over the coming decades by the introduction of alternative pension formulae, by the increase of the pension age, and by simultaneous measures to increase the contribution income. Nevertheless, this long-term analysis indicates that it is unlikely that any reform could be implemented which would allow the deficit to be completely eliminated within the time span of the projections at the assumed level of contribution rates. This is shown in Graph 3.

93.   The situation under Option 2 is a little more complex. Considering again the projected financial position in the year 2050, the accumulated deficit arising from the "frozen" old schemes exceeds the accumulated reserves in the new savings scheme by a percentage of GDP which is closely comparable with the deficits projected under each of the other options. However, it is important to keep in mind the separate nature of these two components. The investment of the large sums representing individuals' contributions to the new scheme envisaged under this option would inevitably have a profound and lasting impact on the capital market. Concurrently, the financing of the "frozen" old scheme will entail the need for substantial public borrowing, and in the long run, the mandatory retirement savings system would supply, directly or indirectly, a substantial proportion of the resources to satisfy that demand.

94.   As a matter of fact, annual deficits are more substantial with option 2 during the transition period when benfits of the old scheme have to be financed entirely from government subsidies. In the long term, the scheme is in equilibrium since retirement benefits are then paid from the individual balance accumulated at time of retirement. For options 1 and 3, ther will still be annual deficits at the end of the projection period unless more substantial transfers are paid during the transion period (like for option 2) so that the new scheme can become partially funded. This is shown in Graph 4.

The distributional effects

95.   Under Option 1, the projections indicate that the long-term development will lead to average replacement rates which are substantially lower than expected under the base case scenario. The average replacement rate will also be lower Under Option 2, but the general levels of pension will be highly dependent on investment yields and hence on long-term economic performance. Although the level of income replacement is lower on average, it is increased for people with average earnings because of the higher ceiling on covered earnings.

96.   Under option 1, the replacement rate is greater for low income people than for the other income groups because of the minimum pension provisions. It is also greater for females than males because of presumed child credits. Under option 2, the replacement rate is the same for all income groups, and it lower for females than males because of their lower retirement age and their greater life expectancy. The replacement rate expressed as a function of the number of contributory years increases more steeply under option 2. Details are shown in Table 8.

97.   Finally, reform options 1 and 3 show positive individual balances at all income levels; albeit to a much more limited extent than under the present system. This means that at present contribution and compliance rates, the schemes still require a government subsidy. Under option 2 the new scheme is in actuarial balance, but the the deficit of the current scheme then has to be financed entirely from government subsidies.

5.4. Sensitivity analysis

98.   The sensitivity of the results to key economic and governance indicators will be tested. Alternative economic assumptions will be used to test how sensitive are the results obtained for the development of social expenditure and its financing over the next 10 years. The sensitivity of the long-term pension results will be tested using alternative assumptions of coverage and compliance.

Economic assumptions and social expenditure

99.   A reduction in real GDP growth rates of 2 percentage point is assumed, compared to the base case assumption, while keeping the assumed labour productivity unchanged. This implies a corresponding reduction of employment and increased unemployment. Details are given in Table 9 and Table 10 (assumptions and results).

100.   There is a fairly substantial reaction of total social expenditure to changes in economic growth. A reduction of 30% of total real growth during a decade leads to an increase of the GDP share of social expenditure by about 16% provided that the benefit and financing provisions are not changed. It also has an impact on the revenue side. Social insurance contributions are then lower and a growing share of revenues has to come from the general budget: 7.6% of GDP in 2005 compared to 6.5% in the main projection.

101.   The reaction of a national social protection system to growth is one of the key economic characteristics of the system. The more anti-poverty elements and flat-rate elements a system contains, the bigger the increase of the GDP share of social expenditure during times of reduced or negative growth.[17]

Pension coverage and pension results

102.   Gaps in coverage and in compliance may be attributable to the failure to register all eligible employees and employers, to the under-declaration of income, or to the legal exemption of some groups of

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[17]   In periods of stable (positive) growth such a system in a stationary state would experience a rapidly declining GDP share, provided that benefit provisions are not changed. The fact that the GDP share in Demoland increases despite of growth might indicate on the one hand that the system is not mature but should on the other hand also trigger an analysis of the benefit provisions. Normally social expenditure is anticyclical - in times of growth it should at least stabilize if not reduce.

employees. An improved coverage and compliance situation would result in an increase in the amount of contributions in the short term and the benefit expenditure would also increase in the long term.

103.   In the case of Demoland, the current deficits of the schemes could be substantially reduced for a transition period if it were possible to achieve high levels of coverage and compliance. Nevertheless, the deficit would re-emerge after a certain number of years. In fact, the deficit would ultimately surpass the deficit in the standard variant because there would be a higher number of beneficiaries with higher pension amounts to be subsidized by the Government.

104.   The situation would be different if the scheme were modified to establish some kind of a long-term equilibrium between the contribution rate and the benefit provisions. Improved coverage and compliance would then ease the financial strain during the transition period, and in the long-term, deficits would be alleviated or at least reduced if the schemes were closer to equilibrium.

6.   Conclusion

105.   Models may never be an exact image of reality. But major financial redistribution systems which are designed to have a profound impact on the income and hence on the well being of individuals and households require financial analyses both under the status quo conditions and in a context of reforms. Models - limited as they are - are the main quantitative planning tools available to social protection planners, governors, managers and administrators.

106.   Models can provide a coherent picture of the expected financial development of a social protection system. Sound governance requires a clear understanding of the major determinants in the development of the cost of a scheme and its financing. The question of the interrelationships between the different components of the system also has to be addressed, along with the sensitivity of the results to a changing environment and the implications of social measures for public finance.

107.   Considering the long-term nature of a pension scheme, it is necessary to adopt a long-term perspective in the assessment of the financial viability of a scheme. Since a social protection system redistributes resources between individuals and in order to achieve the policy objectives, it is necessary to clearly understand who benefits from the system and how is the consequential financial burden split. The long-term financial, fiscal and economic viability of a social protection system requires the establishment of reasonable and adequate benefit provisions relying on a sound financing basis.

108.   Transparent management and clear understanding by all the interested parties are also necessary conditions, and information produced by the models should help to foster the understanding of how social protection systems operate and what they can realistically achieve. They should also contribute to feed public policy debates on social priorities and ultimately, to enhance the public acceptance of the existing or reformed social protection systems. Informed policy debates are the first step towards the building of a national consensus which has to carry all national social transfer systems.

109.   No social protection reform should be undertaken without simulating the potential fiscal, economic and distributional effects of intended reform options. No reform of one branch of the national social protection system should be analysed without simulating its impact on other branches of social security. Since the impacts of major benefit reforms cannot be easily be tested in practice before their implementation, models are a useful tool to analyse potential effects through simulation.

110.   Finally, models should be used for a periodical monitoring of the experience of the schemes so that corrective measures can be introduced at an early stage if needed. Models are thus indispensable tools

for the design and planning as well as governance and management of national social security systems. They are tools for the analysis of routine as well as change.

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Table 1. **Basis of determination of the major demographic and economic assumptions**

Population

Starting with data on the current population, population projections may be produced using mortality, fertility and migration assumptions. Assumptions are based on recent experience for the first years of projection, and gradually converge to generally accepted ultimate values (life expectancy, total fertility rates). Reasonably chosen real rates of economic growth and productivity increases are exogenous inputs. Inflation rates are also exogenous. Possible impacts of alternative social policy options on economic growth is introduced exogenously.

Economic growth

Labour force, employment and covered population

The number of people available for work (the labour force) is obtained by multiplying the population by labour force participation rates. Aggregate employment results from the division of real GDP (total output) by average labour productivity (output per worker). The difference between the labour force and aggregate employment is measured unemployment.

The number of people covered by the schemes are obtained by applying (history-based) coverage rates to the appropriate reference population. The reference population may be the total population, the labour force or the employed population depending on the nature and the provisions of the schemes. The participation history to the schemes (contributory period) may be calculated using the coverage rates and assuming a certain level of turn-over in the covered population.

Distribution patterns by age and sex have to be specified in addition to the assumptions on the aggregate level of participation, employment and coverage.

Wages

Based on a split of total GDP between capital income and labour income, wages are calculated by dividing the wage share of GDP by employment.

In the medium-term, real wage developments ar e checked against labour productivity growth. In specific situations (high unemployment for instance) wages might grow more or less than productivity. Over longer simulation periods, real wage developments are usually assumed equal to labour productivity growth since wages should adjust to efficiency levels over time.

Assumptions on wage distribution are also needed since social protection systems redistribute income between people with different income levels. Assumptions on the differientiation of wages by age and sex are specified as well as assumptions on the dispersion of wages between income groups. Average career wages which are essential inputs for calculations of social protection benefits are also calculated.

Table 2. Financing Methods

Name of the method	Contribution rate Funding level
PAYG	Contributions collected year by year should exactly balance the expected expenditure of the year
	It does not lead to the accumulation of funds except for a modest contingency reserve maintained to avoid liquidity problems.
Partial funding	The contribution rate is fixed and maintained constant over a defined period (called equilibrium period) so that incomes and expenditure should be in actuarial balance over this period, taking into account the funding objective at the end of the equilibrium period.
	The size of the reserve normally goes along with the length of the equilibrium period, and a funding objective at the end of the equilibrium period is fixed, either to avoid liquidity problems or to pre-fund part of the liabilities.
Full funding	Contributions collected over a defined period should be equal to the discounted value of the benefits accrued during this period, subject to adjustments for accumulated surpluses or past unfunded liabilities.
	A reserve equal to the value of all accrued benefit entitlements is accumulated. The value of accrued benefit entitlements includes the value of current pensions and the value of benefit entitlements earned to date by active and inactive members.

Table 3. Key economic assumptions and macroeconomic parameters:

Demoland: 1995-2050 (base scenario)

Year	Annual rate of growth of real GDP	Annual rate of growth of employment	Unemployment rate	Annual rate of increase in CPI	Annual rate of increase of the national average wage
1995	5.9	2.3	8.1	90.0	99.0
1996	5.9	2.3	7.8	70.0	77.4
1997	5.9	2.3	7.6	50.0	57.2
1998	5.9	2.3	7.0	20.0	27.1
1999	5.9	2.3	7.0	10.0	15.8
2000	5.9	2.3	6.9	5.0	10.9
2001	5.9	2.3	6.7	5.0	9.4
2002	5.9	2.3	6.6	5.0	9.4
2003	5.9	2.3	6.5	5.0	9.4
2004	5.9	2.3	6.6	5.0	9.4
2005	5.9	2.3	6.7	5.0	9.4
2010*)	4.6	1.6	6.8	0.0	4.4
2020*)	4.0	1.4	7.0	0.0	3.0
2030*)	3.5	0.9	5.0	0.0	2.7
2040*)	3.0	0.6	4.6	0.0	2.5
2050*)	3.0	0.7	1.6	0.0	2.5

Note: *) Average annual rates over periods as indicated

Table 4. Social expenditure and its financing

Demoland: 1995-2005 (base scenario)

	1995	1996	1997	1998	1999	2000	2005
Total expenditure							
I. Pensions	3.4	3.6	3.7	3.9	4.1	4.3	5.2
- Old-age benefits	2.6	2.8	2.9	3.0	3.2	3.4	4.1
- Other benefits	0.7	0.7	0.7	0.8	0.8	0.8	0.9
- Administrative expenditure	0.1	0.1	0.1	0.1	0.1	0.1	0.1
II. Health	4.2	4.3	4.3	4.4	4.5	4.6	4.9
III. Short term benefits	0.2	0.2	0.2	0.2	0.2	0.2	0.2
IV. Unemployment insurance	0.0	0.0	0.1	0.1	0.1	0.1	0.1
V. Social assistance, NGO welfare	0.3	0.2	0.2	0.2	0.2	0.2	0.2
VI. Special schemes for specific industries	2.0	1.8	1.8	1.9	1.9	1.9	1.9
Total current expenditure	10.0	10.2	10.3	10.7	11.0	11.3	12.5
Change of reserves[1]	0.0	0.4	0.5	0.5	0.4	0.3	0.4
Total social expenditure	10.0	10.6	10.8	11.3	11.4	11.6	12.9
Social protection income	10.0	10.6	10.8	11.3	11.4	11.6	12.9
I. Social insurance contributions							
- Pension schemes	2.5	2.8	2.8	2.9	2.9	3.0	3.2
- Health insurance schemes	2.0	2.0	1.9	2.0	2.0	2.0	2.1
- Unemployment fund	0.6	0.6	0.6	0.6	0.7	0.7	0.8
II. Investment income	0.0	0.3	0.3	0.3	0.3	0.3	0.3
III. Other income	0.0	0.1	0.3	0.4	0.2	0.2	0.2
IV. Transfers from general revenues	2.8	2.7	2.7	2.8	2.8	2.9	3.1
	4.7	4.9	5.0	5.2	5.4	5.6	6.5

[1]   Reserve of the unemployment fund

Table 5. Consolidated budget in % of GDP

Demoland: 1995-2005 (base scenario)

Base line	1995	1996	1997	1998	1999	2000	2005
	% of GDP						
Revenues	17.9	15.3	14.7	14.5	14.2	14.0	13.5
Direct taxes	6.4	6.5	6.6	6.6	6.7	6.7	7.0
Indirect taxes	7.6	6.3	5.9	5.7	5.5	5.4	5.3
Social security contributions	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other non-tax revenues	2.5	2.4	2.2	2.0	1.9	1.7	1.2
Grants	0.1	0.1	0.1	0.1	0.1	0.1	0.0
Annexed budget	0.1	0.1	0.1	0.1	0.1	0.1	0.0
Privatization revenues	1.2	0.0	0.0	0.0	0.0	0.0	0.0
Capital income	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Received government transfers	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other revenues	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures	21.7	18.2	16.9	15.4	14.8	14.5	14.6
Personnel	6.7	6.6	6.5	6.4	6.3	6.2	6.1
Other current expenditures	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Social assistance paid by ministries	0.1	0.1	0.1	0.1	0.1	0.0	0.0
Social security benefits	0.3	0.3	0.3	0.3	0.4	0.4	0.5
investment	1.1	0.9	0.9	0.9	0.9	0.9	0.8
Interest	7.5	4.1	2.8	1.3	0.7	0.4	0.5
Transfers to SEEs	0.6	0.6	0.6	0.5	0.5	0.5	0.4
Transfers to social security institutions	1.3	1.7	1.9	2.2	2.4	2.6	3.2
Other transfers	2.8	2.6	2.5	2.4	2.3	2.1	1.7
Balance	-3.8	-2.9	-2.1	-0.9	-0.6	-0.5	-1.1
Deferred payments	0.3	0.1	0.1	0.1	0.1	0.1	0.0
Advances	0.3	0.1	0.1	0.1	0.1	0.1	0.0
Cash balance	-3.8	-2.9	-2.1	-0.9	-0.6	-0.5	-1.1

Table 6. Summary of the main features of the reform options

	Option 1	Option 2	Option 3 (1st tier)	Option 3 (2nd tier)
CONTRIBUTION:				
Insurable base				
- maximum	5 times MW	5 times MW	5 times MW	5 times MW
- minimum	1 times MW	1 times MW	1 times MW	1 times MW
Contribution rate	21.5%	21.5% (of which: ISA:17%, Inv.+Surv and adnm:4.5%)	16.5%	5%
OLD-AGE PENSION:				
Eligibility condition				
- regular pension	10 years	-	10 years	-
- minimum pension	30 years	30 years	15 years	-
Pensionable age	raised to 60(M)/58(W) gradually	raised to 60(M)/58(W) gradually	raised to 60(M)/58(W) gradually	raised to 60(M)/58(W) gradually
Pension formula	1.5%*PAW* (cont. yrs)	Final balance of indiv. account divided by annuity factor	1.33%*PAW* (cont. yrs)	Final balance of indiv. account divided by the annuity factor
Minimum pension	25%*NAE	40% * PAW	20%*NAE	-
Benefit adjustment	In line with NAE	In line with NAE	In line with NAE	In line with NAE

Note: MW: minimum wage; NAE: national average earnings; CPI: consumer s price index; PAW: personal average reference wage; NAE: national average earnings

Table 7. Fiscal effects of the various reform options

(% GDP differential form the base case)

	1995	1996	1997	1998	1999	2000	2005
Total Social Expenditure							
- Option 1	0.0	-0.1	-0.2	-0.4	-0.5	-0.6	-1.4
- Option 2	1.2	1.6	1.8	1.4	1.1	0.9	1.0
- Option 3	0.7	0.8	0.8	0.5	0.2	0.0	-0.6
Contributions							
- Option 1	0.3	0.3	0.3	0.3	0.3	0.3	0.3
- Option 2	-0.2	-0.3	-0.3	-0.3	-0.3	-0.3	-0.4
- Option 3	0.4	0.2	0.2	0.2	0.2	0.2	0.2
Investment income							
- Option 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
- Option 2	0.3	0.8	1.0	0.7	0.5	0.4	0.7
- Option 3	0.0	0.1	0.2	0.1	0.1	0.0	0.1
Other income (1)							
- Option 1	0.9	1.1	1.0	1.1	1.1	1.2	1.5
- Option 2	0.9	1.1	1.0	1.1	1.1	1.2	1.5
- Option 3	0.9	1.1	1.0	1.1	1.1	1.2	1.5
Government subsidies							
- Option 1	-1.2	-1.5	-1.5	-1.7	-1.9	-2.1	-3.1
- Option 2	0.2	0.0	0.0	-0.1	-0.3	-0.4	-0.8
- Option 3	-0.7	-0.6	-0.6	-0.9	-1.2	-1.5	-2.4
Balance of General Government s Account							
- Option 1	0.3	0.8	1.5	1.9	1.8	1.8	3.5
- Option 2	-1.1	-2.3	-3.1	-2.7	-2.3	-1.8	-1.9
- Option 3	0.6	0.8	1.2	1.6	1.8	1.8	3.5

(1) Imputed contributions to cover the cost of special schemes for specific industries

Table 8. Replacement rate as a function of the number of contributory years

Reform options and	Male, age 60		Female, age 58	
Earnings level	20 years	40 years	20 years	40 years
Minimum wage				
Present	1.16	1.35	1.16	1.35
Option1	0.76	0.76	0.76	0.76
Option 2	0.29	0.82	0.28	0.78
Option 3	0.61	0.77	0.61	0.81
3 times minimum wage				
Present	0.42	0.51	0.42	0.51
Option1	0.30	0.60	0.36	0.66
Option 2	0.29	0.82	0.28	0.78
Option 3	0.35	0.77	0.40	0.81
5 times minimum wage				
Present	0.25	0.30	0.25	0.30
Option1	0.30	0.60	0.36	0.66
Option 2	0.29	0.82	0.28	0.78
Option 3	0.35	0.77	0.40	0.81
10 times minimum wage				
Present	0.13	0.15	0.13	0.15
Option1	0.15	0.30	0.18	0.33
Option 2	0.15	0.41	0.14	0.40
Option 3	0.18	0.39	0.20	0.41

Table 9. Key economic assumptions and parameters

Demoland: 1995-2005 (low GDP and employment growth scenario)

| Year	Annual rate of growth of GDP (%)	Annual rate of growth of Employment (%)	Unemploy- ment rate (%)	Annual rate of increase in CPI (%)	Annual rate of increase of the national average wage (%)
1995	3.9	0.4	9.9	90.0	100
1996	3.9	0.4	11.2	70.0	75.0
1997	3.9	0.4	12.6	50.0	55.5
1998	3.9	0.4	13.7	20.0	26.0
1999	3.9	0.4	15.1	10.0	14.5
2000	3.9	0.4	16.6	5.0	10.0
2001	3.9	0.4	18.0	5.0	8.5
2002	3.9	0.4	19.3	5.0	8.5
2003	3.9	0.4	20.7	5.0	8.5
2004	3.9	0.4	22.1	5.0	8.5
2005	3.9	0.4	23.6	5.0	8.5

Table 10. Social expenditure and its financing
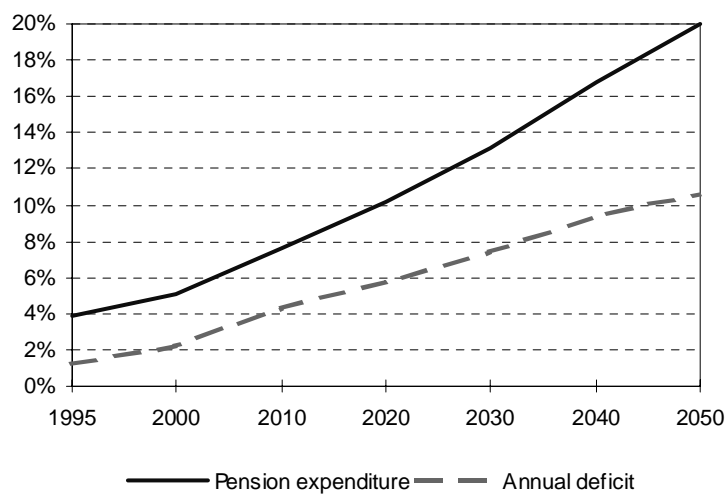
Demoland: 1995-2005 (low growth scenario)

	1995	1996	1997	1998	1999	2000	2005
Total expenditure							
I. Pensions	3.4	3.6	3.8	4.1	4.3	4.6	5.8
- Old-age benefits	2.6	2.8	3.0	3.2	3.4	3.6	4.6
- Other benefits	0.7	0.7	0.7	0.8	0.8	0.8	1.1
- Administrative expenditure	0.1	0.1	0.1	0.1	0.1	0.1	0.1
II. Health	4.3	4.4	4.4	4.6	4.6	4.7	5.2
III. Short term benefits	0.2	0.2	0.2	0.2	0.2	0.2	0.2
IV. Unemployment insurance	0.0	0.0	0.1	0.2	0.2	0.3	0.4
V. Social assistance, NGO welfare	0.3	0.3	0.3	0.4	0.4	0.4	0.7
VI. Special schemes for specific industries	2.0	2.0	2.1	2.2	2.3	2.4	2.8
Total current expenditure	10.3	10.6	10.9	11.6	12.1	12.6	15.1
Change of reserves[1]	0.0	0.4	0.4	0.4	0.2	0.1	0.0
Total social expenditure	10.3	10.9	11.4	12.0	12.3	12.7	15.0
Social protection income	10.3	10.9	11.4	12.0	12.3	12.7	15.0
I. Social insurance contributions	2.6	2.8	2.8	2.9	2.9	2.9	3.0
- Pension schemes	2.0	2.0	2.0	2.0	2.0	2.0	2.0
- Health insurance schemes	0.6	0.6	0.6	0.6	0.6	0.6	0.7
- Unemployment fund	0.0	0.3	0.3	0.3	0.3	0.3	0.3
II. Investment income	0.0	0.1	0.2	0.3	0.2	0.1	0.1
III. Other income	2.9	2.9	3.0	3.2	3.4	3.6	4.3
IV. Transfers from general revenues	4.8	5.1	5.3	5.6	5.8	6.2	7.6

[1]   Reserve of the unemployment fund

Graph 1. Performance indicators of the pension system

Legend: —— Beneficiary ratio — — Benefit ratio ···· PAYG
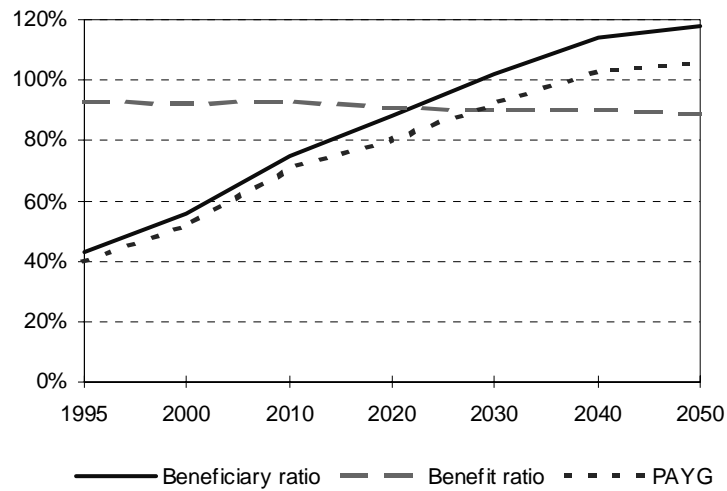
Graph 2. Expenditure and deficit of the pension system

(base scenario - % GDP)

Legend: —— Pension expenditure — — Annual deficit

Graph 3. Cumulative deficit for the various reform options
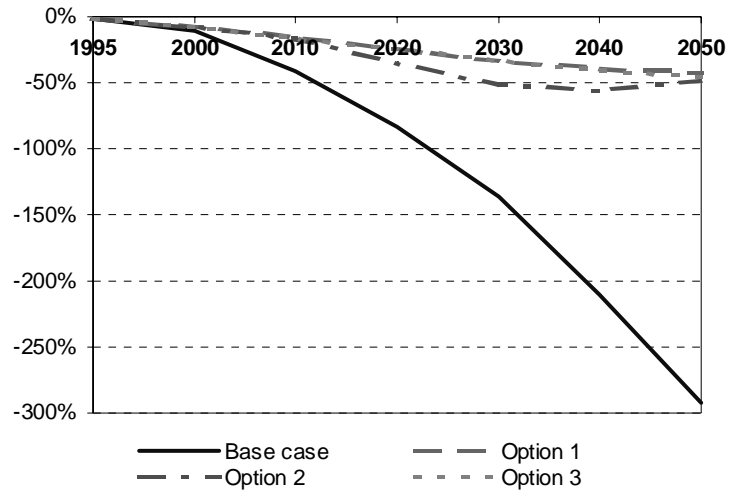
Graph 4. Annual deficit for the various reform options